

2017

SUSTAINABILITY REPORT

RATCH



RATCHABURI
ELECTRICITY GENERATING
HOLDING PCL.



2017

Embracing
Environment
& Social Care
for Sustainability

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About This Report

Reporting Approach

This 2017 edition of the Sustainability Report of Ratchaburi Electricity Generating Holding PCL. (RATCH) publicizes the policies, strategies, sustainability development approach, along with governance, economic, social, and environmental performance considered material for the businesses of RATCH and its stakeholders.

Spanning business performance from January 1 to December 31, 2017, this is the fifth report prepared under the guidelines of Global Reporting Initiative (GRI) and the first under GRI standards and GRI's Electric Utilities Sector scope (In-accordance Core Level).

Quality Assurance and Reliability

In preparing this report, RATCH followed the GRI guidelines. Topics and contents embraced the sustainability context, significant aspects to RATCH and its stakeholders, and significant aspects for stakeholders' decisions. To ensure completeness and accuracy, the company also organized reviews by key information holders and its central report-preparing unit. All information disclosed in this report has already won endorsement from top management.

Scope of the Report

This report contains information of RATCH, subsidiaries, and joint-venture companies, where RATCH and its subsidiaries holds at least a 50% stake, or subsidiaries and joint-venture companies controlled operation. RATCH's financial statement consolidated operating performance of the above mentioned companies based on equity method. A comprehensive list of subsidiaries and joint-venture companies is found in the 2017 Annual Report, downloadable from www.ratch.co.th.

Subsidiary / Joint venture	Location	% share	Type of business
1. Ratchaburi Electricity Generating Co., Ltd.	Thailand	99.99	Power generation business. Operating the 3,645-MW Ratchaburi power plant and the 720-MW Tri Energy power plant (both equity capacities)
2. Ratchaburi Energy Co., Ltd.	Thailand	99.99	Investing in renewable power generation and related businesses
3. RATCH-Australia Corporation Ltd., holding through RH International (Singapore) Corporation Pte. Ltd.	Australia	80.00	Investing in, developing, and operating the power generation and related businesses in Australia. Operating three gas-fired and one diesel-fired power plants and four windfarms with a combined equity capacity of 693 MW
4. RATCH-LAO Services Co., Ltd.	Lao PDR	99.99	Providing operation and maintenance services, as well as operating businesses related to investment in Lao PDR

Subsidiary / Joint venture	Location	% share	Type of business
5. Chubu Ratchaburi Electric Services Co., Ltd.	Thailand	50.00	Operating and maintaining the 1,490-MW Ratchaburi Power power plant. With its 25% equity in Ratchaburi Power Co.,Ltd., RATCH holds 372.50 MW equity capacity.
6. Nava Nakorn Electricity Generation Co., Ltd., holding through Ratchaburi Electricity Generating Co.,Ltd.	Thailand	40.00	Operating a cogeneration power plant with an equity capacity of 55.65 MW. A RATCH delegate serves as the joint-venture company's Managing Director.
7. Berkprai Cogeneration Co., Ltd., holding through Ratchaburi Electricity Generating Co.,Ltd.	Thailand	35.00	Operating a small cogeneration power plant with an equity capacity of 34.73 MW. A RATCH delegate serves as the joint-venture company's Managing Director.
8. Solarta Co., Ltd., holding through Ratchaburi Energy Co.,Ltd.	Thailand	49.00	Operating a solar farm with an equity capacity of 20.73 MW. A RATCH delegate serves as the joint-venture company's Managing Director.
9. Songkhla Biomass Co., Ltd., holding through Ratchaburi Energy Co.,Ltd.	Thailand	40.00	Operating a biomass power plant with an equity capacity of 3.96 MW. A RATCH delegate serves as the joint-venture company's Managing Director.

It appeared that the scope of Sustainability Report in 2017 covered RATCH's subsidiaries and operational control joint ventures changing from 2016 where included reporting of non-controlling joint entities.

Company	Revised Scope in 2017	Scope in 2016
Ratchaburi Electricity Generating Co., Ltd.	✓	✓
Ratchaburi Energy Co., Ltd.	✓	
RATCH-Australia Corporation Limited	✓	✓
RATCH-Lao Services Company Limited	✓	
Chubu Ratchaburi Electric Services Company Limited	✓	
Nava Nakorn Electricity Generating Company Limited	✓	✓
Berkprai Cogeneration Company Limited	✓	
Solarta Company Limited	✓	
Songkhla Biomass Company Limited	✓	
Ratchaburi Power Company Limited		✓
Ratchaburi World Cogeneration Company Limited		✓
Hongsa Power Company Limited		✓

The changes in the scope of report had consequence for information revision of economic, safety, environmental aspects as well as Performance Data on indicators of Greenhouse Gas, resources usage and environment.

Determination of Contents

This report’s contents align with the approach adapted by GRI Standard (Core), which requires four stages as detailed below. In addition, the measurement methods, calculation principles, and assumptions made for data compilation appeared under the applicable topics without restating the past year’s data. Indicators of key aspects appear in the GRI Content Index, page 142.

Step 1 Identification

- **Key sustainability aspects** significant to RATCH’s businesses are considered and compiled from six major sources:
 - 1) Short-term, medium-term, and long-term strategic plans and goals (annually revised)
 - 2) Corporate risk factors and aspects with significant impacts on the power generation and energy industry, including emerging risks likely to affect RATCH’s businesses
 - 3) Intelligence from assorted media for the analysis of trends, opportunities, and significant risks to RATCH, as well as relevant stakeholders’ needs and expectations related to its businesses
 - 4) Responses to questionnaires and interviews with RATCH’s top and middle management reflecting work-related opinions and experiences aspects likely to materially impact businesses, as well as opinions and expectations of relevant stakeholders
 - 5) Casual feedback and consultation sessions with applicable agencies or those in direct contact with each stakeholder
 - 6) Feedback of those representing key stakeholders at two-way consultation/communication sessions, namely customers, suppliers, partners, major shareholders, securities analysts, mass media, community, and regulators.

- **Stakeholder Grouping**

Grouping stakeholders into 8 groups by their relevance to both positive and negative impacts on its businesses, RATCH has its own process for forging participation and engagement, while addressing each group’s expectations as detailed below:

Stakeholder	Expectation	Participation channel	How expectation is addressed
1. Shareholders and investors	<ul style="list-style-type: none"> • Efficient corporate management • Sound income, share price, and dividends favoring attractive returns on investment • Fair, transparent business conduct with adequate, timely information disclosure • Business alignment with the directions and strategies of EGAT and cooperation to raise competitiveness • Contractual power generation and planned income generation • Business growth for higher enterprise value 	<p>Major shareholder: EGAT</p> <ul style="list-style-type: none"> • Meetings such as EGAT’s Business Committee meetings, Board meetings, and Portfolio Management units’ meetings • Formal and informal activities • Site visits • Interviews for business insights <p>Shareholders and investors</p> <ul style="list-style-type: none"> • Shareholders’ and analysts’ meetings • Site visits • Meetings with investors through various activities • Company website • Company Secretary Office and Investor Relations 	<ul style="list-style-type: none"> • Aligning strategies and business goals with the “EGAT Group policy”, coordination, and cooperation to promote information sharing and develop common work processes • Managing power plant efficiency in support of national power security (EGAT’s mandate) • Expanding integrated energy businesses and developing emerging businesses for greater income security and business sustainability • Staging shareholders’ meetings for queries and comments • Achieving membership certification of the Council of Thailand’s Private Sector Coalition Action against Corruption (CAC)

Stakeholder	Expectation	Participation channel	How expectation is addressed
			<ul style="list-style-type: none"> • Disclosing information in the annual and sustainability reports • Attending meetings to provide information to the major shareholder
2. Creditors	<ul style="list-style-type: none"> • Financial discipline and debt coverage • Compliance with laws • Fair, transparent business conduct • Asset profitability • Corporate goodwill and credibility 	<ul style="list-style-type: none"> • Information-sharing meetings and relationship-building • Site visits • Contact through finance units 	<ul style="list-style-type: none"> • Compliance with laws relating to business, environment, safety and labor; and setting sustainable development goal • Strictly honoring debt repayment schedules for creditors' trust • Credit rating by domestic and international institutions, namely TRIS Ratings, S&P Ratings, and Moody's • Analyzing and estimating revenue, and managing financial risks • Upgrading the anti-corruption system through CAC membership certification
3. Business allies	<ul style="list-style-type: none"> • Competent personnel with business insight and synergy of strengths among business allies • Fair, transparent business conduct • Systematic, standard business management • Corporate goodwill and credibility • Robust financial standing • Fair sharing of benefits • Sound business alliance with long-term relationships 	<ul style="list-style-type: none"> • Formal and informal meetings • Site visits • Business negotiations and deals for mutual benefits • Sharing of information, lessons learned, and skills • Activities and occasional visits for stronger ties • Interviews for business insights 	<ul style="list-style-type: none"> • Searching for business allies, a prime strategy defined under long-term strategic plans • Introducing basic measures to constantly assess confidence in business allies and develop work processes • Assigning committed, professional personnel to liaise with business allies • Valuing risk management • Setting a clear information-disclosure protocol concerning business allies • Upgrading the anti-corruption system through CAC membership certification
4. Regulators	<ul style="list-style-type: none"> • Compliance with laws and regulations • Environmental quality management with continuous, concrete community stewardship • Fair, transparent business conduct • Transparent, complete, and timely information disclosure 	<ul style="list-style-type: none"> • Formal and informal meetings • Site visits • Coordination through responsible agencies/units • Participation in regulator-organized training and seminars 	<ul style="list-style-type: none"> • Operate business with good governance principle and strict compliance with law, regulations, and requirements. • Environmental management and community stewardship • Monitoring changes in applicable legislation and regulations, and regularly reviewing actions for complete applicable compliance • Assessing risks, setting measures, and reviewing emergency response plans and running annual drills • Reporting complete information as required by law • Upgrading the anti-corruption system through CAC membership certification

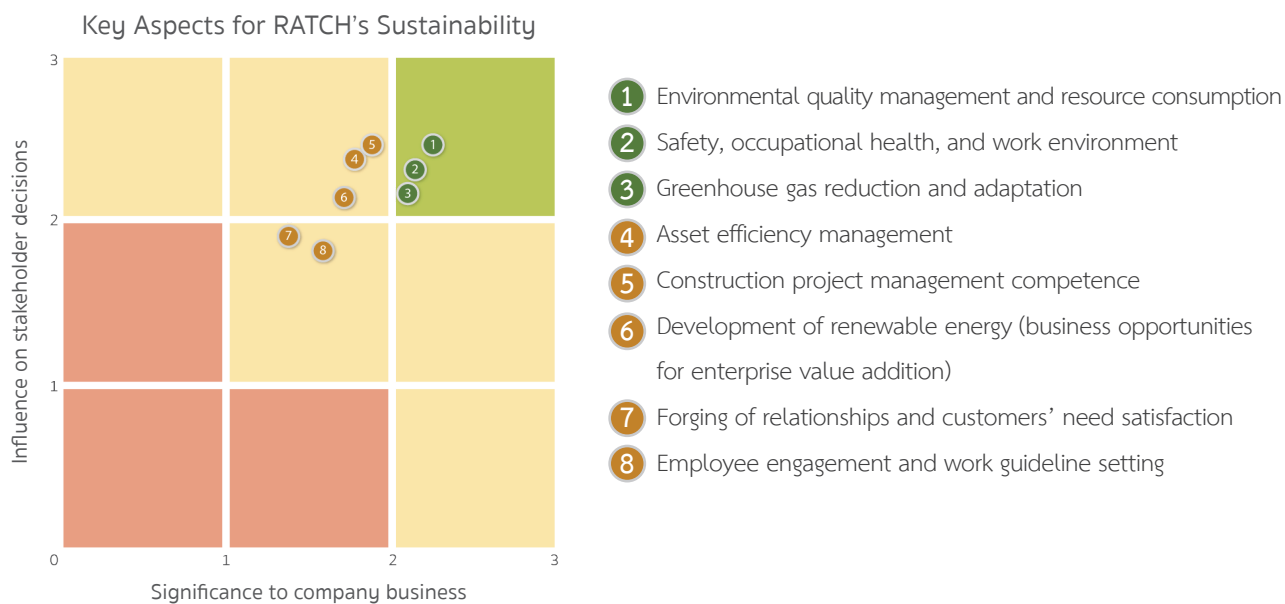
Stakeholder	Expectation	Participation channel	How expectation is addressed
5. Trade partners & contractors	<ul style="list-style-type: none"> • Sound business partnership and long-term relationship • Fair, transparent, and professional business conduct • Robust financial standing with punctual payment • Stewardship of work safety, occupational health, and workplaces • Corporate goodwill and credibility 	<ul style="list-style-type: none"> • Information-sharing and choice of business partners and contractors • Meetings, regular follow-ups of work progress, and joint problem-solving efforts • Regular communication with trade partners and contractors 	<ul style="list-style-type: none"> • Joint consultation with partners for mutually satisfactory work agreements • Establishing a transparent, internationally accepted procurement system to prevent conflicts of interest • Assessing trade partners before and after appointment, and setting aside preferred partners • Safety training for trade partners and contractors; enforcing strict measures for trade partners' and contractors' safety • Setting work plans with clear completion dates together with follow-up and budget control processes • Upgrading the anti-corruption system through CAC membership certification
6. Employees	<ul style="list-style-type: none"> • Attractive, fair pays and welfare on a par with peer businesses • Capability building • Career growth and participation in career path planning for various levels and responsibilities • Decent work environment and work safety 	<ul style="list-style-type: none"> • Townhall and departmental meetings • Feedback and grievance channels • Welfare Committee; Safety, Occupational Health, and Work Environment Committee; and 5S Committee • HR's employee relations activities • Employee volunteer activities 	<ul style="list-style-type: none"> • Conducting regular reviews of the remuneration structure for regular benchmarking against peer industries • Developing succession plans for career growth • Developing clear career growth plans to let employees identify growth opportunities and retain high-potential staff • Setting a training plan to raise staff potential and boost their morale • Setting a yearly plan on employee volunteer activities and inviting engagement in public service • Setting standard measures for safety, occupational health, and work environment • Heeding views and recommendations of staff for improved work methodologies
7. Customers & consumers	<ul style="list-style-type: none"> • Honoring power generation and delivery contracts in volume and quality • Green power generation process based on acceptable standards and minimized impacts on community • Administration with good governance, morality, and ethics • Sensible power pricing 	<ul style="list-style-type: none"> • Meetings to share information and views • Setting measures to boost power generation efficiency • Interviews for business operation insights 	<ul style="list-style-type: none"> • Promptly and efficiently readying operating systems in compliance with customers' requests in promotion of power security • Strictly following maintenance schedules for power distribution efficiency • Managing consumption of parts and fuels for cost reduction and improved generation efficiency

Stakeholder	Expectation	Participation channel	How expectation is addressed
	<ul style="list-style-type: none"> Ability to respond/assist in maintaining national power security 		<ul style="list-style-type: none"> Practicing proper, complete environmental management as required by law, and paying constant attention to communities' well being Reviewing crisis and emergency response plans and running annual drills Upgrading the anti-corruption system through CAC membership certification
8. Society and communities	<ul style="list-style-type: none"> Responsible operation without adverse impacts on communities and the environment Ongoing community and social stewardship, development, and promotion of the quality of life Community engagement and listening with an open mind Upgrading of socially and environmentally friendly operations for participation in tackling climate change 	<ul style="list-style-type: none"> Site visits Community development activities Community feedback and visits Public relations and information publicity for proper understanding Social engagement activities and campaigns Corporate Relations serves as RATCH's communication channel 	<ul style="list-style-type: none"> Compliance with laws relating to environment and continuing community development Implementing diverse communication, including newsletters, news alerts, and occasional visits, as well as community development activities Taking part in the Power Development Fund Committee for maximum community benefits Establishing an environmental inspection team from all sectors to inspect environmental management at power plants; also, providing knowledge and training to team members Campaigning for energy-saving and promoting economic power consumption by communities Arranging promotional activities for community forest conservation nationwide as a source of carbon sink to ease global warming Upgrading the anti-corruption system through CAC membership certification

Step 2 Prioritization

Assessed significant aspects acquired in Step 1 yield priorities varying with economic, social, and environmental impacts on business, as well as significance of influence on stakeholders' decisions. The Materiality Matrix below summarizes their prioritization.

Assessment Outcomes of Key Aspects of Sustainability



Step 3 Validation

Reviewing the aspects, the central unit responsible for preparing corporate reports proposes material ones for top management's consideration and endorsement to ensure comprehensive aspect identification and alignment of disclosed details with the principle of report quality measurement.

Step 4 Review

A suggestion form is attached to the report and posted on the website. Direct interviews with stakeholders take place after report issuance to gauge their satisfaction with RATCH's sustainability development report, ranging from topics and contents, information adequacy and credibility, presentation methods, linguistic usage, report format, to other recommendations for sustainability aspects to make next year's report most responsive to stakeholders' needs and expectations.

Reliability of this Report

This report was certified by the assurance third-party who specialized in reviewing and assuring the report's completeness, accuracy, and reliability against GRI standards. The said assurance third party did not have any relationship with the company and it was selected according to the company's procurement rules with the top executive's consideration and approval. The assurance statement can be found on page 149.

Access to Information

Should further information be required or should there be recommendations, please call Corporate Relations Division, Ratchaburi Electricity Generating Holding Public Company Limited, Tel: 66 2 794 9940, 9951, e-mail: charusudab@ratch.co.th, or pornpent@ratch.co.th.



Sustainability Aspects in This Report

Key Sustainability Aspect	GRI Aspect	Report Topic	Page	Report Boundary			
				Internal			External
				Power generation	Businesses related to power and energy	Non-power businesses	Community / customer / supplier / business ally / shareholder / creditor / regulator
Economic							
4. Asset efficiency management	GRI 201-1 Economic Performance	Economic Performance	79	✓	✓	✓	-
6. Development of renewable energy (business opportunities for enterprise value addition)	GRI 201-1 Economic Performance	Economic Performance	79	✓	✓		-
Environmental							
1. Environmental quality management and resource consumption	• GRI-301 Materials	Resource consumption and environmental management	50	✓	✓	✓	-
	• GRI-302-1 Energy consumption within the organization		139				
	• GRI-302-3 Energy intensity		140				
	• GRI-302-4 Reduction of energy consumption		64,140				
	• GRI-303 Water		51,140				
	• GRI-305-7 NO _x / SO _x and other significant air emissions		140				
	• GRI-306 Effluents and Waste		140,141				
3. Greenhouse gas reduction and adaptation	GRI-305 Emissions (GHG emissions Scope 1&2/ GHG emissions intensity)	Greenhouse Gas Management	65	✓	✓	✓	-
Social							
2. Safety, occupational health, and work environment	GRI-403 Occupational Health and Safety	Safety and Occupational Health	99	✓	✓	✓	Suppliers
5. Construction project management competence	GRI 419-1 Socioeconomic Compliance	Economic Performance	78	✓	✓	✓	Suppliers
7. Forging of relationships and customers' need satisfaction	GRI 419-1 Socioeconomic Compliance	Customer Relationship Management	97	✓	✓	✓	-
8. Employee engagement and work guideline setting	• GRI 401-2 Benefits provided to full-time employees that are not provided to temporary or part-time employees • GRI 404 Training and Education	Organizational development and employee engagement	117	✓	✓	✓	-
			116				

■ highly significant aspect

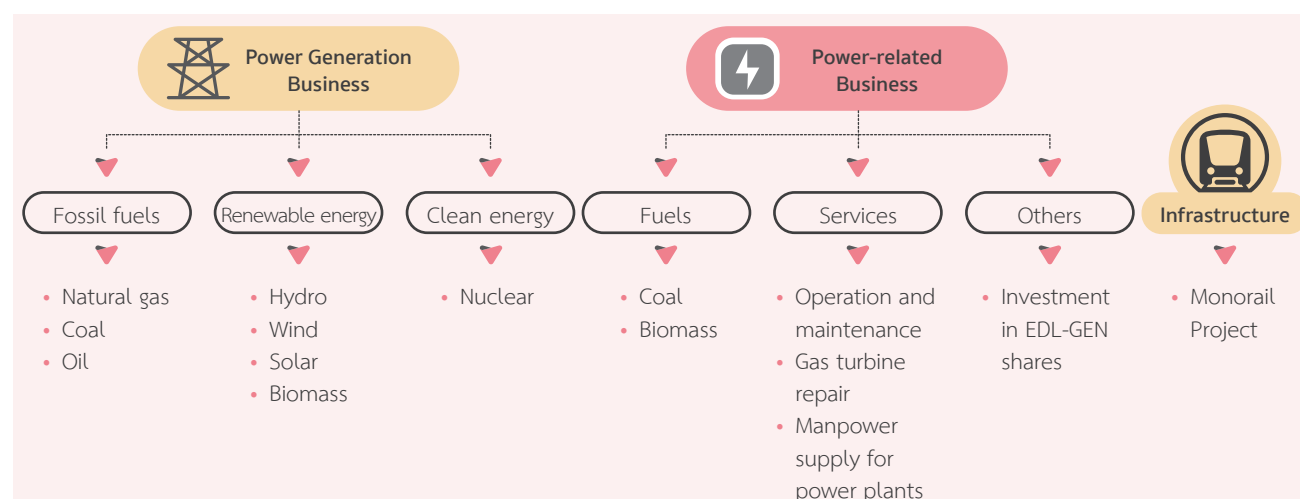
■ moderately significant aspect

Ratchaburi Electricity Generating Holding PCL. (RATCH), a public company listed on the Stock Exchange of Thailand (SET), is headquartered at 8/8 Moo 2, Ngam Wong Wan Road, Bangkhen subdistrict, Muang district, Nonthaburi, Thailand.



Nature of Business

RATCH operates its overall business as a holding company investing and holding shares in subsidiaries and joint ventures engaging in the power generation business based on various sources of energy or in power-related businesses. Also diversifying into other businesses, its investment is categorized as follows.



Products, Services, and Markets

Products and services under RATCH's management are made up of

- Electricity** - This is its core product in the form of energy whose production has to meet customers' demand in both quality and quantity specified under power purchase agreements (PPAs). The 18 power plants under RATCH's management as of December 31, 2017, with a total equity installed capacity of 4,960.06 MW consist of:

Power Plant	Location	Operator	Equity (%)	Equity installed capacity (MW)
Ratchaburi	Thailand	Ratchaburi Electricity Generating Co., Ltd.	99.99	3,645.00
Tri Energy				720.00
Nava Nakorn Electricity Generating (NNEG)		Nava Nakorn Electricity Generating Co., Ltd.*	40.00	55.65

Power Plant	Location	Operator	Equity (%)	Equity installed capacity (MW)
Solarta **	Thailand	Solarta Co., Ltd.*	49.00	20.73
Songkla Biomass		Songkhla Biomass Co., Ltd.*	40.00	3.96
Kemerton	Australia	RATCH-Australia Corp. Ltd.	80.00	246.40
Townsville			80.00	187.20
BP Kwinana			24.00	28.32
Starfish Hill			80.00	26.40
Toora			80.00	16.80
Windy Hill			80.00	9.60

Remark : * RATCH representatives in top executive positions

** Eight projects now under Solarta's management

2. Services

Business	Operator	Location	Equity (%)	Customer
Operation and maintenance	Chubu Ratchaburi Electric Services Co., Ltd.	Thailand	50.00	Ratchaburi Power Co., Ltd., the owner of Ratchaburi power plant* with an installation capacity of 1,490 MW, located in Ratchaburi
Manpower supply for power plants	RATCH-Lao Services Co., Ltd.	Lao PDR	99.99	EGAT, the service provider of operation and maintenance for Hongsa power plant**, with an installed capacity of 1,878 MW and located in Lao PDR

Remark : * RATCH holds 25% in Ratchaburi Power Co., Ltd.

** RATCH holds 40% in Hongsa Power Co., Ltd., the owner of Hongsa power plant.

RATCH applies the B2B approach in the sale of its products and services. Both sides (seller and buyer) agree on transaction terms and conditions before a contract is signed.

Since electricity is part of state infrastructure and one of the strategic factors vital to the country's economic and social development, the power generation business is state-regulated.

In Thailand, the Enhanced Single Buyer mode structures the power generation business. Therefore,

power plants currently under RATCH management are bound to generate electricity for EGAT. Power distribution proceeds under PPAs with the price, quality, quantity, and production period parameters spelled out. As for VSPPs, some of which run on renewable energy, electricity is generated for sale to the Provincial Electricity Authority (PEA).

In Australia, two approaches govern the production and sale of electricity: production for direct sale to buyers under a long-term PPA and direct sale to the merchant market.

Power Plant	Location	Operator	Buyer
Ratchaburi	Thailand	Ratchaburi Electricity Generating Co., Ltd.	EGAT
Nava Nakorn Electricity Generating		Nava Nakorn Electricity Generating Co., Ltd.*	EGAT/factories in the Industrial Estates
Solarta		Solarta Co., Ltd.*	PEA
Songkla		Songkhla Biomass Co., Ltd.*	PEA
Kemerton	Australia	RATCH-Australia Corporation Ltd.	Synergy
Townsville			AGL Energy/Arrow
BP Kwinana			Verve Energy/BP
Starfish Hill			Alinta Energy
Toora			Merchant market
Windy Hill			Ergon Energy

Remarks: EGAT –Electricity Generating Authority of Thailand
PEA –Provincial Electricity Authority

Location of Operation

RATCH invests in and operates its businesses in five countries. Indonesia is a new investment destination for 2017.

Country	Power Generation Business			Power-related Businesses			Infrastructure
	Fossil Fuels	Renewable Energy	Clean Energy	Fuels	Services	Others	Monorail project
Thailand	✓	✓		✓	✓		✓
Lao PDR	✓	✓		✓	✓	✓	
Australia	✓	✓					
China			✓				
Indonesia	✓						

Locations of significance to RATCH are Thailand, Lao PDR, and Australia since most of the investment has been made in power generation that has gone commercial. For the change in operation location this year, RATCH cancelled two joint investment projects in Japan, with a combined equity capacity of 20.33 MW.

Power Plants with Commercial Operation:

Country	Power Plant	Type	Fuel	Installed Capacity (MW)	Equity (%)	Operator
Thailand	Ratchaburi ¹⁾	Thermal and combined-cycle	Natural gas	3,645.00	99.99	Ratchaburi Electricity Generating Co., Ltd.
	Tri Energy ¹⁾	Combined-cycle	Natural gas	720.00	99.99	

Country	Power Plant	Type	Fuel	Installed Capacity (MW)	Equity (%)	Operator
Thailand	Ratchaburi Power	Combined-cycle	Natural gas	1,490.00	25.00	Ratchaburi Power Co., Ltd.
	Ratchaburi World Cogeneration	Cogeneration	Natural gas	234.00	40.00	Ratchaburi World Cogeneration Co., Ltd.
	NNEG ²⁾	Cogeneration	Natural gas	139.13	40.00	Nava Nakorn Electricity Generating Co., Ltd.
	Solarta ³⁾	Renewable	Solar	42.30	49.00	Solarta Co., Ltd.
	Korat 3,4,7	Renewable	Solar	21.60	40.00	Solar Power Khorat 3 Co., Ltd. Solar Power Khorat 4 Co., Ltd. Solar Power Khorat 7 Co., Ltd.
	Huay Bong 3 and Huay Bong 2	Renewable	Wind	207.00	20.00	First Korat Wind Co., Ltd. K.R.Two Co., Ltd.
	Songkla Biomass ²⁾	Renewable	Biomass	9.90	40.00	Songkla Biomass Co., Ltd.
Lao PDR	Nam Ngum 2	Renewable	Hydro	615.00	25.00	Nam Ngum 2 Power Co., Ltd.
	Hongsa	Thermal	Coal	1,878.00	40.00	Hongsa Power Co., Ltd.
Australia	Townsville ¹⁾	Combined-cycle	Natural gas	234.00	80.00	RATCH-Australia Corp. Ltd.
	Kemerton ¹⁾	Combined-cycle	Natural gas	308.00	80.00	
	BP Kwinana ¹⁾	Cogeneration	Natural gas	118.00	24.00	
	Starfish Hill ¹⁾	Renewable	Wind	33.00	80.00	
	Windy Hill ¹⁾	Renewable	Wind	12.00	80.00	
	Toora ¹⁾	Renewable	Wind	21.00	80.00	

Remark : 1) Projects operated by subsidiaries

2) Projects with RATCH's representatives in top executive positions

3) Solarta features eight projects

Of the total 27 investment projects featured in the table above, 18 are under RATCH's operation and management (12 in Thailand and six in Australia). RATCH commands a total equity installed capacity of 4,960.06 MW, of which 4,765.34 MW is produced under PPAs. Moreover, there was no newly operated project in 2017.

In 2017, RATCH invested in 5 projects with the equity capacity of 510.39 MW: 2 monorail projects in Thailand, 2 renewable projects in Australia and 1 combined cycle power plant in Indonesia. Meanwhile, there are three existing projects under construction, namely Xe-Pian Xe-Namnoy in Lao PDR, Berkprai Cogeneration power plant in Thailand and Fangchenggang Nuclear power plant phase II in China, with the combined capacity of 373.23 MW.

Projects Under Construction and Development

Country	Project	Status	Fuel	Installed Capacity (MW)	Equity (%)	Scheduled Commercial Operation (year)	Operator
Thailand	Berkprai Cogeneration power plant	Under construction	Natural gas	99.23	35	2019	Berkprai Cogeneration Co., Ltd.
	Pink line monorail	Under construction	-	-	10	2020	Northern Bangkok Monorail Co., Ltd.
	Yellow line monorail	Under construction	-	-	10	2020	Eastern Bangkok Monorail Co., Ltd.
Lao PDR	Xe-Pian Xe-Namnoy power plant	Under construction	Hydro	410.00	25	2018	Xe-Pian Xe-Namnoy Power Co., Ltd.
Australia	Mount Emerald power plant	Under construction	Wind	180.45	80	2018	RATCH-Australia Corp. Ltd.
	Collinsville Solar power plant	Under construction	Solar	42.50	80	2018	
China	Fangchenggang nuclear power plant phase 2	Under construction	Nuclear	2,360.00	10	2021	A joint venture company being established
Indonesia	Riau combined-cycle power plant	Under development	Natural gas	287.81	49	2021	PT Medco Ratch Power Riau (MRPR)

Shareholding Structure

EGAT, a state enterprise in charge of national power security, is RATCH's major shareholder with 45% of the total 1.45 billion common shares. The company's major shareholders, number of shares and registered capital remained unchanged in 2017.

As of September 5, 2017, below are RATCH's top five shareholders, with a combined 73.95% of the total shares.

Shareholder	Shares	Equity (%)
EGAT	652,500,000	45.00
Thai NVDR Company Limited	275,020,737	18.97
Social Security Office	55,676,700	3.84
LITTLEDOWN NOMINEES LIMITED	47,637,000	3.29
EGAT Saving and Credit Cooperative Limited	41,387,200	2.85
Total shareholding	1,072,221,637	73.95
Others	377,778,363	26.05
Total shares	1,450,000,000	100.00

Shareholders grouped by nationality:

Nationality	Shares	Equity (%)	Number of shareholders
Thai	1,311,718,641	90.46	19,212
Foreigner	138,281,359	9.54	98
Total	1,450,000,000	100.00	19,310

Size of the Organization

RATCH's business bases already in operation are found in three countries: Thailand, Lao PDR, and Australia. It has a combined workforce of 445 (excluding contractors' staff), an increase of 1.37% from the 2016 headcount. Of the total staff members, 59.33% are hired for work in Thailand, the major business base, followed by 35.96% in Lao PDR, and 4.94% in Australia.

Data as of December 31, 2017

Type of employment	Total	Thailand	Lao PDR	Australia
Permanent staff				
Female	148	129	14	5
Male	293	132	146	15
Permanent contractors				
Female	0	0	0	0
Male	0	0	0	0
Temporary contractors				
Female	0	0	0	0
Male	4	3	0	1
Third-party employees				
Female	26	25	1	0
Male	40	33	7	0

Workers of Thai nationality accounted for 62.02% of the entire workforce, followed by Laotian nationality for 33.71% and Australian nationality for 4.27%.

Data as of December 31, 2017

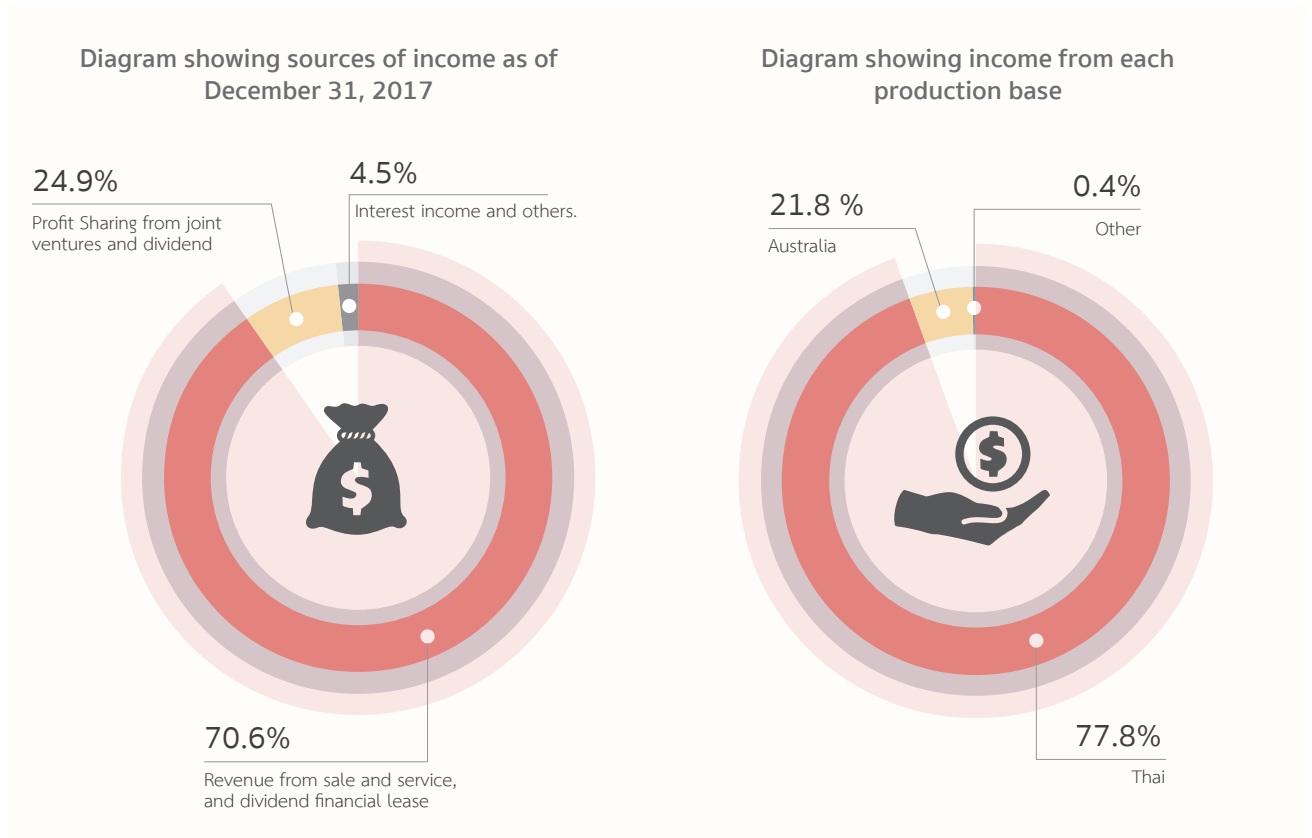
Type of employment	Thai	Laotian	Australian	Others
Permanent staff				
Female	130	13	5	0
Male	143	137	13	0
Permanent contractors				
Female	0	0	0	0
Male	0	0	0	0
Temporary contractors				
Female	0	0	0	0
Male	3	0	1	0

Revenue Structure and Financial Status

RATCH has 3 major sources of income, namely:

- Revenue from sale and service, and financial lease.
- Profit Sharing from joint ventures and dividend
- Interest income and others.

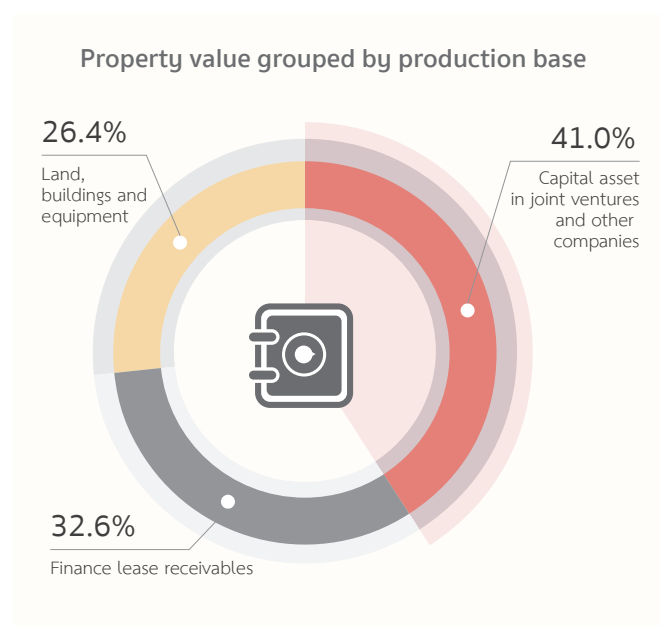
The production base in Thailand is considered the prime source of revenue, followed by those in Australia and others.



Financial Status

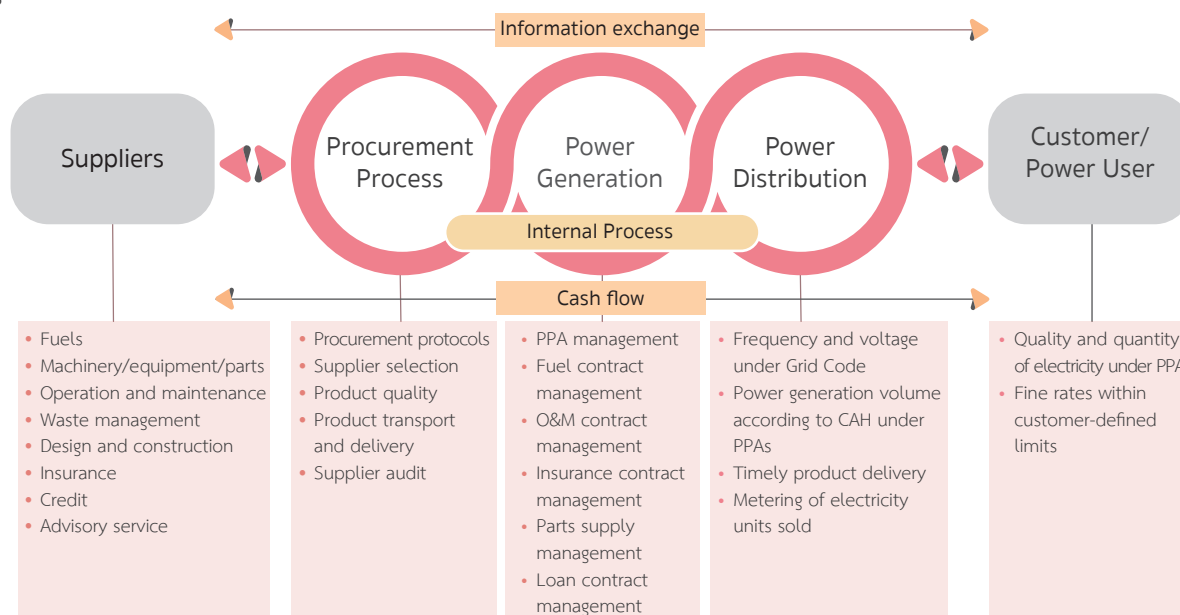
As of December 31, 2017, the company recorded the total asset of 94,224.83 million baht. 41% out of this amount is capital assets in joint ventures and other companies; followed by finance lease receivables of 32.6%, and land, buildings, and equipment of 26.4%.

In addition, RATCH's the liabilities stood at 30,943.65 million baht, divided into the long-term liabilities of 69.2% and the current liability of 30.8%. The shareholders' equity amounted to 63,281.18 million baht.



Power Generation Supply Chain

Power generation is RATCH's core business, of which the supply chain can be described using the diagram below:



Remark : * CAH-Contracted Availability Hours

* PPA-Power Purchase Agreement

* O&M-operation and maintenance

The power generation supply chain is made up of the three following elements:

1) Business Suppliers

Considered vital to the business, Suppliers include those providing of power generation fuels, machinery, equipment, and parts. Also categorized are companies engaging in engineering design, procurement and construction of power plants, creditors, operation and maintenance service providers, insurers, and consultants specializing engineering, legal, financial, and environmental matters.

2) Internal processes

The processes, intended for connecting RATCH with suppliers, fall into three stages:

2.1 Procurement - RATCH has in place regulations on materials that determine procurement methods, quality and delivery of products and services, as well as selection and audit of suppliers. These regulations ensure that suppliers and their products and services are up to the desired standards, able to provide support for RATCH's successful response to customers' contractual needs, and cause no impacts on the environment and society.

2.2 Power generation - This focuses on management of contracts that are significant to the generation of power that RATCH is obliged to deliver to customers. Customer relations management is also included.

2.3 Power distribution - Since electricity is an energy product, the process focuses on the quality and quantity of electricity that meet the agreed PPA terms, namely the voltage and frequency that must match customers' grid code. This includes timely delivery and metering of electricity units.

3) Customers

This element involves meeting customer satisfaction by delivering products that are of the quality, quantity, and timeliness agreed with customers.

Throughout the supply chain, flow of information exchange among all parties is encouraged so that transactions made along the chain may best meet the objectives of each party, which benefits not only the economic status of all parties involved, but the overall industry and the country as a consequence.

Types and Number of Business Partners

Types	Number		
	Thailand	Lao PDR	Australia
Fuel supply	1	0	1
Machinery/equipment/parts	155	0	3
Operation and maintenance	1	1	1
Waste management	5	0	2
Insurance	9	2	1
Advisory service	42	5	8
Credit	8	0	3
Others	363	4	12

As of December 31, 2017

The supply chain structure, the number of key suppliers, the partner selection process, and supplier relationship strengthening continued further in 2017, with no significant change. No supplier termination was made also. (Details are showed in Supply Chain Management in page 82)

Stakeholder Engagement

In conducting a sustainable business, RATCH values relationships with all stakeholders, including shareholders, partners, customers, and business allies on regular, voluntary bases. Relationships established with various agencies in both public and private sectors, associations, and various institutions are seen through activities involving the economy, society, environment, and corporate governance.

Agency	Country	Type	Starting year	Project/Activity
Thai Institute of Directors (IOD)	Thailand	Voluntary	2015	Private Sector Collective Action Coalition against Corruption (CAC) Project
Thai Listed Company Association (TLCA)		Voluntary	2014	Sustainability Awards Project
Stock Exchange of Thailand		Voluntary	2015	Thailand Sustainability Investment Project
Thailand Business Council for Sustainable Development (TBCSD) and Thailand Environment Institute Foundation (TEI)		Voluntary	2014	Project to promote solar energy at Baan Hua Ha Village, Mae Hong Son
			2014	Phummaree Project, women empowerment for environment conservation
Thailand Greenhouse Gas Management Organization (Public Organization)		Voluntary	2017	Less Emission Support Scheme (LESS)
Department of Industrial Works		Voluntary	2012	Corporate Social Responsibility, Department of Industrial works (CSR-DIW)
Community Forest Management Office, Royal Forest Department		Voluntary	2007	Communities love and conserve forest Project
			2013	Research project on carbon capture and biodiversity in community forests with local people's participation
Department of National Park, Wildlife and Plant Conservation	Voluntary	2014	Project on planting of watershed forests to create carbon storage	

Agency	Country	Type	Starting year	Project/Activity
Energy Offices of Chiang Mai, Lamphun, and Nan, Ministry of Energy	Thailand	Voluntary	2017	Community Energy Project
Ministry of Education	Lao PDR	Voluntary	2011	Vocational education and skill Development Project

Membership of Various Associations

Organization	Status	Significance	RATCH's Role
Thailand Management Association (TMA)	Member	Economic	<ul style="list-style-type: none"> Joining meetings and seminars to enhance knowledge about business management / joining activities to create network
Thai Institute Of Directors	Member	Corporate Governance	<ul style="list-style-type: none"> Joining training and seminars on good corporate governance among directors, executives, and staff Supporting academic activities
Thailand Listed Companies Association	Member	Corporate Governance	<ul style="list-style-type: none"> Joining meetings, training, and seminars to enhance knowledge about business administration Taking part in projects involving sustainability awards
Private Sector Collective Action Coalition Against Corruption (CAC)	Member	Corporate Governance	<ul style="list-style-type: none"> Taking part in declaration of intent and becoming a CAC member
Association of the Electricity Supply Industry of East Asia and Western Pacific (AESIEAP)	Member	Economic	<ul style="list-style-type: none"> Sharing information on the regional power industry Joining meetings, seminars, and studies on regional power technology
ICC Thailand National Committee	Member	Economic	<ul style="list-style-type: none"> Joining various meetings, seminars, training, and activities Supporting various activities
The Thai Chamber of Commerce			
Thailand Electricity Supply Association	Executive Director	Economic	<ul style="list-style-type: none"> Promoting technology for the power industry and sharing knowledge, experience, research findings, and technology in all disciplines of engineering Taking part in activities that enhance knowledge and capability of the engineering profession
TBCSD & TEI	Member	Environmental Social	<ul style="list-style-type: none"> Serving as council member, associate member, and public relations member Taking part in environmental and social efforts
Institute of Electrical and Electronics Engineers (IEEE)	Supporter	Economic	<ul style="list-style-type: none"> Supporting academic activities
Ministry of Energy	Supporter	Economic & environmental	<ul style="list-style-type: none"> Supporting Sustainable Energy Technology Asia Project
Thailand productivity Institute	Member	Social	<ul style="list-style-type: none"> Joining seminars and study visit



Dear shareholders and stakeholders,

Countries around the world are nowadays attempting to solve problems and ease impacts of global climate change through international cooperation, with goals for greenhouse gas (GHG) reduction and Sustainable Development Goals (SDGs) to frame these countries' implementation. To these, Thailand has agreed and set out clear work plans and goals. This matter is significant to RATCH's business and lead to its redesigned business paradigm with due regard for aspects of climate change and SDGs more and more, as seen in its effort to set top goals for GHG reduction of its power plants and intention to address SDG 12 (sustainable consumption and production) and SDG 13 (coping with weather conditions) because they benefit society and the environment directly and indirectly.

To RATCH, these trends have led to technological disruptions or innovations that exert pressure on the business sector. RATCH has had to amend its business model. For this year, it has revised its business plans to deal with such change by diversifying investment in businesses of RATCH's expertise apart from power generation and the deployment of the sustainable development approach in the company and its subsidiaries' operations.

Scoping GHG reduction

In scoping GHG reduction goal-setting for the Group, this year RATCH focused on setting the GHG concentration derived from a unit of power generated and the approach to GHG reduction, which is being investigated for the sensibility of goals and work plan details.

RATCH also defined a capacity rise goal for renewables this year at 10% of its 7,500-MW equity capacity goal and RATCH's proportion of renewable energy-based capacity now stands at 676.50 MW, accounting for 9.2% out of the entire capacity as a result of higher capacity proportion of fossil fuel in its power generation. However, the company established a long-term goal to achieve the renewable capacity of 20% of its 10,000-MW target in 2023.

Our plan is for Ratchaburi power plant, our core asset, to generate solar power by installing a 2-MW floating solar farm on a reservoir at the plant for its own consumption to trim power purchase from outside and cut GHG emission, with the construction and operation scheduled to start next year.

These actions addressed SDG 13, urgent action to combat global climate change and its impacts. Going forward, RATCH will continue to develop, promote, and support all GHG reduction activities.

Environment and safety

All our power plants' environmental quality management strictly complies with the law while maintaining their standards, a result of the maximized operation efficiency and diligent efforts to cut fuel and water consumption in their processes. In particular, Ratchaburi power plant this year saw the replacement of water quality control systems for the cooling tower, which has multiplied water reuse, thus reflecting our commitment to generate electrical power that is friendly to the environment, while fulfilling SDG 12 (sustainable consumption and production).

Work safety is RATCH's ultimate aim, for which zero accident is the goal, particularly for power plants aged more than 10 years and during outage, which typically see suppliers work in the plants. At Ratchaburi power plant, executives are instructed to meet with suppliers to educate them and foster awareness while reminding everyone

to pay attention to risk prevention in their own work and look after colleagues. Tri Energy power plant, our pride in safety and operational excellence, won the Ecomagination Nation Award (Gold Level) presented by General Electric, its service provider for plant operation and maintenance. This year there was no incident impacting the lives and properties of employees, contractors, and RATCH.

Shared benefit with communities and society

Vital to RATCH's sustainability and secure growth are communities' trust and acceptance. In looking after communities, RATCH values communication aiming at fostering mutual understanding and trust and enables communities to jointly monitor power plant's operations. Several plants appointed joint panels featuring community members, the civil sector, public agencies, and the plants. Also, efforts have been made to improve the community quality of life in several ways. This year RATCH expended 50.07 million baht (0.81% of the net profit) to promote and support communities and society apart from 1.346 billion baht in government tax payment.

Strengthening the corporation

Based on the revised business plan drawn up to keep pace with global trends as mentioned above, this year RATCH has applied several management tools to upgrade operational excellence, ranging from HPO (High-Performance Organization), designed to scrutinize aspects of the corporate against high-performance entities in Thailand and around the world. The identified gaps were incorporated into RATCH's work plan to be implemented in 2018. Meanwhile, employee engagement was surveyed for the first time this year to make RATCH aware of its current status. RATCH intends to elevate employees' satisfaction and engagement to a comparable level with industrial peers.

To address evolving business expansion plans and business models moving toward digital and innovation drivers, RATCH has taken steps to spur and promote corporate innovation approaches by staging "Corporate Innovation through Design Thinking" workshops for the Board, executive team, and relevant engineering teams. These people will form our mainstay in our strides for emerging businesses.

Economic growth

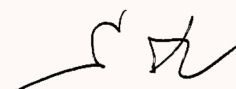
The company is marching to supplement business values under the 10-year strategic plan (2013-2023), which strives for 10,000 MW equivalent in total equity capacity, including investment other than power generation. This year we managed to bring capacity up to 7,380 MWeq. RATCH made investment in five projects this year, with the combined capacity of 510.39 MW. The 120-MW generation capacity missing target this year will be accumulated in the 2018 target. Meanwhile, the asset management, particularly for power plants remains the key driver towards business growth and the financial stability. RATCH's 2017 profit sharing from joint ventures increased to 23% of the 46.438-billion-baht total revenues, compared to 2016.

Grappling with future world dynamics

Global climate change will continue to exert tremendous pressure on RATCH's growth and sustainability. Recognizing this threat, RATCH diligently eyes investment opportunities throughout its renewable-energy value chain as well as green businesses and start-ups, hoping to supplement values and extend our businesses more swiftly. Next year should see more tangible outcomes, building on the work begun this year. Naturally, our efforts will be based on prudent and watertight risk prevention, as well as continual good corporate governance and execution. Above all, RATCH will adhere to its advocacy of environmental stewardship, human rights protection, employee equitability, and as a CAC ally, all forms of corrupt practices.

This sustainability report brings to you detailed concepts and strategies for sustainable development together with this year's goals and performances in economic, environmental, and social aspects. I am grateful to the Board of Directors, the management team, employees, and stakeholders for their comments, which inspired helpful ideas for the improvement of this report.

RATCH assures you that our formulated approaches being executed with various sectors today will-in time-lead us to our destination of sustainability.



Kijja Sripatthangkura
Chief Executive Officer

Sustainable Development Strategies and Approach



RATCH’s vision “To be a leading value-oriented integrated energy company in Asia-Pacific” showcases its commitment to driving the corporation toward its sustainable goals (economic, social, and environmental).

To this end, the approaches to sustainable development contained in RATCH’s Code of Conduct are highlighted below:

 <ul style="list-style-type: none"> • Commit to sustainable development as a business approach by being responsible to the economy, society, and the environment 	 <ul style="list-style-type: none"> • Business decisions must take into account economic, hygienic, safety, environmental, and social aspects 	 <ul style="list-style-type: none"> • Activities must rest on sustainability principles and aim for sustainable outcomes for stakeholders’ acceptance and trust
 <ul style="list-style-type: none"> • Executives and employees must regularly foster human interactions with stakeholders 	 <ul style="list-style-type: none"> • Executives and employees must conform to requirements for occupational health, safety, security, and socio-environmental responsibility 	 <ul style="list-style-type: none"> • Conduct business that fosters sustainable social benefit; safeguard the occupational health and safety of employees, business partners, and communities; prevent business impacts on communities; curb the emission of greenhouse gases (GHGs) derived from production/generation; and protect the ecology and biodiversity.

These approaches form the basic principles for the power generation business-RATCH’s core business. The actively pursued economic, social, and environmental sustainability, along with good governance, aspects valued by RATCH are summarized below.

Dimension	Objective/goal	Aspect	Action
Environmental	Minimum environmental impacts from production/ generation and business	<ul style="list-style-type: none"> • Environmental management • Ecology and biodiversity • Energy efficiency • Climate change 	<ul style="list-style-type: none"> • Relentlessly improve environmental management to cut waste, GHGs, and air pollution to levels superior to standards or legal requirements • Install technologies efficient in eliminating and curbing power plant pollutants • Maintain power plants as scheduled to maintain generation efficiency and cut fuel consumption • Pursue improvement of power plant efficiency and energy efficiency

Dimension	Objective/goal	Aspect	Action
			<ul style="list-style-type: none"> • Campaign to conserve energy in power plants and office buildings • Invest more in power generation from renewables • Choose green materials, equipment, and products • Engage communities in expressing environmental woes and jointly solve them to minimize conflicts
Social	Stakeholders' trust and acceptance	<ul style="list-style-type: none"> • Stakeholder communication and relations • Human rights • Safety and occupational health • Decent work environment • Employee stewardship 	<ul style="list-style-type: none"> • Open up, listen, and regularly foster relations with stakeholders with transparency, sincerity, and equitability • Accept and respect differences in values, faiths, religious beliefs and cultures of communities and societies • Generate and deliver goods (electricity) to customers with agreed quality and quantities • Maintain power plants' availability and reliability to boost customers' confidence and national power security • Formulate safety and security measures with necessary equipment to protect employees, contractors, and neighboring communities
Economic	Corporate value, growth, and power generation to satisfy economic development and society as a whole	<ul style="list-style-type: none"> • Investment growth • Shareholders' returns • Supply chain management • Business partners • Risk management 	<ul style="list-style-type: none"> • Diversify investment to other businesses to supplement value and shareholders' returns, as well as mutual benefit for stakeholders • Pursue partnership collaboration to strengthen competitiveness based on long-term mutual benefit • Base standards for business partner selection and procurement on transparency, auditability, and equitability • Constantly improve and develop cost management efficiency and asset profitability • Regularly allocate returns to the shareholders under the dividend policy and allocate provisional funds for uninterrupted investment • Assess risks concerning the economy, environment, society, and good governance and define relevant protection and mitigation measures for such risks • Take into account aspects of safety, the environment, and society in the course of business decision-making
Good governance	Transparent, fair, and auditable corporation	<ul style="list-style-type: none"> • Morality and business ethics • Culture of integrity and responsibility • Equitable treatment of all stakeholders 	<ul style="list-style-type: none"> • Comply with the laws governing RATCH's businesses and through its business chain • Assess corruption risks, define protection and control measures and track compliance with these measures • Amend internal control tools and RATCH's regulations to always be compatible with situations while minimizing risks concerning good governance • Cultivate corporate values focusing on morality, ethics, integrity and responsibility through RATCH's tools, processes and activities • Treat employees and stakeholders with equitability and fairness and refrain from harassment and discrimination

RATCH reviews and assesses material aspects under each dimension to make them compatible with its strategic plans and goals, which are reviewed annually. Such practices have been galvanized into day-to-day work processes and plans.

Strategy Effectiveness Assessment

Measures for controlling and assessing strategy effectiveness are:

- Define the strategy as a part of the corporate KPI including increase in capacity, profit, Return on Assets (ROA), returns, budget management, sustainability assessment score organized by the Stock Exchange of Thailand (SET) and the company's rating.
- Participate in the assessment organized by external agencies-The company participated in the SET sustainability assessment, covering economic, social and environmental dimensions as well as good governance practice. RATCH's score totaled 93 out of 100, and it was listed on 2017. Thailand Sustainability Investment (THIS).

Materialized Aspects in 2017 & Response

The surveys of middle managers upward concerning sustainability aspects together with key stakeholders-the major shareholder, power customers, business partners engaging in operating and maintaining power plants, investment partners, investors, and communities-have revealed the three top material aspects for 2017:



Environmental quality management and resource consumption



Safety, occupational health, and the environment



GHG reduction

Environmental Quality Management and Resource Consumption

Rationale

- RATCH's core business remains power generation and investment biased toward fossil fuel-fired power plants
- Fossil fuel-fired power plants take up vast volumes of water, fuels, power, and other resources
- Communities and stakeholders are increasingly paying attention to environmental impacts, particularly those concerning air, water, and waste.

RATCH's Response

RATCH strives to generate and deliver "green" power that is acceptable to communities and society. While its strategic plans still focus on investment in the power generation business, increasing weight has been given to environmental management and

resource consumption-particularly that of fuels, water, and plant electricity. RATCH also allowed community participation in monitoring its environmental management practices at Ratchaburi power plant (nameplate capacity of 3,645 MW), its 99.99%-owned core asset. It appointed an environmental inspection committee consisting of representatives of the public sector, community members, and civil society to inspect and monitor environmental impact management at Ratchaburi power plant and Ratchaburi World Cogeneration power plant. Similarly, a tripartite (public, community, and power plant) panel monitors and inspects power plants. This year RATCH took steps to address these aspects, as summarized below.

- In designing new power plants, it chose high-efficiency, environment-friendly technologies,

as seen at the Berkprai Cogeneration power plant (nameplate capacity of 99.23 MW), 35%-owned by RATCH. Here, the Green Gas Engine technology was picked for its high operating efficiency, ability to vary its capacity to accommodate peak power demand (daytime or night-time, or both), and start and stop during each interval, not to mention environmental friendliness, for it has passed the test of NO_x emission control by outdoing international standards

- At every power plant, installed are equipment and systems to eliminate and curb air pollution, pollutants, water discharge, and waste. Environmental impact prevention and mitigation measures-stated in project EIAs, laws, and applicable requirements-must be in compliance. For instance, at bunker oil-fired and coal-fired power plants (like the Hongsa power plant in Lao PDR), one can find high-efficient SO₂ desulfurizers, stack continuous emission monitoring systems, and leeward weather stations in neighboring communities
- All power plants engage in monitoring and measuring impacts on air, water, waste, and biodiversity as stated in all plants' EIAs, and reports are submitted to regulators as required by law
- RATCH improves generation efficiency to trim fuel, water, and power consumption at Ratchaburi power plant, its core asset, where it devised and improved the plant's systems, equipment, and work processes with tangible results (as detailed on page 49 and 66). As for office buildings, light bulbs have been replaced with energy-saving bulbs, air-conditioners maintained, energy-saving and green goods or products used, electricity, water, and paper consumption minimized, and re-usable materials or products adopted.

Safety, Occupational Health, and the Environment

Rationale

- Ratchaburi power plant, its core asset, has exceeded 10 years of operation, with assorted machinery in declining states
- Several major power plants are under construction, for which strict compliance with measures on safety, occupational health, and environment is required.

RATCH's Response

To achieve the goal of social acceptance by communities and stakeholders, RATCH is keenly aware that it must, with genuine attention and earnestness, protect lives and properties of employees, business partners, customers, neighboring communities, and stakeholders working alongside RATCH. That is why all sites and power plants where RATCH operates and invests must have safety, occupational health, and environmental policies, formulate measures for work practices of employees and stakeholders, and strictly comply with applicable laws. Above all, RATCH's policy is that for each RATCH-operated power plant, "zero accident" must be one of the goals. For instance, at Tri Energy power plant, international-standard systems and safety measures have garnered The Ecomagination Nation (Gold Level), presented by General Electric, its operation and maintenance service provider. This also finds application at Ratchaburi power plant. Below are how RATCH responded to this aspect this year.

- At Ratchaburi power plant, executives met with business partners' staff every day during maintenance turnarounds (minor inspection and major overhaul) to seek understanding of the plant's safety measures and remind workers to never take things for granted and to wear personal protective equipment at all times while at work
- At Tri-Energy power plant, an EHS Stand-down Day was staged to promote awareness of safety and encourage brainstorming on work hazards and risks to then formulate prevention measures to lessen risks
- Ratchaburi power plant and Ratchaburi Power-plant continued their Log Out Tag Out practices and Stop Work Authority while at work
- Ratchaburi power plant ran occupational health campaigns among employees and business partners' workers there, namely the NCD-free, hearing conservation, and anti-drug projects
- For power plants under construction, RATCH delegated inspection and supervision officers to control and inspect contractors' work and ensure that safety, occupational health, and environmental work was in compliance with the law and agreed terms.

GHG Reduction

Rationale

- The energy sector, particularly the power generation business, represents a national goal for GHG reduction, with explicit goal-setting and plans
- Business risks arising from the impacts of climate change and global warming.

RATCH's Response

Since the bulk of RATCH's investment and assets are tied to fossil fuel-fired power plants, and with rising awareness among countries of climate change and global warming, RATCH has taken steps to amend its long-term strategic plans and set tangible goals for developing power plant projects based on renewables. Its aim is to raise renewable-energy capacity to 20% of the total capacity of 10,000 MW equivalent in 2023 while giving more weight to projects' environmental risk assessment and emerging risks from natural catastrophes to define prevention and mitigating measures associated with RATCH's power plants and business overview.

In addition, RATCH has advocated power plants' activity focus on cutting GHGs in addition to economic benefit, including power generation

efficiency improvement, fuel reduction in processes, and power conservation. Application of methods and standards for GHG management of Thailand Greenhouse Gas Management Organization (Public Organization) (TGO) is in place in the operation of Ratchaburi power plant and Tri Energy power plant, along with the promotion of a CSR after-Process activity plan, including community forest promotion to increase forest acreage, promotion of energy reduction by communities, and reforestation. Below are how RATCH responded to this aspect this year.

- Laid down a scope for defining intensity-based GHG reduction goals for RATCH Group together with guidelines for tasks/activities to address this goal, and participated in the Thailand Voluntary Emission Reduction (TVER) Project of TGO
- Pursue investment in developing power projects from renewables. This year saw investment made in Australia's Collinsville Solar PV Project with a capacity of 42.5 MW and Mount Emerald wind farm with a capacity of 180.45 MW, in which RATCH holds 80% through a subsidiary
- Set work plans for developing floating solar energy farm development on a reservoir in Ratchaburi power plant, designed to trim power consumption at the plant, due to begin in 2018.

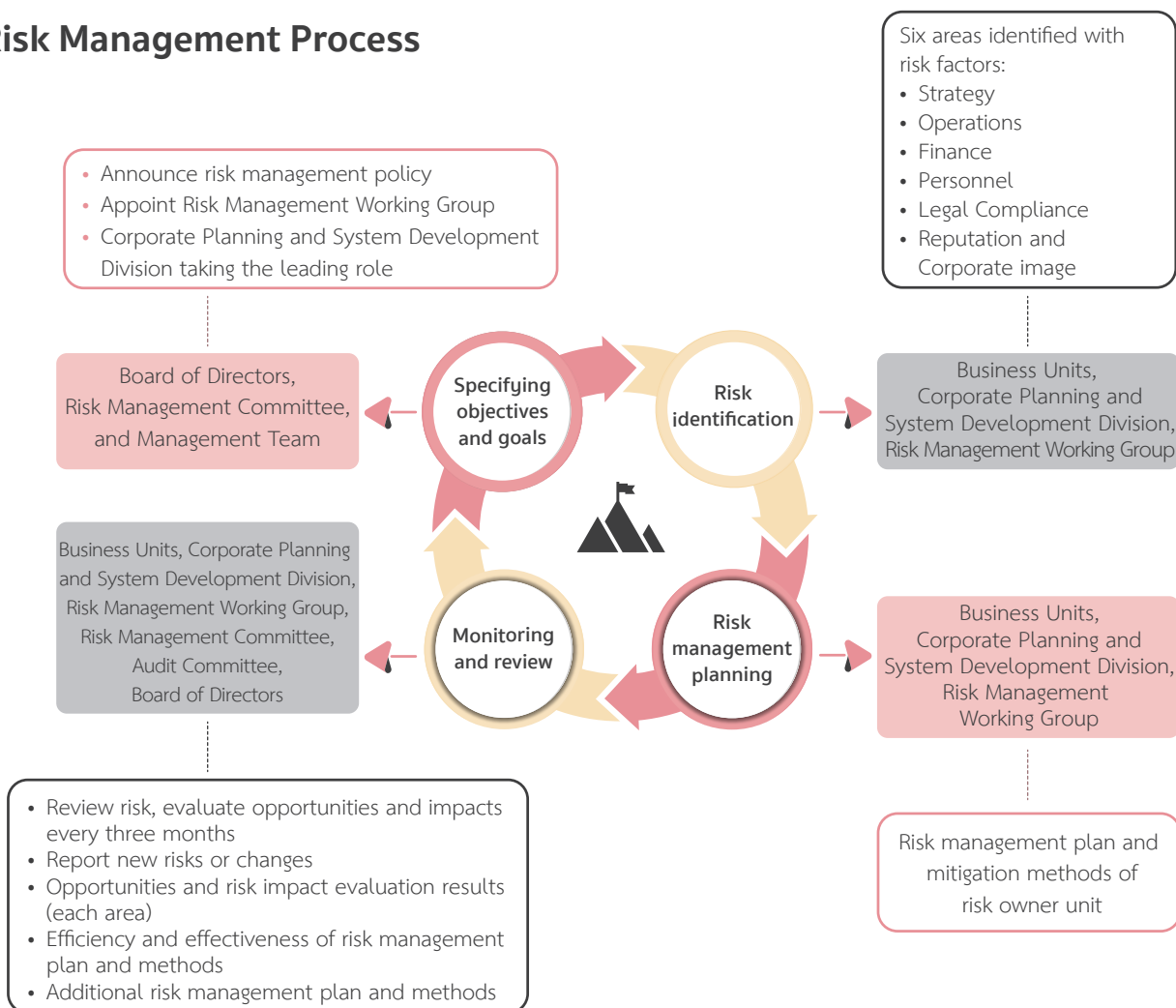


Risk and Opportunity Management



RATCH realizes that risk management is a key element underpinning corporate governance, which will take the organization to its goals and make business strategies materialize. Business efficiency will increase as a result. With a determination to achieve sustainable growth, RATCH set a goal to increase the organization's value by expanding investment to raise its capacity to 10,000 MW by 2023, not just in Thailand but in Asia Pacific. RATCH is thus confident that risk management is an essential tool to ensure that investment will add value to the organization with security and sustainability.

Risk Management Process



In the risk management process, each business unit in the company has their roles to play. These roles are interconnected and are part in the four main steps of risk management.

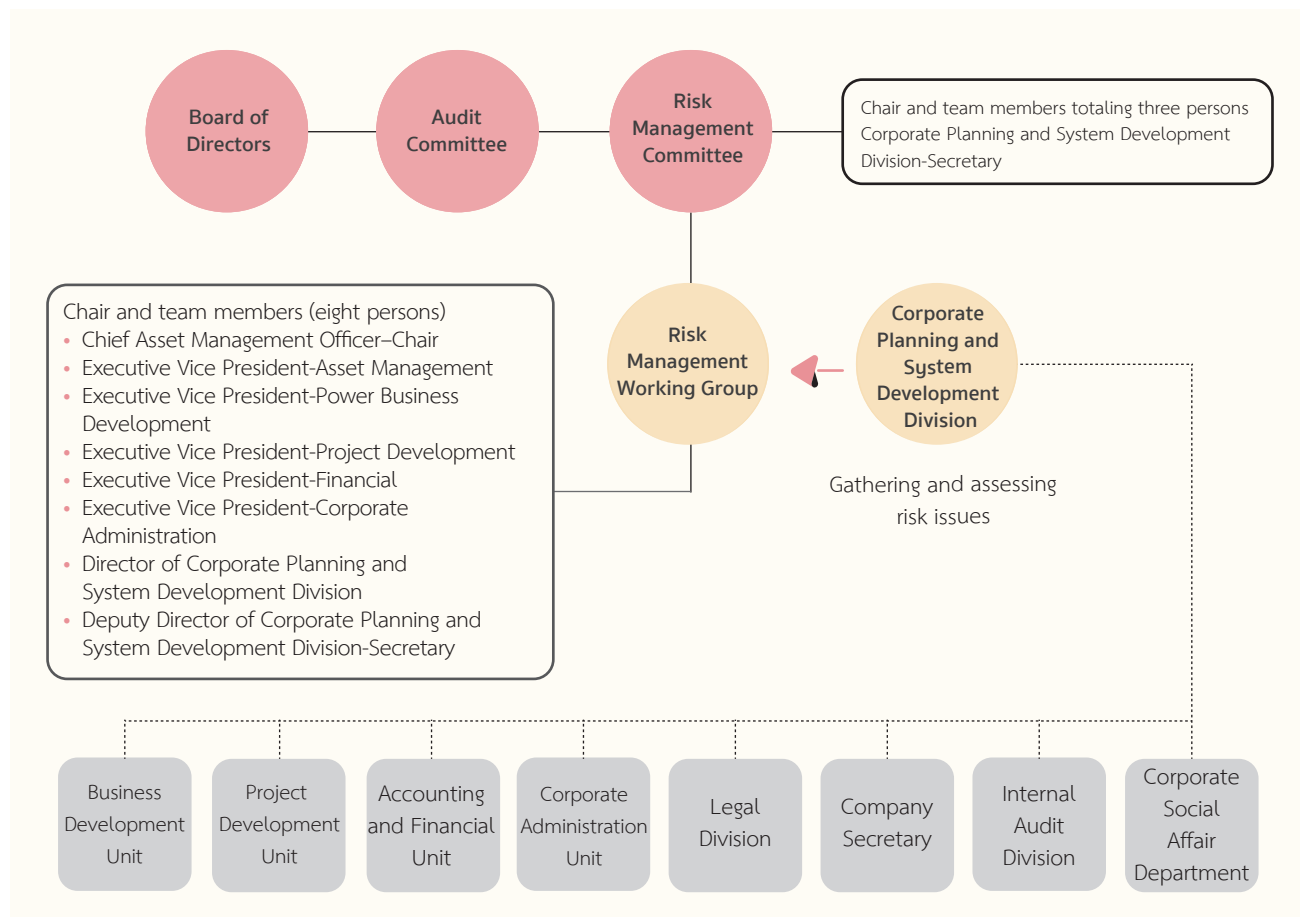
From the diagram above, the Board of Directors, Risk Management Committee, and Management Team take the role of framing risk management. In doing so, they devise a policy on risk management and set up a Risk Management Working Group to take charge of driving and monitoring the organization's overall risk management progress. Also, they assign the Corporate Planning and System Development Division as the central unit responsible for evaluating, analyzing, and following up the progress of risk management in each business unit and then making a report to Risk Management Working Group and Risk Management Committee.

To analyze and identify risks, all units in RATCH will take charge of assessing and identifying both internal and external risk factors within the context of each that may pose threat or obstruct goal attainment.

To be taken into account are the probability and impact on the organization in economic, social, and environmental aspects and in corporate governance. Corporate Planning and System Development Division will then collect information from business units for evaluation using risk assessment tools accepted and approved by the Risk Management Committee.

The efficiency and effectiveness of the plan to prevent and minimize risks identified in each unit's operation will be monitored by Corporate Planning and System Development Division, who will make a report to the Risk Management Working Group, Risk Management Committee, Audit Committee, and Board of Directors respectively for consideration.

Risk Management Structure



In 2017, the Risk Management Committee held four meetings to oversee and monitor risk management progress based on guidelines and the policy approved by the Board. The committee also made a report on risk management performance and status of risks identified at the corporate level and at each stage of projects to the Audit Committee and the Board respectively. This is to ensure that organizational risks are managed in compliance with RATCH's policy and strategy.

The Risk Management Committee is made up of high-ranking personnel from all business units, who gather at four meetings to consider risk factors in several aspects as well as the efficiency and effectiveness of risk management methods in a bid to keep impacts on the business, corporate image, and stakeholders at manageable and acceptable levels under RATCH's risk management policy.

Risk Factors and Risk Management Method

Risk Factor : Strategy

Cause

- More players in the local market and business expansion overseas adds to competition
- Business diversification to industries beyond power generation, RATCH's expertise
- Foreseeable demand for renewable energy caused by the increasingly severe climate change
- Diminishing fossil fuel reserves globally
- Expiring power plant, which have been major sources of income
- Disruptive technology which is causing change to the energy and power business

Management Method

- Review strategy and goals on an annual basis and adjust the company's annual KPIs
- Exchange information and keep up with changes in public policies and related agencies as well as regularly assessing possible impacts
- Monitor annual maintenance shutdown plans of Yetagun and Yadana gas fields and gas transmission pipelines
- Keep up with meteorological information to assess possible impacts from natural disasters, such as drought and floods which may affect new investments, projects under development and construction, and projects being operational
- Study political, economic, social, and cultural structures of investment destinations.
- Seek partners with business expertise and thorough understanding in target countries and cooperate with partners in EGAT Group to raise the RATCH's investment potential
- Seek partners with expertise in businesses other than energy or other innovations, such as electrical vehicles, smart grids, and energy storage
- Plan balance of greenfield investment and merger & acquisition in businesses considered suitable to support RATCH's financial strength
- Carry out risk assessment of the target countries to identify opportunities and threats impacting investment while analyzing costs incurred from risks

Key Measures for 2017

- Review and adjust long-term strategy by going beyond the energy and power business
- Increase capacity to replace power plants to be decommissioned in 2027 while targeting to maintain capacity at 10,000 MW by 2027
- Set organizational KPIs based on combined strategies and sustainability assessment.
- Set a hurdle rate that covers basic risks in investment target destinations.

Risk Level

High—but still acceptable since risks are caused by outside factors which can be analyzed and predicted

Risk Factor : Operations

Cause

- Operating efficiency of over-10-year old power plants possibly declining, thus affecting the plant's availability and reliability
- Production efficiency of newly commercialized capacities not yet stable, possibly affecting reliability and availability
- Unplanned shutdowns of natural gas fields in Myanmar cause power plants in the West of Thailand to maintain fuel reserves (diesel/fuel oil), or to suspend generation

- Natural disasters like El Nino causing droughts possibly affecting production of hydropower plants and La Nina causing floods
- Projects being developed facing difficulties caused by uncertain regulations concerning, for example, project site sourcing, community and environmental management, loan arrangement, and infrastructure approval, which may cause project delays
- Higher production costs due to higher fuel/energy consumption caused by prolonged maintenance, untimely supply of spare parts, and unskilled personnel in charge of operation and maintenance
- Dividends from subsidiaries and profits from joint ventures missing targets
- Environmental concerns by communities and society

Management Method

- Thoroughly check operability of power plants' main equipment and machines to minimize the risk of unplanned maintenance shutdowns
- Draw up maintenance schedules
- Require engineering, procurement, and construction contractors to guarantee their equipment and availability efficiency before job handover
- Arrange for insurance of power plants to minimize impacts on RATCH's financial status to prepare for the unexpected events
- During the development stage of a power plant, impose strict control to ensure compliance with contracts to have machinery and equipment worked at their full capacity, with future machinery upgrades to minimize the need for immediate plant shutdowns
- Arrange for fuel supply agreements that last for a similar period to power purchase agreement (PPA)
- Arrange for spare part supply contracts with manufacturers with specifications on delivery time
- Assign representatives from RATCH to take executive positions in subsidiaries and joint ventures and establish an asset management unit to monitor the performance of subsidiaries and affiliates
- Seek methods to improve power plant efficiency and innovation to minimize fuel consumption, cost, and environmental impact
- Look for local partners with desired expertise and strong financial status
- Analyze risk factors that may lead to drought and floods, assess possible impacts, and define some measures to prevent and minimize risks for projects under development, under construction, and currently operational
- Monitor compliance with measures drawn up to prevent and minimize environmental impacts as stated in the EIAs of all power plants as well as strict compliance with laws and regulations

Key Measures for 2017

- Pay more attention to issues that may develop into threats to project development
- Closely monitor increase in the availability of Hongsa power plant to ensure revenue generation as planned
- Define return on asset (ROA) as one of the targets for power plants with current commercial operations
- Draw up a decommissioning plan for expiring plants and a plan for using power plants after contract expiration
- Improve crisis management and crisis communication plans and integrate them into emergency response plans of subsidiaries and joint ventures, and draw a business continuity plan for 2018

Risk Level

High—since major power plants are aging and PPAs are expire soon, but still manageable

Risk Factor : Finance

Cause

- Exchange and interest rates fluctuation that may lead to higher costs
- More overseas investment resulting in more income in foreign currencies, and more loans made in foreign currencies
- Capital-intensive power and energy projects possibly affecting liquidity

Management Method

- Strike a balance between loans from financial institutions and those from financial instruments while keeping debt-to-equity ratios at appropriate levels to prevent impact on costs and liquidity for business expansion
- Devise a financial plan as a criterion for management of interests, foreign exchange rates, and liquidity to ensure strong financial status and performance as planned
- Manage finance cost through debt restructuring to suit financial market situation with efficient tax management
- Devise a plan to prevent forex risks and interest rate risks using both natural hedge and derivative instruments
- Devise a financing plan to secure funds for supporting planned investments

Key Measures for 2017

- Improve the financial policy to prevent and monitor risks arising from exchange and interest rates as well as hedging
- Set ceilings for risks arising from currency exchange and interest rates and liquidity together with implementation guidelines
- Lay out the financial policy

Risk Level

Low—since RATCH’s liquidity, debt-to-equity ratio, and credit rating are still strong

Risk Factor : Personnel

Cause

- High-ranking executives retiring at the same time, posing a threat to business continuity
- Staff’s capability and size of the workforce adequate to drive business competitiveness and overseas expansion
- Aging society and the new generation’s preference for becoming an entrepreneur, threatening lack of personnel
- Ability of personnel to adjust to diversity in terms of language, work method, culture and belief in countries of investment target

Management Method

- Assess capabilities of middle and first-line managers to make a list of future leaders at middle and top levels
- Carry out an Executive Development Program to prepare high-potential staff to take higher positions
- Raise potential and language proficiency, including English and local languages, of staff posted in countries of investment target
- Set a remuneration and benefit structure for staff working overseas, including Indonesia, China, and the Philippines
- Improve guidelines concerning do’s and don’ts for staff posted in Australia, Lao PDR, and Indonesia
- Develop a manpower plan to support business expansion while seeking personnel with desired qualifications for working overseas
- Using high-performance organizations as benchmarks for staff and organizational development in response to staff’s expectations concerning career advancement and organization sustainability

Key Measures for 2017

- Assess staff's satisfaction and commitment to improve HR management and management of the entire organization
- Assess organizational capability to become a high-performance organization
- Develop a knowledge management system in support of working teams concerning business development, project development, asset management, and support unit
- Develop proficiency in local languages for staff posted in Indonesia, new investment base, as well as their remuneration package
- Develop and support organizational innovation through increasing knowledge and understanding about Design Thinking Process, start-up business, and research and development (R&D)
- Revisit structure of the Business Development Unit, of which responsibilities comprise two units: power business development and development of general energy and new businesses

Risk Level

Low—thanks to plans and management which can keep potential impacts under control

Risk Factor : Reputation, corporate image, and compliance

Cause

- Concerns of communities and society over impacts on the environment caused by power plants and large-scale utility projects
- Public policy that aims to reduce GHGs in the power and energy sector
- The global trend that gives greater recognition of corporate governance, anti-corruption, information disclosure, and sustainable development
- Laws and regulations issued under the Precautionary Principle, which requires complete and strict implementation
- Changes in laws and regulations concerning license issuance

Management Method

- Taking issues about corporate governance into consideration when an investment decision is to be made
- Include guidelines for sustainable development, stakeholder treatment, and community, social, and environmental care in the company's Code of Conduct
- Initiate community relations plans at the project level based on communication to create a mutual understanding, raising the life quality and community engagement
- Establish the corporate governance and social responsibility committee, announce a policy on good corporate governance, and appoint a Corporate Governance Working Group to ensure compliance with laws, ethics, and corporate governance principles of SET and other regulators
- Take part in Thailand's Private Sector Collective Action Coalition Against Corruption (CAC) to exhibit the RATCH's intention and position on corporate governance
- Encourage social and environmental responsibilities as well as disclosure of information about society and the environment on a continuous basis
- Adhere to laws that are compulsory and those based on the Precautionary Principle, as well as measures for minimizing environmental impacts stated in the EIAs
- Review and improve the crisis communication plan in line with the crisis management plan while initiating an annual exercise
- Develop the standard for information disclosure and reporting system using GRI's sustainability report and SET's reporting guidelines as references
- Follow up on changes in regulations on the energy industry in Thailand and countries of investment target, including Myanmar, Vietnam, Cambodia, Indonesia, and the Philippines.
- Lay down measures and guidelines concerning GHG reduction while promoting international standards or GHG management method for power plants

Risk Factor : Reputation, corporate image, and compliance

Key Measures for 2017

- Define rules for setting targets and guidelines for the reduction of greenhouse gases (GHG) for major power plants
- Keep up with amendments made to laws and regulations related to the business, such as regulations on using the land belonging to the Agricultural Land Reform Office in Thailand and regulations on land use for projects overseas
- Monitor amendments made to the SET Act and SEC's CG Code
- Follow up news and information to support analysis of issues concerning the environment, society, and communities related to power plants and large-scale utility projects in and outside Thailand
- Cooperate with government agencies and the civil sector in doing after-process CSR projects
- Improve the crisis communication plan and organize an exercise to ensure thorough understanding

Risk Level

Medium—since the power generation business is sensitive to environmental, community and governance issues but still at manageable level

Foreseeable Risks

Factors that could pose future risks that Risk Management Committee recognizes are:

1. Cyber threat to the power plant's generation control system
2. Natural disasters, such as drought and floods
3. Disruptive technology.

Cyber threat to power plant's IT system	Natural disaster	Disruptive technology
Probability		
<ul style="list-style-type: none"> • Development of malware that can penetrate and more seriously damage the IT system and information • Attack on the power system, which are found to happen more frequent abroad, considered a threat that needs closer monitoring 	<ul style="list-style-type: none"> • Impacts of El Nino and La Nina, which cause more severe droughts and floods each year • Water scarcity in communities and conflicts over water consumption between the community and the industry 	<ul style="list-style-type: none"> • Serious development of renewable technology at the global level • Attempt to develop batteries for the storage of renewable energy • Government policy that aims to develop a smart grid by using integrated technology for managing the entire chain of power business from power generation and transmission to distribution to consumers • Develop microgrids to fit power generation and sale between communities or users
Impact		
<ul style="list-style-type: none"> • Interruption to power plant operation • Damage to data and information • Financial damage • National power security lacking • Reputation and credibility of power plants 	<ul style="list-style-type: none"> • Power generation halted • Revenue decreased, cost increased • Resistance from local communities, shaking corporate image 	<ul style="list-style-type: none"> • Business strategies and goals unable to respond to the trend • Opportunity to add value to the business

Cyber threat to power plant's IT system	Natural disaster	Disruptive technology
Risk management		
<ul style="list-style-type: none"> • Have stand-alone IT system installed at power plants • Install Distributed Control System (DCS) and Supervisory Control and Data-Acquisition Systems (SCADA), which can efficiently prevent and detect any unusual objects or hacking into the system. • Regularly run efficiency test of the detection and prevention systems by related staff and the system developing company 	<p>For operated power plants</p> <ul style="list-style-type: none"> • Study and analyze possible impacts from floods and draw up measures to prevent and minimize such impacts, including devising a flood response plan and improving the flood prevention system • Study and analyze statistics concerning sources of water supply for power plants, which reveal data concerning water consumption, and assess the consumable water volume to ensure sufficient amount of water for both power production and community consumption • For hydroelectric power plants-monitor weather conditions to assess the volume of rain water that can be reserved each year and make power generation plans accordingly <p>For power plants under development and under construction:</p> <ul style="list-style-type: none"> • Seek additional information on the volume of water in the water supply sources to be used by the power plant and the community, while assessing the water source potential to see long-term supply for power generation and draw up measures to minimize foreseeable impacts • Study statistics of floods around the power plant location to identify the trend so that the design and installation plan of the power plant's key equipment can be drawn up to ensure that it is safe from possible floods • Ensure that the power plants are designed with raised floor to prevent impacts from floods 	<ul style="list-style-type: none"> • Adjust strategies and goals by expanding the investment boundary to cover the value chain of renewable energy and new technologies related to energy and global megatrends • Keep up with trends and changes of technology • Encourage personnel's paradigm shift regarding organizational innovation by providing knowledge and training as well as studying success stories of other organizations • Promote Design Thinking Process and innovation among engineers in the business development, project development, asset management units, and support units.

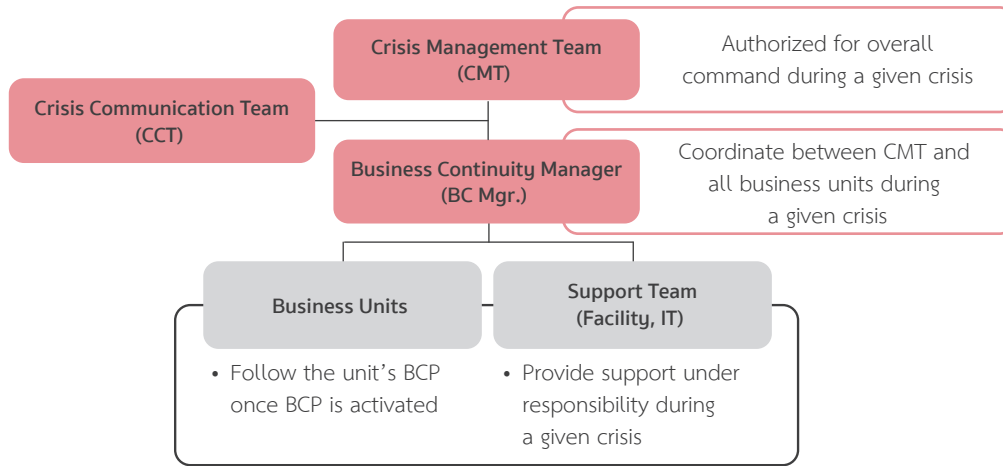
Business Continuity Management

In 2017, RATCH started to apply the Business Continuity Management (BCM) concept to its administration as part of risk management to ensure that, even in an unusual condition, key parts of the business can be continuously operated at an acceptable level until normality returns. RATCH has therefore developed key plans under BCM, namely the emergency response plan, crisis management and crisis communication plans, and business continuity plan, and put them into integration.

This year, RATCH developed and improved its crisis management plan and crisis communication plan, which are applicable to the company, subsidiaries, and joint ventures. Essentially, these plans have been linked to emergency response plan.

RATCH will carry on with development of Business Continuity Plan (BCP) in the following year with a target for completion in June 2018.

Structure of Crisis Management Team and Crisis Communication Team



Crisis Management Team

It comprises the management team, who is authorized for overall command in response to any possible crisis or disaster that may pose threats to staff, assets, financial status, reputation, and credibility of the company, as well as stakeholders, and the normal operations. CMT is also in charge of overseeing and coordinating tasks with internal units and outside parties at the corporate level to ensure business continuity in a crisis. The responsibility also includes keeping impacts from the crisis to the lowest possible level.

Crisis Communication Team

This team is assigned by RATCH to take charge of releasing information that is correct, appropriate, and necessary to uphold the company's reputation and credibility, while minimizing impacts caused by a crisis or disaster. The team is to consider and apply the Crisis Communication Plan as appropriate for the severity of the crisis/disaster to efficiently get each message across to those affected/concerned.

Business Continuity Manager

He/She is appointed by the management as the coordinator between CMT and various units in the corporation, subsidiaries, and joint ventures in a crisis/disaster to ensure the smooth operation of crisis management. The person also plays the role of secretary to CMT.

Support Team

They are a group or groups of people appointed by the management to take charge of various areas of work in support of the CMT and business units to ensure business as usual once the Business Continuity Plan is announced.

Business Unit

All business units in RATCH are responsible for salvaging their respective critical business functions to continue each unit's BCP.

During 2017, RATCH appointed its staff members to take the roles of members of the Crisis Management Team, members of the Crisis Communication Team, the Business Continuity Manager, and members of the Support Team. Business units required for drawing a Business Continuity Plan were also defined. Moreover, walk-through and call tree exercises were arranged for the Crisis Management Team and the Crisis Communication Team to ensure thorough understanding.

Corporate Governance

The Board of Directors' accountability is to assure stakeholders of positive corporate financial performance, business adaptation to changes and nurturing of good relationships with stakeholders.

RATCH's Board applies the Corporate Governance Code in performing its duties for sustainable corporate values in economic, social and environmental aspects to achieve the following goals:

- Competitiveness and satisfactory financial performance taking into account long-term impacts
- Operations with ethics, respect to others' rights and accountability to shareholders and stakeholders
- Being supportive to society and taking part in environmental impact reduction
- Adaptability to changes

Board of Directors' Principles



RATCH's regulations stipulate the scope of the Board's duties as summarized below;

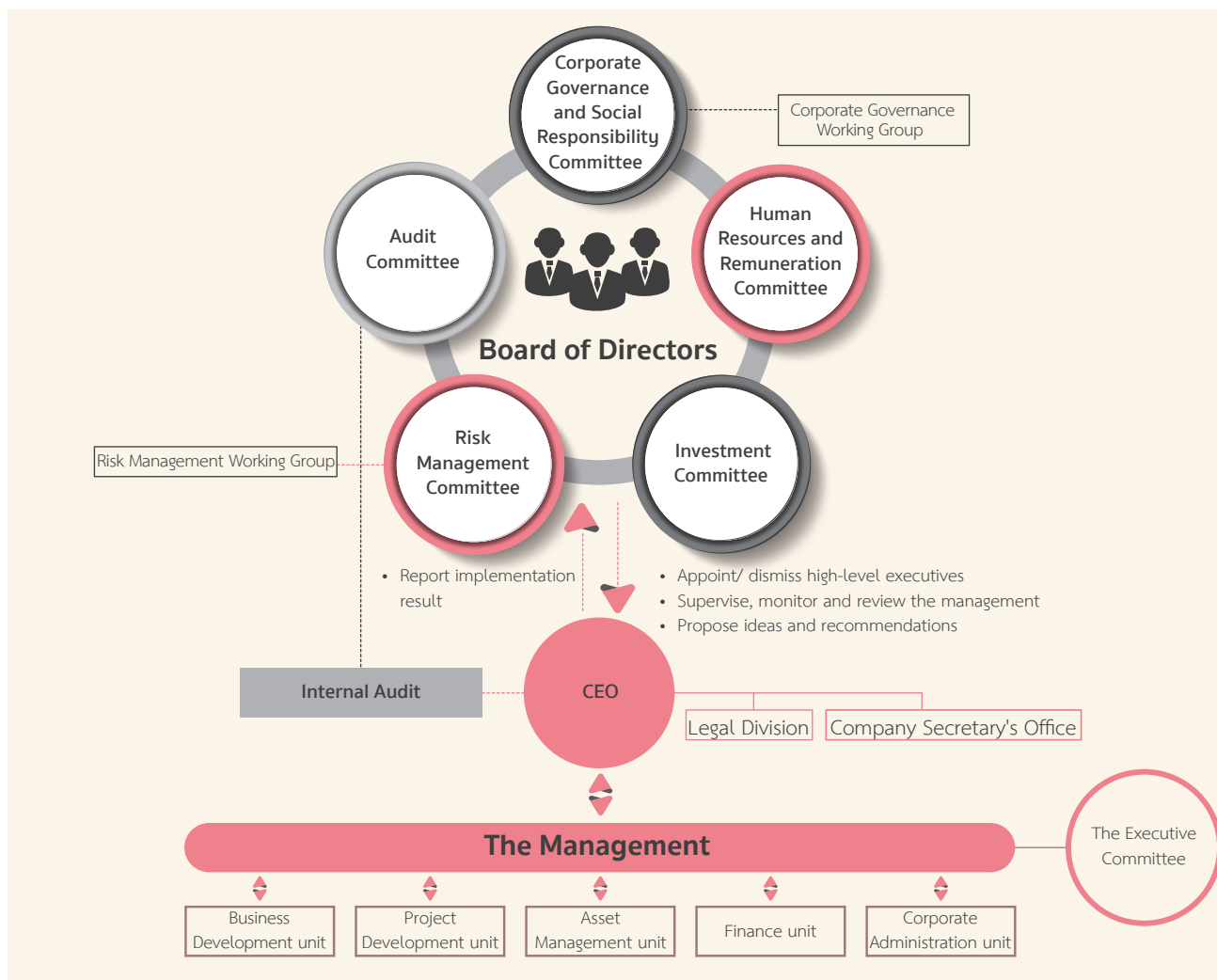
The Board of Directors' Duties



Details are available on the Company's website: www.ratch.co.th (under Item: Regulations of the Board of Directors).

Corporate Governance Structure

The Board of Directors establishes 5 sub-committees to closely oversee substantial issues particularly risk management and corporate governance. The sub-committees are supported by a working group consisting of high-level executives for maximum efficiency and effectiveness of operation. The sub-committees' meeting minutes are reported for the Board's consideration and the Board make decisions in economic, social and environmental issues.



Following the Board's meetings, the executive committee consisting of high-level executives hold meetings to discuss the Board's opinions or proposed issues for further implementation. Progress, performance and obstacles are monthly reported to the Board.

Composition of the Board of Directors

The Board consists of at least 7 but no more than 15 directors. As of 31 December, the Board has 12 directors who reside in Thailand and have never embarked on any transactions that pose conflicts of interest.

1	6	6 (including CEO)	1 (CEO)	2	10	2
Chairman (Non-executive and not CEO)	Independent Directors (No less than 1/3)	Directors representing major shareholders	Executive directors (No more than 1/3)	Female directors	Shareholder- appointed directors	Directors appointed by the Board during the year

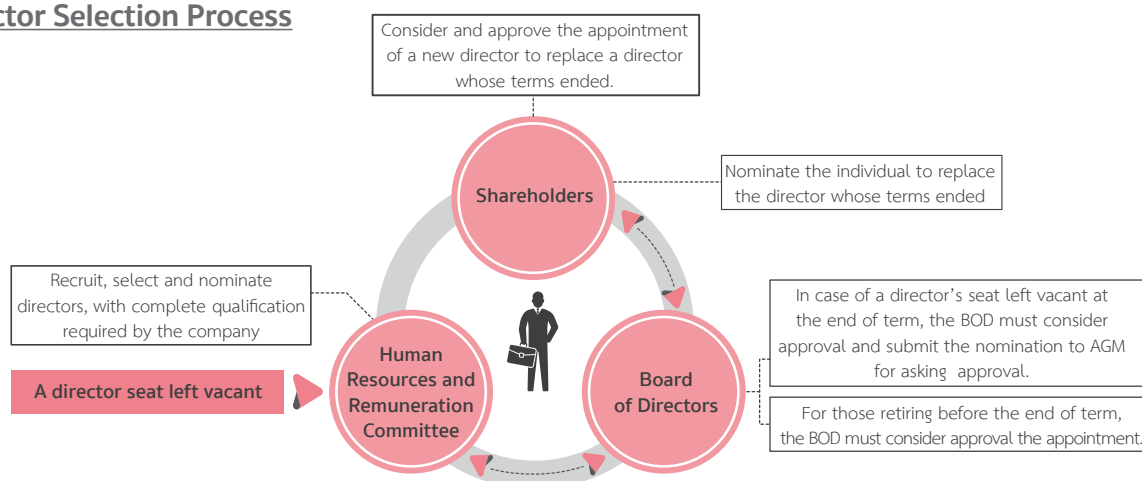
Director Selection

The Human Resources and Remuneration Sub-committee is assigned to find, screen and nominate individuals to be appointed as directors and independent directors, taking into account the Company’s criteria, their special expertise, particular experience necessary for the Company’s mission. Gender is not part of the criteria. The Company also allows minority shareholders to submit nominations to replace directors whose terms end. Their nominations can be submitted to the Board which will present the nominations at the annual general meeting of shareholders.

The nominations are submitted to the Board or the shareholders’ meeting for approval under the following circumstances:

- To fill up a director seat left vacant before the end of the term, the Board will appoint the replacement with at least three-fourth vote from existing directors. The replacement will complete the departing director’s term.
- To fill up director seats left vacant at the end of their terms, the Board will approve the nominations which meet the Company’s criteria and submit the nominations to the shareholders’ meeting for approval.

Director Selection Process



Director Qualification Review

The Company’s Competency Matrix sets directors’ skills in two categories—core skills and alternative skills, to find the directors who will ably lead the Company towards its strategic goals.

Category	Requirement/Criteria
Core Skills	✓ Knowledge in generating business
	✓ Knowledge in accounting and finance
	✓ Knowledge of laws
Alternative Skills	✓ Knowledge in finance-banking business/capital market
	✓ Academic knowledge or technological expertise in related businesses
	✓ Knowledge in strategic planning
	✓ Holding a high-level executive post at other companies in the same peer
	✓ Knowledge in corporate governance/risk management/social responsibility
	✓ Tax knowledge

Category	Requirement/Criteria
	✓ Knowledge in marketing/public relations
	✓ Public-sector work experience

In 2017, the Company had 12 directors (as of 31 December 2017), all boasting knowledge, experience and expertise in various fields. Together, they have ably strengthened corporate governance practices and prepared the Company for changes.

Directors' skills and expertise

Political Science 1	Accountancy 1	Law 1	Business Administration 2	Mining Engineering 1	Civil Engineering 2	Mechanical Engineering 1	Electrical Engineering 3
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Performance Summary of 2017

Committees	No of members	Performance
Board of Directors	12	<ul style="list-style-type: none"> • 12 full meetings • 1 meeting for non-executive directors (prior to 12th Board of Directors meeting) • Visit and monitor progress of Mount Emerald Project in Australia, and Fangchenggang nuclear power plant, Phase II, China
Audit Committee	3	<ul style="list-style-type: none"> • 9 meetings • 8 meetings with the management • 1 meeting with the auditor without the management's presence
Risk Management Committee	3	<ul style="list-style-type: none"> • 4 meetings
Human Resources and Remuneration Committee	3	<ul style="list-style-type: none"> • 9 meetings
Investment Committee	4	<ul style="list-style-type: none"> • 8 meetings
Corporate Governance and Social Responsibility Committee	3	<ul style="list-style-type: none"> • 2 meetings

Aside, in 2017 the Company reviewed the Corporate Governance Working Group's duties in line with amendments in related laws and regulations as well as the Board's guidelines.



The assessment of corporate governance practices in 2017 found no incidents which violated the laws, regulations and the Company's Code of Conduct or indicated signs of corruption.

Assessment of the Board of Directors' Performance

RATCH schedules annual assessments of the Board of Directors and all sub-committees. The assessment results in 2017 are as follows:

Committees	Full Score	2017				2016			
		Group		Individual		Group		Individual	
		Score	Level	Score	Level	Score	Level	Score	Level
Board of Directors	100	97.14	Excellent	96.19	Excellent	95.02	Excellent	95.46	Excellent
Human Resources and Remuneration Committee	100	97.39	Excellent	97.39	Excellent	93.83	Excellent	93.83	Excellent
Audit Committee	30	29.00	Excellent	29.00	Excellent	28.00	Excellent	28.00	Excellent
Risk Management Committee	30	27.25	Excellent	27.25	Excellent	28.50	Excellent	28.50	Excellent
Investment Committee	30	28.75	Excellent	28.75	Excellent	28.75	Excellent	28.50	Excellent
Corporate Governance and Social Responsibility Committee	30	28.00	Excellent	28.00	Excellent	28.00	Excellent	28.00	Excellent

Directors' Remuneration

The Human Resources and Remuneration Committee's function is to define the remuneration-setting guidelines for the Board of Directors, sub-committees and high-level executives, in consultation with the Board. The Board and sub-committees' remuneration requires endorsement from the Board and shareholders' approval at the annual meetings.

Type of Remuneration

Regular compensation

- Members of the Board of Directors are entitled to monthly compensation: 75% is being fixed and 25% depends on meeting attendance. The chairman's meeting allowance is 25% above other directors'.
- Members of sub-committees are paid upon meeting attendance and chairpersons' meeting allowance is 25% above other directors'.

Bonus

Allocated accordingly to their tenures and meeting attendance. During a particular tenure, if serving more than 1 company in the Group, they will receive bonus from the company that pays the highest bonus. The chairperson's bonus is 25% above other directors'.

Compensation Criteria

Set in line with the committees' performance, taking into account;

- 1) The Group's targets and financial performance
- 2) Scope of assignments or responsibility in comparison with peers in the same industry
- 3) Ability in enticing and inspiring qualified, experienced and capable personnel in contributing to the organization's success

Directors' remuneration in 2017 is disclosed in the Annual Report 2017.

Public Recognition

Listed in THSI



Goal

To be included in the Stock Exchange of Thailand's Thailand Sustainability Investment (THSI) list, among companies in Group 2 or those with market capitalization between 30-100 billion baht.



Result

The Company has been on THSI list for 3 consecutive years with sustainability assessment score of 93 points from 100 points, well above Group's average score of 72 points.

Sustainability Information Disclosure



Goal

To continually win sustainability-reporting awards to reflect improvement in the Company's performance on sustainability. The disclosure contains all material topics, based on the ESG-reporting criteria set by Thai Listed Companies Association, the Office of Securities and Exchange Commission and Thaipat Institute.



Result

The Company has received the "Outstanding" Sustainability Report Award for 5 consecutive years, with reliability above the average.



Thailand Sustainability Investment (THSI)



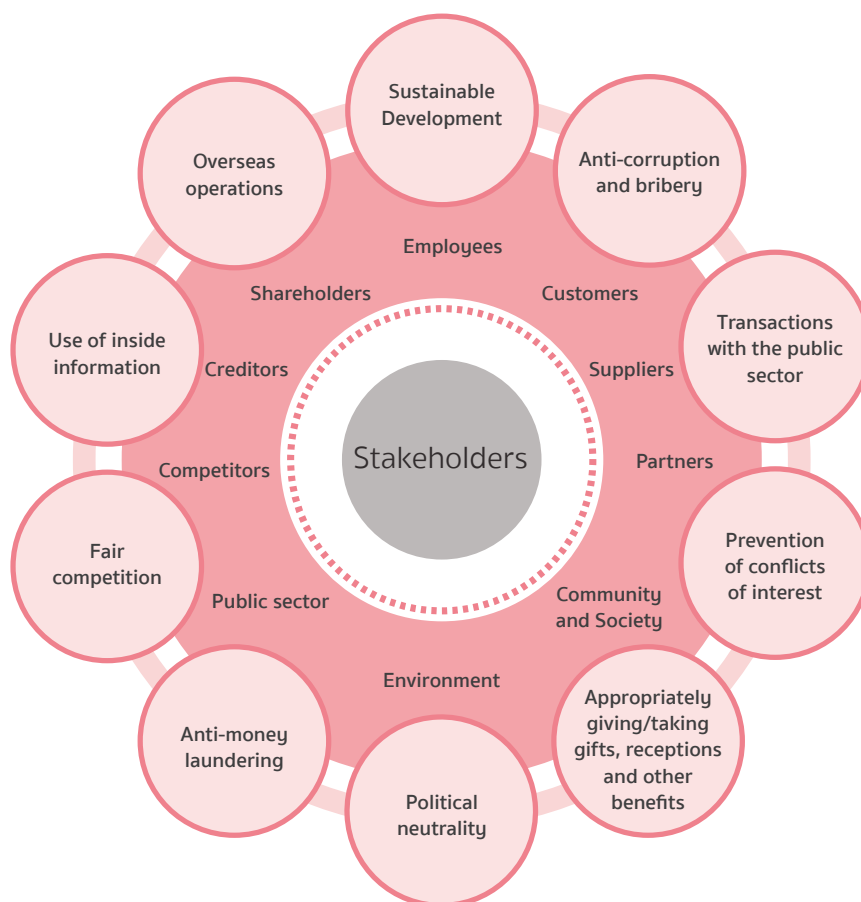
"Outstanding" Sustainable Development Report Award for 2017

Ethic and Anti-Corruption Practices

RATCH firmly believes ethical, moral and integrity together with good management system and corporate governance are key factors towards sustainable success and the attainment of business leadership. RATCH consequently encourages executives and employees at all levels to follow the Code of Conduct. Executives are responsible for setting the norm and culture in upholding the Code of Conduct by encouraging and promoting employees' understanding and awareness, to ensure their willingness in complying with the Code of Conduct. The executives are also required to come up with appropriate responses to related issues.

Guidelines

RATCH provided 11 easy-to-understand business guidelines for promoting compliance. The said guidelines are in line with the Company's rules and regulations and can properly respond to stakeholders' needs.



Compliance with Code of Conduct

Individuals required to comply with RATCH's Code of Conduct are:

- 1) The Company's directors, executives and employees.
- 2) Existing and to-be-established subsidiaries controlled by RATCH which must accept and comply with the Code.
- 3) Subsidiaries that are not controlled by RATCH should also accept and do business aligned with the Code.
- 4) Outsiders representing RATCH, such as advisors, representatives, and independent partners shall be responsible for:
 - complying with the Code
 - understanding the Code
 - accepting consequences including the cancellation of contracts in case of a breach of the Code

A Breach of the Code of Conduct

Directors, executives and employees are required to uphold the guidelines prescribed in the Code of Conduct. The following actions or behaviors are considered as a breach of the code:

- 1) Violate the prescribed guidelines
- 2) Advise, encourage or support others to violate the Code
- 3) Ignore violation that they know or should know, as the violation are related to their responsibilities
- 4) Fail to cooperate or obstruct investigation on alleged violation
- 5) Retaliate employees who report doubtful actions
- 6) Commit unfair acts against others who report the violation

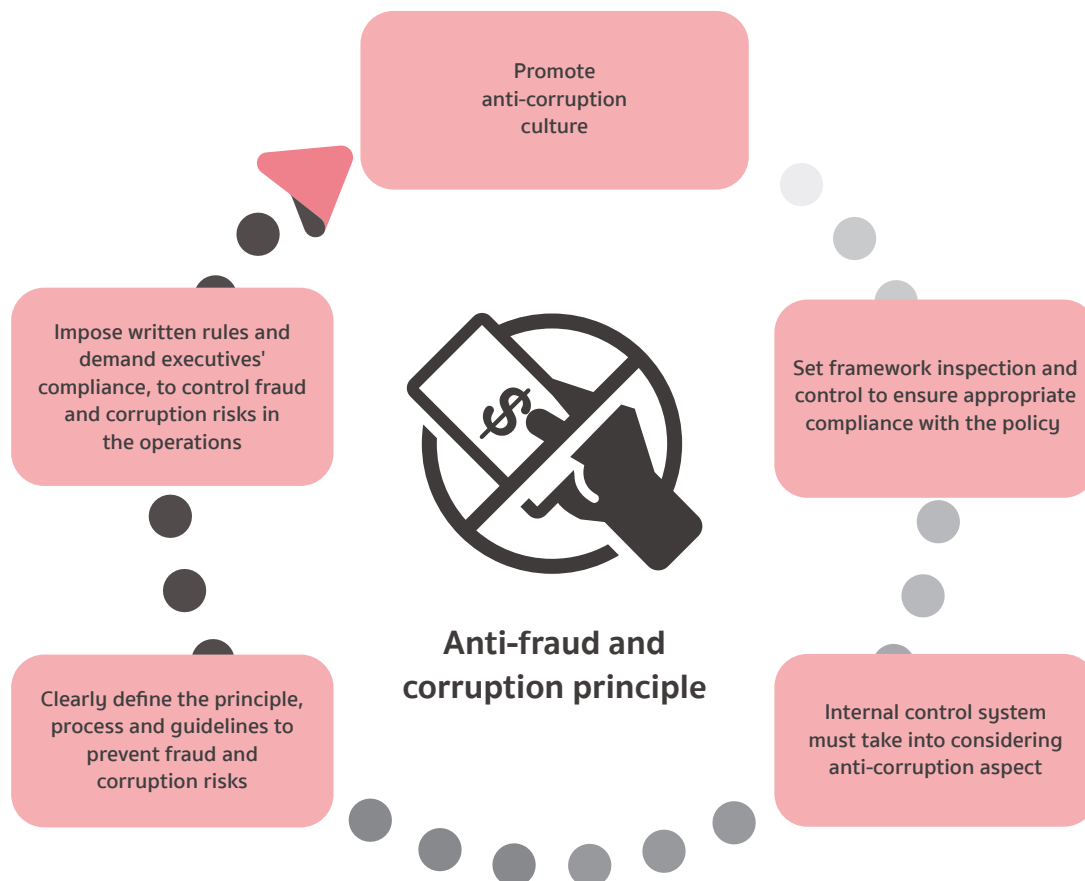
Those who breach the Code of Conduct are liable to disciplinary actions as prescribed by the Company. They may also be subjected to penalties, if such acts violate the laws.

Anti-Fraud and Corruption

Certified by Thailand's Private Sector Collective Action Coalition Against Corruption (CAC) in 2016, the company has continually improved its work procedures in line with RATCH Group's anti-fraud and corruption policy and also prepared for CAC's review in 2019.

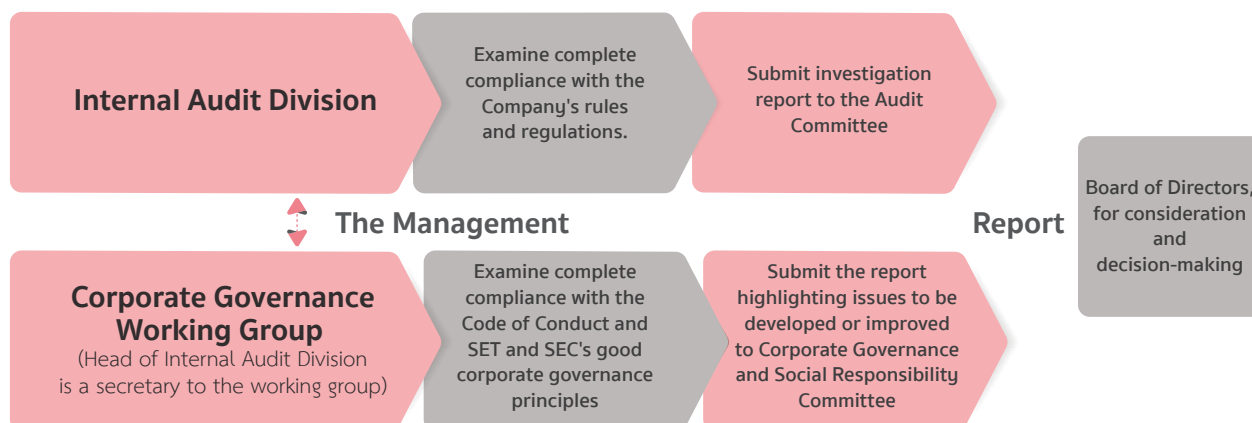
Anti-Fraud and Corruption Policy

RATCH determined its intention not to engage all forms of frauds and corruption, directly and indirectly, in doing business with the public sector or the private sector. All personnel, including directors, executives to employees are prohibited to request, commit or accept fraud and corruption to benefit themselves, their families, friends and acquaintances. The anti-fraud policy's guidelines cover the following main aspects.



Compliance with Anti-Fraud and Corruption Policy

The company assigned Internal Audit Division and the Corporate Governance Working Group to supervise, monitor and promote the compliance with the policy.



Meanwhile, the Audit Committee plays a key role in supervising and reviewing the anti-fraud and corruption process, acting through Internal Audit Division as follows:

- Review fraud risk management policy and process as well as assessing the sufficiency of internal control to prevent possible frauds and corruption.
- Define internal control criteria and make sure supervision on operation completely covering anti-fraud and corruption, to ensure appropriate compliance with the Company's policy in line with international standards.
- Review anti-fraud practices in communications policy and train all employees, outsiders and related individuals to make sure acknowledgement and compliance with the policy and principles.
- Assess compliance with their regulations, orders and the Code of Conduct, on anti-fraud and corruption, gift taking, giving, charitable donations & sponsorship, entertainment allowances, and fraud risk management.
- Schedule annual review to re-examine if the Company's anti-fraud and corruption risk management meet the prescribed criteria or standards.

No violation in connection with fraud or ethics was found in 2017 and no director or executive resigned because of governance issues.

Fraud Risk Management

RATCH formulates 5 anti-fraud principles as the foundation for fostering awareness among executives

and employees, hence establishing the corporate culture.

1) Fraud risk assessment: To identify risks, analyze their impacts, probability and severity, and consider appropriate internal audit and measures to alleviate the risks.

2017 Result:

RATCH reviewed all departments' fraud and corruption risk lists and ordered all to update the lists and lay out additional preventive measures.

2) Prepare the policy, regulations, orders and Code of Conduct with regular improvement and assessment: Communication on relevant issues should be carried out for all workers in order to ensure their acknowledgement and strict compliance with the Company's anti-fraud and corruption policy and method.

2017 Result:

- The rules on taking and giving gifts and souvenirs were revised for enhancing practicality and suitability to the operations, while requiring reports for such gift taking/giving.
- The No Gift Policy was announced ahead of New Year celebrations.

3) Communications and training: To devise the annual communications and training plan covering channel, frequency, content and the process for internal and external effectiveness. The goal is to raise employees' awareness toward the significance of the company's fraud risk management, transparency and determination to fight corruption at all levels as well as to win their engagement in passing

the message to business partners/supplier and stakeholders.

2017 Result:

- Testing employees' knowledge and understanding in the anti-fraud and corruption policy and measures through the e-learning system and 89% passed the test.
- Staging executive training on the amended Securities and Exchange Act and the newly-revised good corporate governance guidelines of the Office of Securities and Exchange Commission
- Publicly announcing, issuing announcement and distributing notifications on anti-fraud and corruption policy and guidelines to business partners and stakeholders for their acknowledgement and strict compliance.

4) **Screen the history of personnel or business-related stakeholders** prior to employment or entering into any business transactions, ensuring the process is agreed upon and permissible by related laws.

2017 Result:

- HR Department was assigned to screen job applicants
- Business Development Unit had a uniform list to screen potential partners for joint ventures or business transactions
- Procurement Department arranged a form to screen supplies and completed the criteria on essential document and securities insurance.

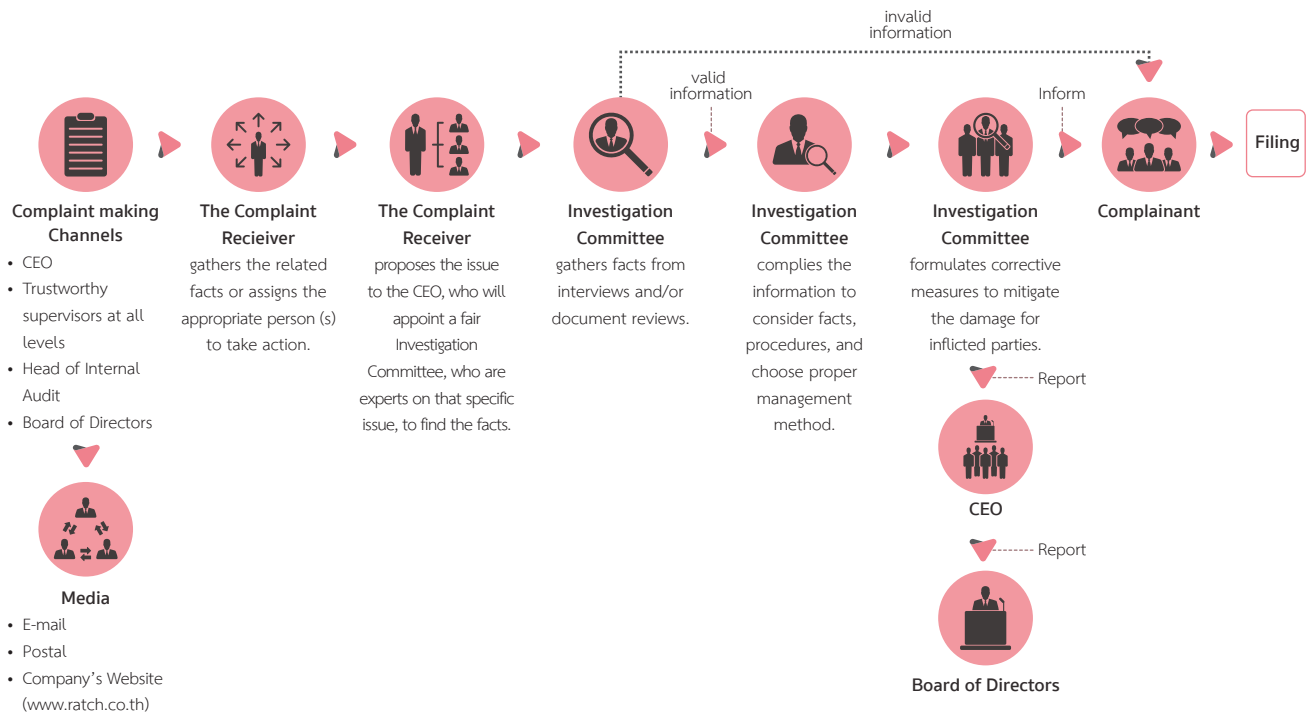
5) **Internal Audit** requiring all departments to prepare written work procedures and internal control, clearly identifying responsibilities in each step with a regular review at least once a year.

2017 Result:

Internal Audit Division examined the work procedures of departments frequently associated with risks, to ensure the effectiveness and sufficiency of preventive measures.

Reporting and Complaint Channels

RATCH has established channels for reports or complaints from internal and external stakeholders who are affected by the Company's operations or the acts by executives and employees which breach the Code of Conduct or related laws.

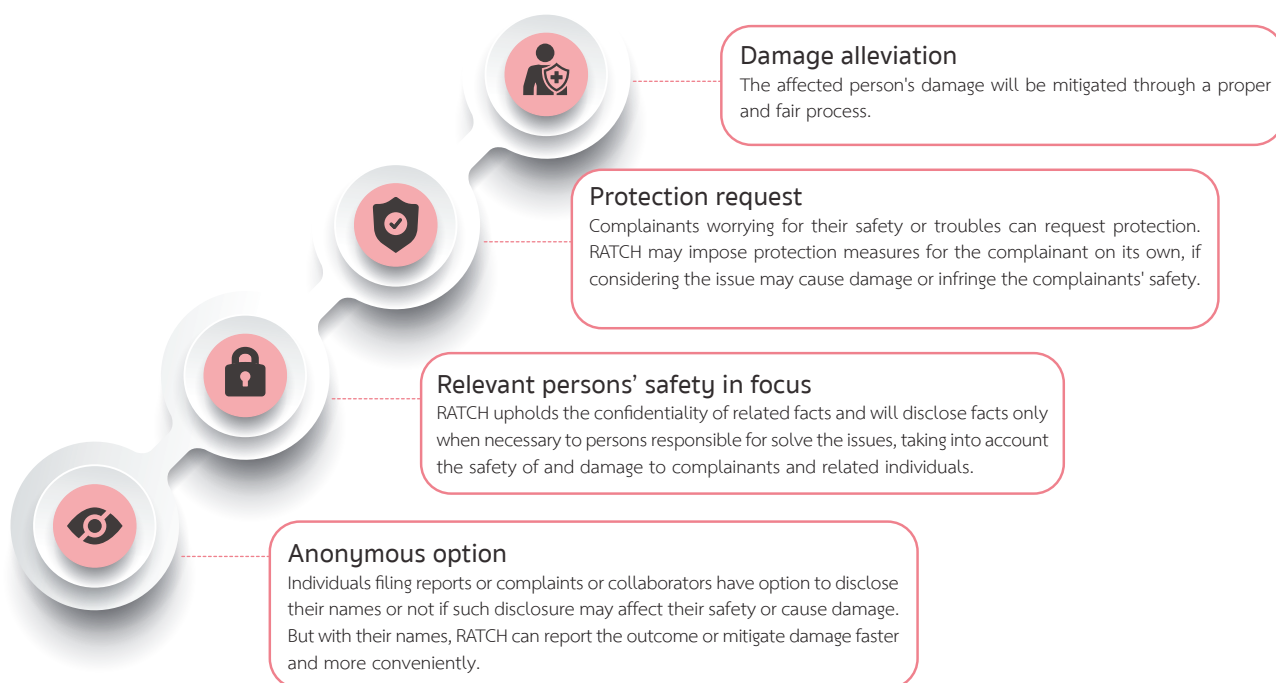


Complaint Channels

Complaint receiver	Alternative complaint channels	
	E-mail	Postal
<ul style="list-style-type: none"> Chairman or Board of Directors (including independent directors) 	directors@ratch.co.th	Addressed to a complaint receiver at Ratchaburi Electricity Generating Holding Public Company Limited 8/8 Moo 2 Ngam Wong Wan Rd., Bangkhen, Muang, Nonthaburi, 11000
<ul style="list-style-type: none"> CEO 	ceo@ratch.co.th	
<ul style="list-style-type: none"> Supervisors 	The supervisors' e-mail addresses	
<ul style="list-style-type: none"> Head of Internal Audit Division 	internalaudit@ratch.co.th	

Retaliation and Damage-Mitigating Measures

Individuals filing reports or complaints or cooperating in the reporting of Code of Conduct violation or breaching are assured of protection and fairness for their facts or clues beneficial to the Company as guided below:



In 2017, RATCH received no report or complaint concerning possible violation of the Code of Conduct or laws or misconducts.

RATCH pinpoints 3 basic human rights principles in the Code of Conduct.



Intention to treat stakeholders in compliance with laws, with respect and concern about human dignity



Treating stakeholders accordingly to their rights, freedom and equality without discrimination in gender, nationality, language, religion, economic status, social status and education level. Political freedom is also included.



Protection of personal rights and confidentiality by limiting access to information and disclosing/using information only when necessary or when required by law.

The principles are translated into various aspects to shape RATCH's policy and work instruction. RATCH puts emphasis on the following 4 main human rights aspects.

1) Labor Rights

RATCH upholds the national labor law in treating and protecting all workers. These reflect in the rules and regulations as well as labor policies which cover indiscriminately employment opportunity, equal opportunity to all, work assignments accordingly ability, appropriate returns, zero forced labor, zero labor aged below 18 years, and zero illegal labor. As prescribed by laws, employees are granted the freedom to form a welfare committee which represents all employees (equal to 100%) in submitting recommendations and demands. In 2017 there was no employees' proposal or claim submitted to the company.

2) Protection and Safety

RATCH is determined to protect and take care of employees and the Company's properties, without infringing others' rights and safety. Aside from the establishment of the Safety, Occupational Health and Environment Committee consisting of representative from employers and employees as specified by law to represent 100% of employees which is directly in charge of this aspect, RATCH has other supporting tools and methods including the assessment and analysis of threats to workplace safety as well as training and awareness raising among employees and workers. In 2017, employees submitted 19 recommendations on safety, occupational health and environment via the Best Suggestion Award Program. Then, safety,

Occupational health and Environment Committee consisting of representatives from employers and employees jointly considered and approved the correction for 17 recommendations.

3) Community's Rights

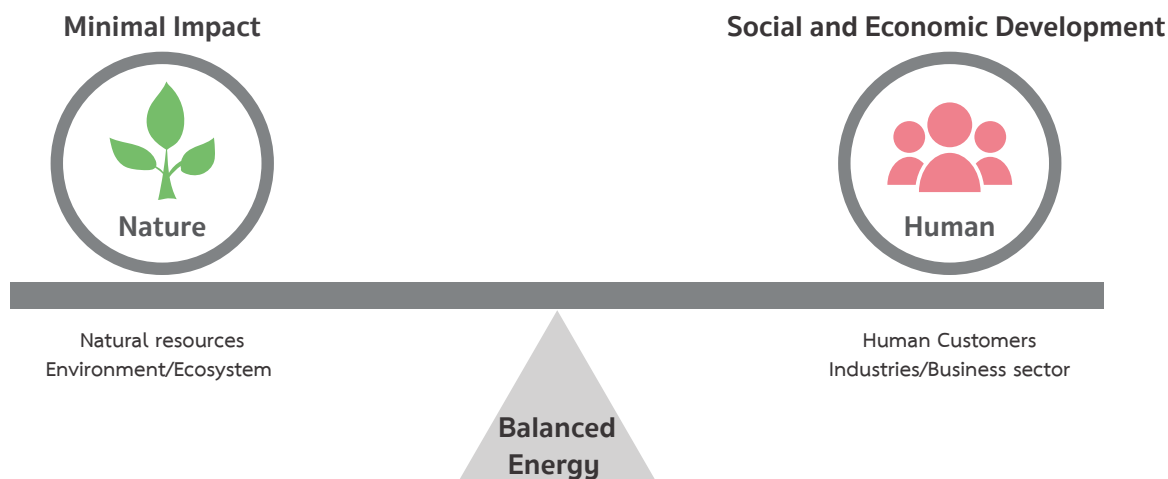
RATCH is open to community's voices while conducting a feasibility study and environmental impact assessment of under-development projects. Their engagement in inspecting and monitoring commercially-commenced power plants is assured through a tri-partite committee. Communications mechanism or channels are initiated to ensure their access to information and opportunity to file recommendations and complaints at all time.

4) Suppliers' Accountability

RATCH puts more emphasis on suppliers' environmental and social responsibility, particularly their labor treatment practices and respect to their own staff. In the supplier assessment form used in the supplier selection process, RATCH has expanded and improved labor, environment and human rights indicators. Constant random checks on their staff and workers operating at RATCH's headquarter or power plants are carried out. Ratchaburi power plant steps up its practices by demanding suppliers to have all workers covered by the social security system. Ratchaburi power plant will shoulder the burden if small suppliers are incapable of doing so.

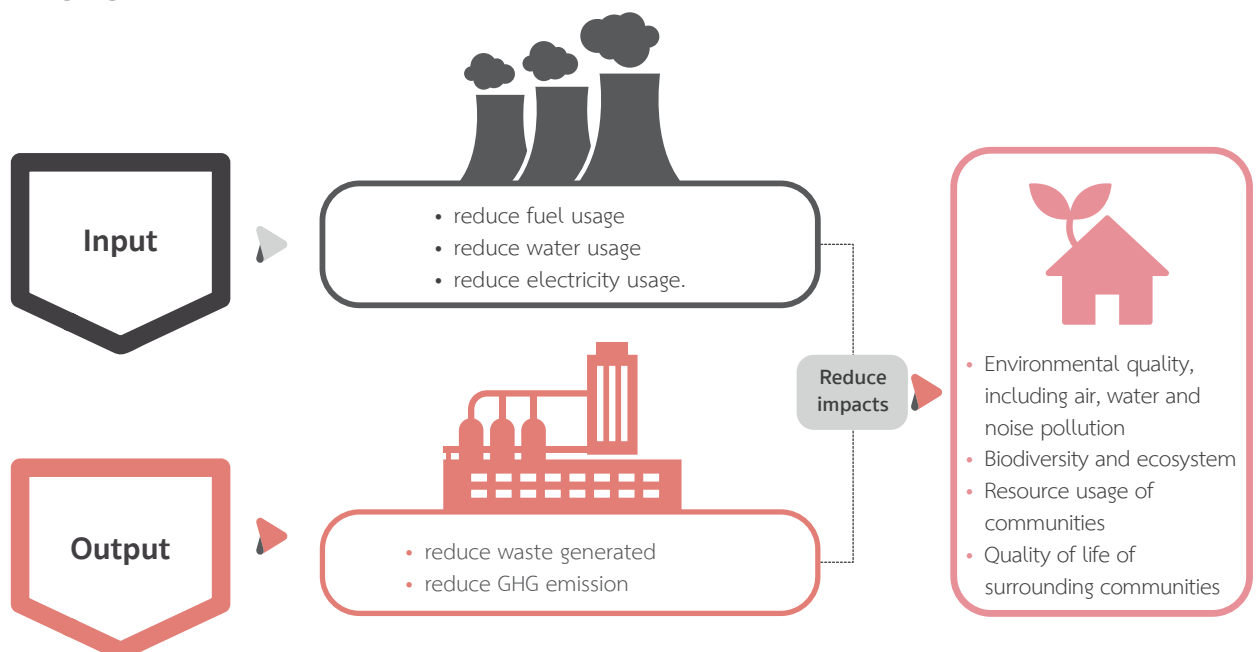
Resource Consumption and Environmental Management

Power generation use consumes massive resources, especially fuel and water, which are the key production factors. RATCH’s power plants adheres to the concept of Balanced Energy in power generation with efforts to maintain high production efficiency while minimizing resource usage and impacts on the environment, while customers, the economy and society satisfy their demand for electricity.



In addition to strict regulatory compliance, power plants paid much attention to the management of natural resources and the environment by reducing the quantities of raw materials used in the processes such as raw water and fuel. At the same time, efforts have been made to reduce the quantity of waste released to the environment such as air emission, water discharge, waste and noise. The objectives to reduce and prevent impacts on the quality of the environment, avoid conflicts with communities in resource usage, minimize greenhouse gas (GHG) emission leading to climate change and maintain the quality of life of communities around the power plants. For ultimate growth and sustainability, RATCH took its efforts seriously and continually to achieve communities’ and public confidence and acceptance.

Managing Resources and the Environment



Resource Usage

This year the power plants operated by RATCH, namely 3,645-MW Ratchaburi power plant 720-MW Tri Energy power plant and 139.13-MW Nava Nakorn power plant consumed non-renewable resources such as natural gas, diesel and fuel oil, and renewable resources such as raw water.

Fuels

Ratchaburi power plant, which comprises thermal power plant and combined-cycle power plant, Tri Energy power plant and Nava Nakorn power plant, used natural gas as fuel. Ratchaburi thermal power plant can also use fuel oil as a backup source. Ratchaburi combined-cycle power plant and Tri Energy power plant used diesel as a back-up fuel for natural gas when natural gas supply from Myanmar was shut down maintenance. The fuel consumption of a power plant varied with the production rate of energy and type of fuel managed by the National Control Center (NCC) of the Electricity Generating Authority of Thailand (EGAT) in order to secure the entire power system of the country.

Fuel Consumption of Power Plants

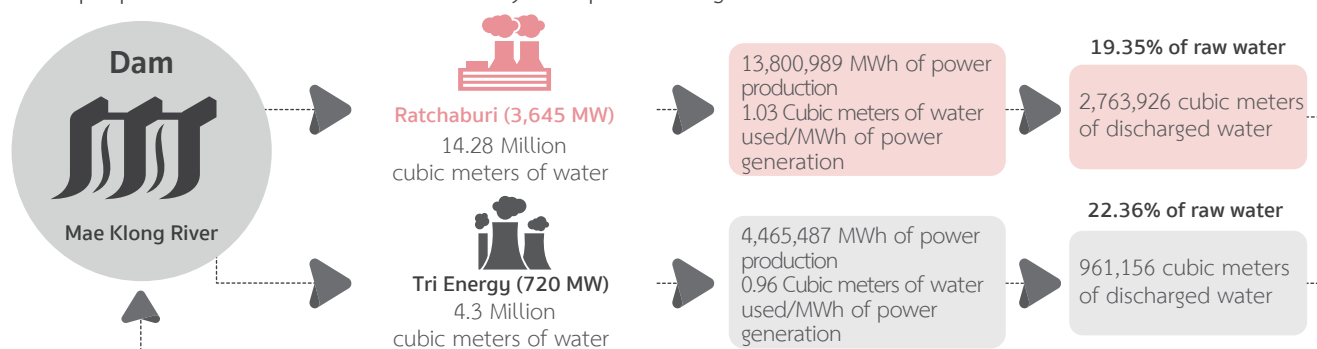
Country	Power Plant	Nameplate capacity (MW)	Natural gas (Million cu.ft)	Diesel (Liters)	Fuel Oil (Liters)	Net Power (MWh)
Thailand	1) Ratchaburi Thermal	1,470.00	548.23	27,144	26,698,857	41,422
	2) Ratchaburi Combined-Cycle	2,175.00	117,660.23	486,262	None	13,759,567
	3) Tri Energy	720.00	38,290.12	126,500	None	4,465,487
	4) Nava Nakorn	139.13	7,015.46	None	None	880,508
Australia	1) Kemerton	308.00	1,190.96	472,290	None	90,012
	2) Townsville	234.00	3,406.38	None	None	380,333

With regard to managing fuel efficiency, all power plants were controlled by the heat rate to maximize the use of resources and minimize the cost of production.

Raw Water Usage

With intensified climate change, all power plants must adapt and manage their use of raw water to maximum efficiency even though water is a renewable resource. This is to reduce the risk of water shortages and competition of water usage against communities and public. Efforts also included support and active participation in community forests to preserve Thailand's watersheds which are major sources of electricity generation.

Regarding the management of raw-water usage of Ratchaburi power plant and Tri Energy power plant this year, it was found that the total volume of raw water from Mae Klong River used by both power plants was reduced to 18.58 million cubic meters (or 0.57 cubic meters per second averagely), which was 0.54% of the total volume of water released from the Mae Klong Dam (or 108 cubic meter per second averagely). This proportion did not affect community and public usage.



Power Plant	Capacity (MW)	Raw water (Million cu meters)	Raw water source	Effluent (cubic meters)
1) Ratchaburi	3,645	14.28	Mae Klong River	2,763,926
2) Tri Energy	720	4.30	Mae Klong River	961,156
3) Nava Nakorn	139.13	1.36	Tap water	74,393
4) Kemerton &Townsville (Australia)	542	0.45	Tap water and surface water	158,908

Remark: Information of power plants in Australia covering 308-MW Kemerton and 234-MW Townsville power plants

Usage of Recycled Water

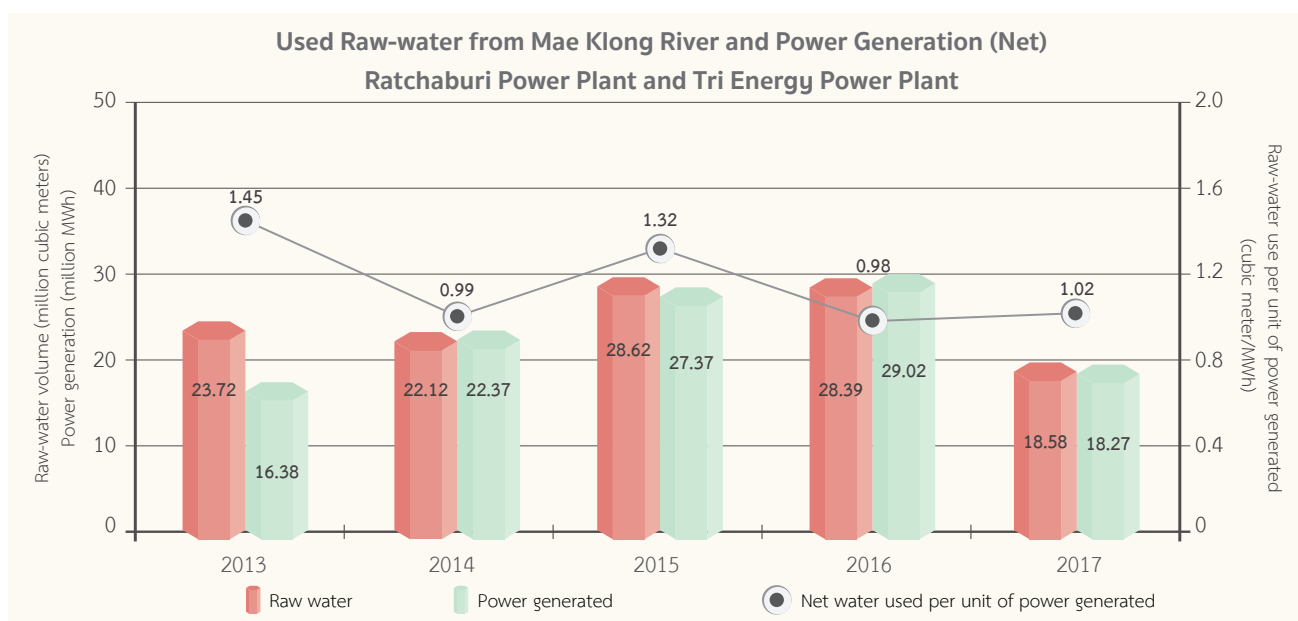
The average water turnover of circulating water in the cooling systems of three power plants in 2017 was 3.48-5.6 cycles. Ratchaburi thermal power plant had the most recycling cycles. After changing the water quality control system from the alkaline system to the acidic system, the quantity of raw water was reduced by about 7 million cubic meters.

Power Plant	Average rounds water recycling			Water quality control system of Cooling Tower	Target
	2015	2016	2017		
Ratchaburi Thermal	3.42	3.32	5.60	Replace its alkaline system to acidic system in 2017	3-4 cycles for alkaline system
Ratchaburi Combined-Cycle	3.01	2.63	3.48	Replace its alkaline system to acidic system in August 2017	4-6 cycles for acidic system
Tri Energy	4.86	4.68	4.71	Acidic System	4-6 cycles
Nava Nakorn	-	-	5	Acidic System	5 cycles

Raw-Water Usage per Unit of Electricity Generated

For Ratchaburi power plant and Tri Energy power plant, the average raw-water usage per unit of electricity generated during 2013-2017 was 1.10 cubic meters per one MWh (net). This year the number was 1.02 cubic meters per one MWh (net).

Used raw-water from Mae Klong river and power generation (net) by Ratchaburi power plant during 2013-2017

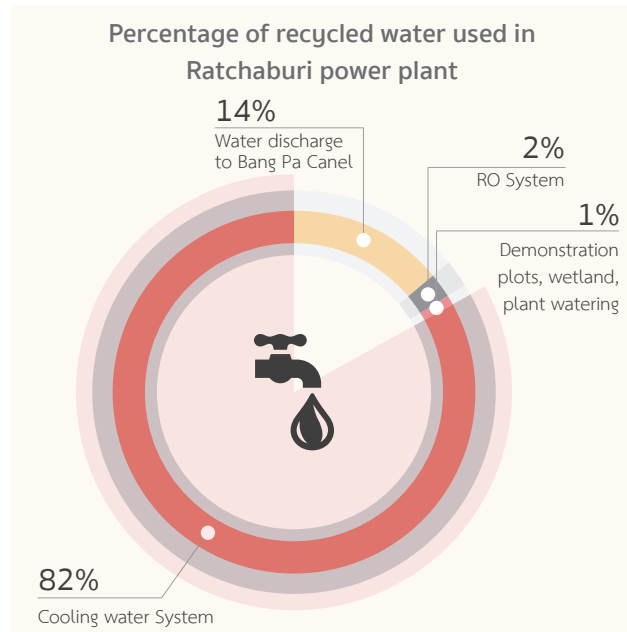


Wastewater Management

All power plants have dedicated their efforts to become “zero wastewater discharge” power plants by managing their recycled water. This year Ratchaburi power plant recycled and reused 744,572 cubic meters of water, which accounted for 27% of the total wastewater discharged from the plants. The total reduction of raw-water quantity being drawn from Mae Klong river can be classified as follows:

- 470,147 cubic meters of water recycled by Reverse Osmosis (RO). This resulted in 236,222 cubic meters of treated water.
- 274,425 cubic meters of water used in wetland, plantation and agricultural demonstration plots of rice field, which represented cooperation between Ratchaburi power plant and the Army Engineer Department Ratchaburi.

In addition, Nava Nakorn Electricity Generation power plant used raw water of 1,356,878 cubic meters, with a water discharge of 74,393 cubic meters and the recycled water of 1,282,485 cubic meters, accounting for 94.52% of raw water used.



Environmental Management

Ratchaburi power plant was ISO 14001 (2015) certified on December 20, 2017

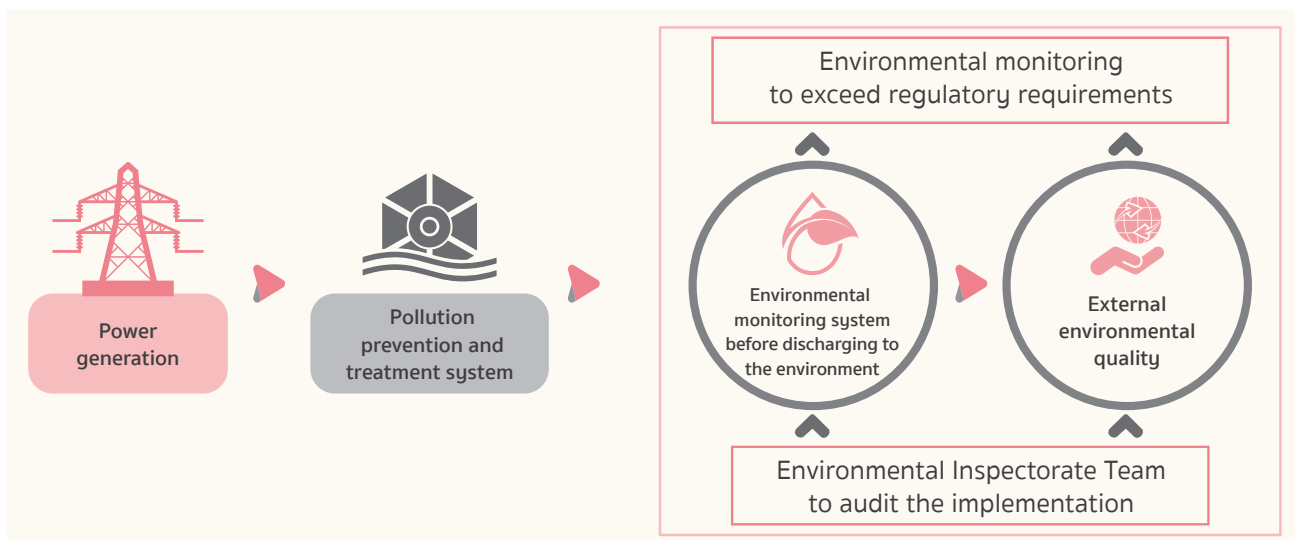
Over the past 17 years, RATCH has consistently adhered to environmental and social responsibility. RATCH recognized realized that eco-friendly business practices are the expectation of stakeholders, especially communities. To achieve this expectation, RATCH must employ a good environmental management system and standards to sustain its business growth in the future by obtaining social license to operate.

Environmental Management Approach

The goal of environmental quality management is to preserve the environment, which consists of air, water, noise, and ecosystems around the power plants, to meet national quality standards, international standards, and community expectations. In 2017, RATCH strictly complied with all laws and regulations, thus there was no citation or fine for non-compliance or violation.



The environmental management system of Ratchaburi power plant employ pollution prevention and control system including continuous monitoring of environmental quality in the plant and the surrounding communities. Environmental monitoring reports and implementation of control and mitigation measures were submitted to the Office of Natural Resources and Environmental Policy and Planning every six months. As part of transparency and good governance, RATCH invited community representatives and government representatives to become members of an Environmental Inspectorate. On December 20, 2017, Ratchaburi power plant’s environmental management system was certified against the ISO14001 (2015) Environmental Management System Standard.



Air Quality Monitoring in 2017

Power plant (Thai)	Average concentration of air pollutants from combustion released by power plants ¹⁾				
	NO _x (ppm)		SO ₂ (ppm)		Back up sources
	Natural gas	Fuel Oil	Natural gas	Fuel Oil	
Ratchaburi Thermal	14.87	86.89	0.76	28.73	Fuel Oil
Ratchaburi Combined cycle	31.86	-	3.34	-	Diesel
Tri Energy	28.70	-	1.35	-	Diesel
Standard limit ²⁾	120	180	20	320	-
Nava Nakorn	37.82	None	0.26	None	None
Limit in accordance with EIA requirements	60	-	10	-	-

Remarks: 1) Average concentration of stack emissions read by Continuous Emission Monitoring Systems (CEMs)

2) Standard limits stipulated by the notification of Ministry of Industry regarding air pollutants release a from power plants, distributed or traded, BE 2547 (2004)

This year the results of the air emission monitoring of the power plants operated by RATCH were superior to the legal standards. All of the air quality monitoring systems have been calibrated and verified for accuracy every six months by the agencies registered with the Department of Industrial Works. The results showed that the air emission monitoring system from the chimney and the ambient air quality monitoring system in communities can measure air quality parameters accurately to meet an acceptable level of confidence.

Power Plant (Australia)	Average concentrated emissions from combustion released from the power plant							
	NO _x (ton per year)		SO ₂ (ton per year)		PM10 (ton per year)		SO ₂ (ton per year)	
	Natural gas	Oil	Natural gas	Oil	Natural gas	Oil	Natural gas	Oil
Kemerton	54.03	7.08	0.31	0.01	3.52	0.09	3.39	0.09
Townsville	154.54	None	0.90	None	10.06	None	9.70	None

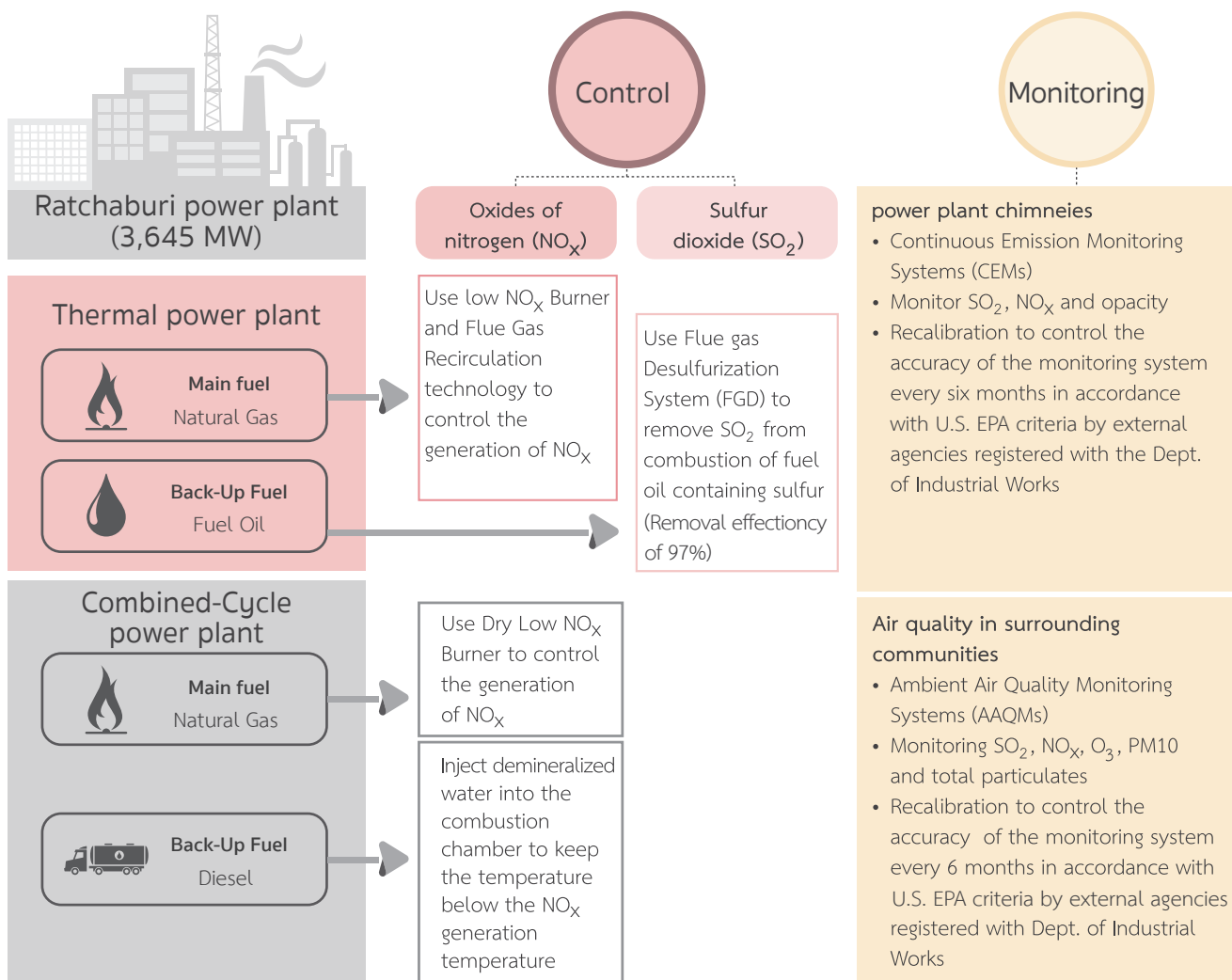
Remark: concentrations of emissions in the stack emission vary with load.

Air Quality Management Ratchaburi Power Plant

Air quality management of power plants has been accepted by communities and regulatory authorities throughout the past 17 years. This is because of the design and installation of the plants with air quality control systems to eliminate pollutants from combustion emission. Control systems include the Flue Gas Desulfurization System (FGD) for sulfur removal, Dry Low NO_x Fuel Combustion System and Low NO_x Burner to control nitrogen oxides from combustion in case of using natural gas as fuel and the mineral water injection system to control oxide in case of using diesel.

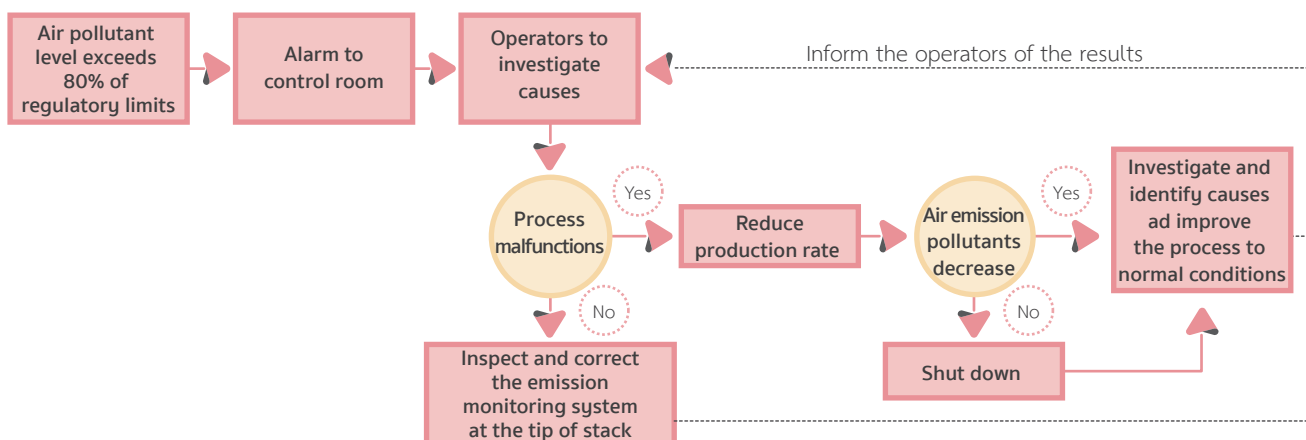
In addition, the power plant has installed air quality monitoring systems at the end of the chimney of all power plants to monitor the efficiency of air pollution control systems. It was to ensure that emission released into the atmosphere are within the legal limits and do not pose any adversary affect the communities. Air emission measurements were reported online to the plant's control room and the Pollution Control Department simultaneously.

To boost confidence among the communities, the power plants also installed a continuous air quality monitoring stations to monitor the potential impacts of air emission on the community. The air quality parameters were measured seasonally in both upwind and downwind of the communities in accordance with the requirements stipulated in EIA reports.



If air quality measurement from the end of the chimney is close to 80% of the limits, Ratchaburi power plant has a procedure and guidelines to reduce the pollutant back to the normal operating level, as shown in the diagram below.

Schematic Diagram Regarding Management of Abnormal Level of Pollutants in Air Emission



Water Quality in 2017

The table below shows the average water quality in 2017 discharged from Ratchaburi power plant (RGCO), Tri Energy power plant (TECO) and Nava Nakorn power plant (NNEG)

Parameter	RGCO & RPCL*	TECO	NNEG	Unit	Standard limit by Royal Irrigation Dept.	Standard limit by Ministry of Industry
Temperature	31.00	31.20	30.10	Degree Celsius	≤33 (Ratchaburi power plant only) ≤40 for general cases	≤ 40
pH	8.00	7.63	7.70	-	6.5-8.5	5.5-9.0
BOD	3.00	2.33	3.20	mg/l	≤20	≤ 20
COD	35.00	45.83	No monitoring	mg/l	≤100	≤ 120
Total dissolved solids (TDS)	686.00	1,196.50	218.00	mg/l	≤ 1,300	≤ 3,000
Conductivity	1,074.00	1,598.00	No monitoring	µS/cm	≤2,000	Not established

Remark: BOD (Biochemical Oxygen Demand) refers to the amount of oxygen required for organic degradation in water.

COD (Chemical Oxygen Demand) refers to the amount of oxygen required for inorganic degradation in water.

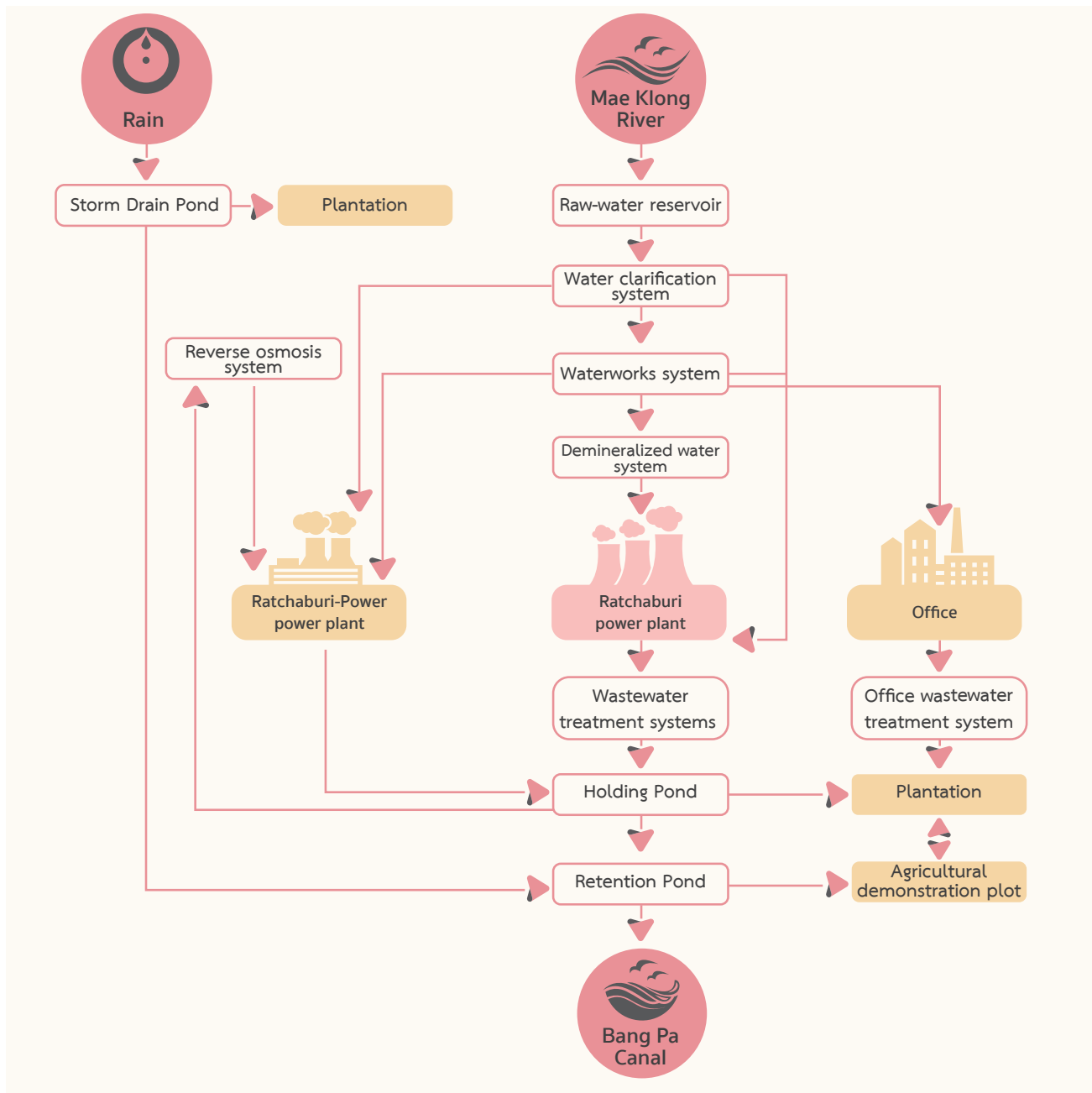
TDS (Total Dissolved Solids) refers to the amount of total dissolved solids in water.

- The Royal Irrigation Department, according to Order No.73/2011, Prevention and Correction of Lower-Quality Drainage through Irrigation Water and Water Connected to Irrigation Water in Irrigation Areas.
- Standard Ministry of Industry according to Notification No.2 (1996) issued under the Factory Act (1992), regarding the characteristics of waste water discharged from factories.

* Effluent quality of Ratchaburi power plant (RGCO) and Ratchaburi power plant (RPCL)

Water Quality Management at Ratchaburi Power Plant

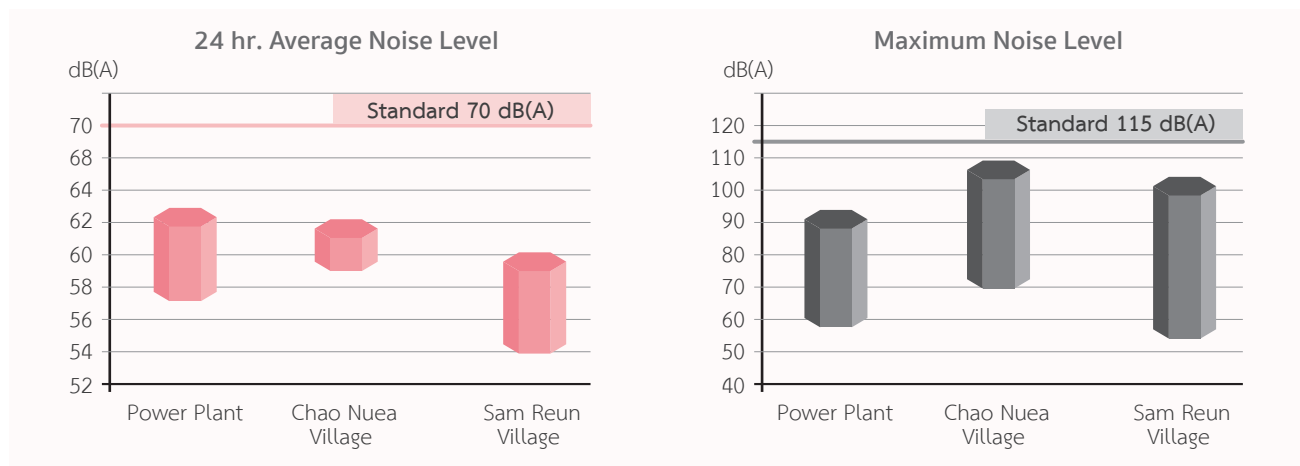
Ratchaburi power plant is the main asset of RATCH with a capacity of 3,645 MW. It uses raw water from the Mae Klong River in its processes. In addition, it supplied raw water to the Ratchaburi-Power power plant, whose capacity is 1,490 MW. The wastewater from both plants are treated and discharged into a public canal. The water quality management of Ratchaburi power plant is shown in the following diagram.



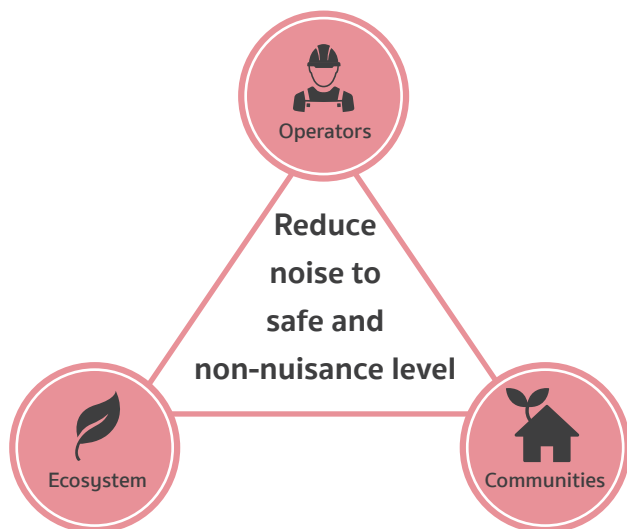
Wastewater is divided into two types: 1) Waste water from production processes 2) Domestic waste water from office buildings. Waste water generated from production processes is treated by a water treatment system, based on specific types of waste water. After treatment, treated water flows to a Holding pond and Retention pond for particulates to settle themselves and cool down to the natural temperature level before discharge. Most of the wastewater is generated from the cooling system, which is 38-42 °C. Therefore it needs adjustment to the natural temperature to protect the living environment of the organisms, plants and animals in the water, including the overall ecosystem. Ratchaburi power plant obtains a permit to discharge treated water at a temperature not exceeding 33° C into the irrigation canal. In summer with high temperatures, the power plant circulates water in the drainage system until the water reaches the required temperature. Then the drainage system is opened and discharges water into the natural water body.

Noise Impact Monitoring in 2017

Each quarter, Ratchaburi power plant has conducted 24-hour average noise level and maximum noise levels monitoring. In the power plant and two community areas, it is found that all noise levels did not exceed 70 and 115 decibels (A) limits respectively, set by the National Environment Board.



Management of Noise Impacts at Ratchaburi Power Plant



Ratchaburi power plant has taken actions to mitigate potential noise impacts on operators and communities by installing noise control and noise reduction measures and equipment. By designing and locating power plants, those noise-producing instruments were located in the center of the project area, creating a buffer zone between power plants and communities in all directions to the north, the village of Don Pho. Tambon Ban Sing: to the east and north, the village Ban Chao Nuea, Tambon Ban Rai, to the west, a 350-rai of empty land area and adjacent to a farm. The nearest community is located in the west, to the namely Ban Sam Ruen. The preventive and mitigation measures are as follows:



Symbol of Noise monitoring location
 ① Location of Ban Sam Ruen
 ② Location of Ban Chao Nuea
 ③ Location of Ratchaburi power plant
 □ Project location

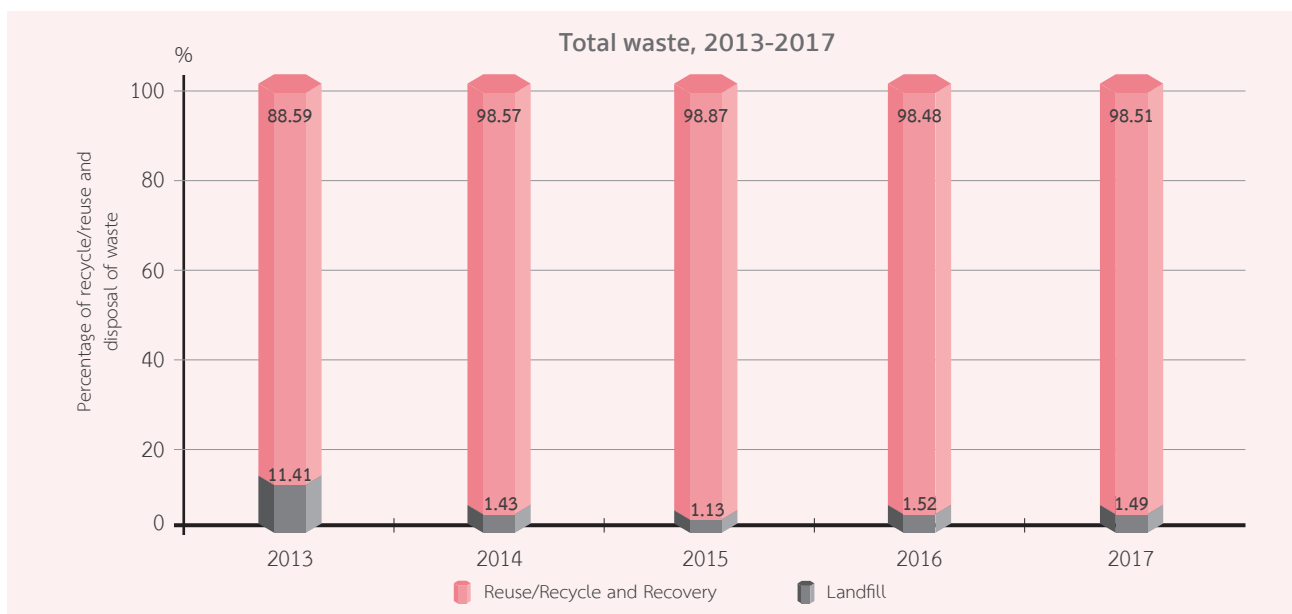
- Source of noise: power plant**
 - Built noise control room or chamber for specific equipment and machines
 - Installed noise absorption at sources
- Path of noise**
 - Established a buffer zone between power plants and communities
 - Built a green belt as a sound barrier around power plants
- Noise receiver**
 - Provision of personal protective equipment (PPE) such as ear plugs and ear muffs to the workforce.
 - Install warning signs and require the workforce to wear protective ear before working in high-noise areas.

- Minimum reduction of noise at sources not exceeding 85 dBA at 1-meter radius.
- Distance to reduce noise level.
- Safe noise levels for operators
 - No noise disturbance to communities

Waste Management in 2017

This year Ratchaburi power plant, Tri Energy power plant and Nava Nakorn power plant managed the following total quantities of waste:

Type of waste Management methods	Hazardous waste (1,021.36 tons)		Non-hazardous waste (5,817.86 tons)	
	Quantity (tons)	%	Quantity (tons)	%
1) Reuse	11.03	1.10	0	-
2) Recycle	17.61	1.70	5,300.97	91.10
3) Recovery (including energy recovery)	967.30	94.70	440.49	7.60
4) Landfill	25.43	2.50	76.40	1.30



Ratchaburi Power Plant's Waste Management Approach

The power plant has adopted the 3Rs principle to reduce the impacts of waste released into the environment by raising the awareness and implementation of control measures to reduce waste generation from its processes and from its offices. A campaign showed the impacts of wasteful use of resources. Such practice generates waste which needed to be landfilled, resulting in the contamination of soil, water, plants, animals and finally entry into the human food chain.

Waste generated from the processes, including operation, maintenance and offices, are segregated to either hazardous waste or non-hazardous waste. Each type of waste is stored in the storage building designed to prevent chemical reactions, leak to the environment and ensure the emergency response plan, devices and tools are available in case of spills or fires.



Operators follow waste management and safety practices to protect themselves and the environment during waste collection, storage, transportation and disposal, especially to prevent contamination to soil and water.

With regard to transportation and disposal of waste, RATCH adheres to the requirements stipulated by the Notification of the Ministry of Industry of 2005 on the disposal of waste or used materials. RATCH assigns specific personnel and supervisors to operate and control its waste management system. They are to submit a report to the Department of Industrial Works every year. They also ensured an emergency response plan and equipment are available in case of leaks and fires.

Waste Management Elements



Pollution prevention system Controller (waste)



Pollution control system operators



Emergency prevention and response plan in case of spills or fires.


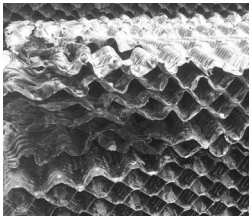
General non-hazardous waste is segregated for recycling or disposal. It is sold to the licensed waste management contractor for reuse and recycling. RATCH has implemented the Recycling Bank Project since 2005 to enhance awareness and understanding of waste segregation and collection practices. It helps reduce the quantity of waste that needs to be disposed of by landfill and promotes recycling and reuse of waste so that it reduces the use of natural resources.

Ratchaburi Power Plant's Waste Management

Source of waste	Type of main waste	Waste classification		Management method
		Non-hazardous	Hazardous	
Process waste	Waste generated from processes, for example fiber glass, wood and cardboard package from operation and maintenance	✓		<ul style="list-style-type: none"> Dispose of in accordance with the Ministry of Industry Notification Track recycling with the Non-Hazardous Waste Manifest System
	Waste generated from processes, for example used oil, insulation from operation and maintenance		✓	<ul style="list-style-type: none"> Dispose of in accordance with the Ministry of Industry Notification Tracked recycling with the by Hazardous Waste Manifest System
	Gypsum generated from Fuel Gas Desulfurization system	✓		<ul style="list-style-type: none"> Store in a gypsum pond lined with HDPE sheet for further selling to other users as raw materials such as cement producers Monitor underground water quality every six months and report to the Office of Natural Resources and Environment Policy and Planning
	Sediment generated by water clarification system	✓		<ul style="list-style-type: none"> Use for watering plants around power plants Encourage communities' use for agricultural purposes
Office waste	General office waste	✓		<ul style="list-style-type: none"> Segregated to the plant's Recycling Bank for further recycling processes by contractors Those non-recyclables were shipped for final sanitary disposal
	Hazardous waste generated in offices		✓	<ul style="list-style-type: none"> Collected and tracked with the Hazardous Waste Manifest System for landfill

Monitoring and Auditing of Waste Disposal Contractors

In addition to compliance with the Notification of the Ministry of Industry 2005 regarding the Disposal of Waste or Un-used Materials, Ratchaburi power plant monitored and audited the operations of two contractors that received waste. The first was a contractor who received and recycled Fill Packs containing expired materials from cooling systems. The second was a contractor who purchased gypsum generated by the sulfur dioxide removal process for its use as a raw material for cement production. The total quantity of waste was 6,023 tons, which accounted for 88% of the total waste generated.

Picture	Waste name	Disposal contractor	Usage	Quantity used
	Gypsum generated from sulfur dioxide removal system	Siam Gypsum Industry (Songkhla) to produce gypsum mixed concrete product	<ul style="list-style-type: none"> Gypsum used for gypsum board production 	<ul style="list-style-type: none"> 5,751 tons (2017) 11,052 tons (2016-17)
	Plastic debris from the mist eliminator of gas turbines (Fill Pack)	Permsap Co.,Ltd. to segregate unused non-hazardous materials for further reprocessing to produce plywood, plastics, PVC pipes, and linoleum	<ul style="list-style-type: none"> Crush, screen dirt out and grind Quality control for further use as a raw material. 	<ul style="list-style-type: none"> 272 tons (2017) 274 tons (2016-2017)

By monitoring and auditing the operations of the two contractors, it was found that they had operated in accordance with the methods and standards prescribed by the requirements for the treatment and disposal of used materials under Factory Classification No. 106, which is about re-processing for industrial use of unused products or waste.

In addition, Ratchaburi power plant recommended these contractors to improve collection, transportation and storage of waste, including ensuring their personnel to wear Personal Protective Equipment (PPE). On the part of suppliers, their operation is quite completed.

Community Participation in Environmental Monitoring of Ratchaburi Power Plant

To build trust and acceptance by communities, Ratchaburi power plant invited communities to participate in managing and monitoring the environmental quality of power plants. This is implemented through the “Environmental Inspectorate”, which comprises government representatives, civil society and the communities around the power plant.

In addition to participation in environmental quality monitoring with environmental consulting companies, Ratchaburi power plant provided training and hands-on experience regarding biological and chemical water quality measurement, laws and regulations related to water by inviting guest speakers from United Analyst and Engineering Consultants Ltd. Furthermore, Ratchaburi power plant invited six representatives from the public sector and representatives from Environment Agency Region 8 (Ratchaburi) to observe sampling and measurement of wastewater quality and surface water quality at five locations. At this event, Ratchaburi power plant’s environmental officer also provided information on environmental management of the power plant to share accurate information and rupture understanding among Ratchaburi power plant and communities.



Biodiversity Represents Evidence of the Efficiency of RATCH's Environmental Management.

Throughout 2017, Ratchaburi power plant continued mitigating biological impacts and reducing air emissions, wastewater discharge, and noise by engaging in good operations so that it may minimize biological disturbance and restore habitats and watersheds to ensure that the ecosystem was sustained as close as its baseline status (before the development of the project in 1996).



This was the 21st consecutive year that Ratchaburi power plant had monitored biodiversity in the area of the plant by surveying the number, diversity, population distribution, abundance, and status of wildlife during the rainy season (August) and dry season (December). Wildlife survey was conducted into four categories, namely mammals, aves, reptiles, and amphibians.



Mammals



Aves



Reptiles



Amphibians

Regarded as a good bio-indicator of the ecosystem around the power plant and required by EIA approval recommendations, bird survey was conducted in a buffer zone of around a square kilometer around the power plant. This year, 107 species of wildlife were identified.

total 107 species



Mammalians
6 species



Amphibians
9 species



Reptiles
12 species



Aves
80 species

Categorized by status

Wildlife Reservation and Protection Act, B.E. 2535 (1992)

83 Listed Species

- 1) Mammalians: 1 species
- 2) Aves: 77 species
- 3) Reptiles: 5 species

Thailand's Bio-Resources Status 2007 (Conserved)

28 Listed Species

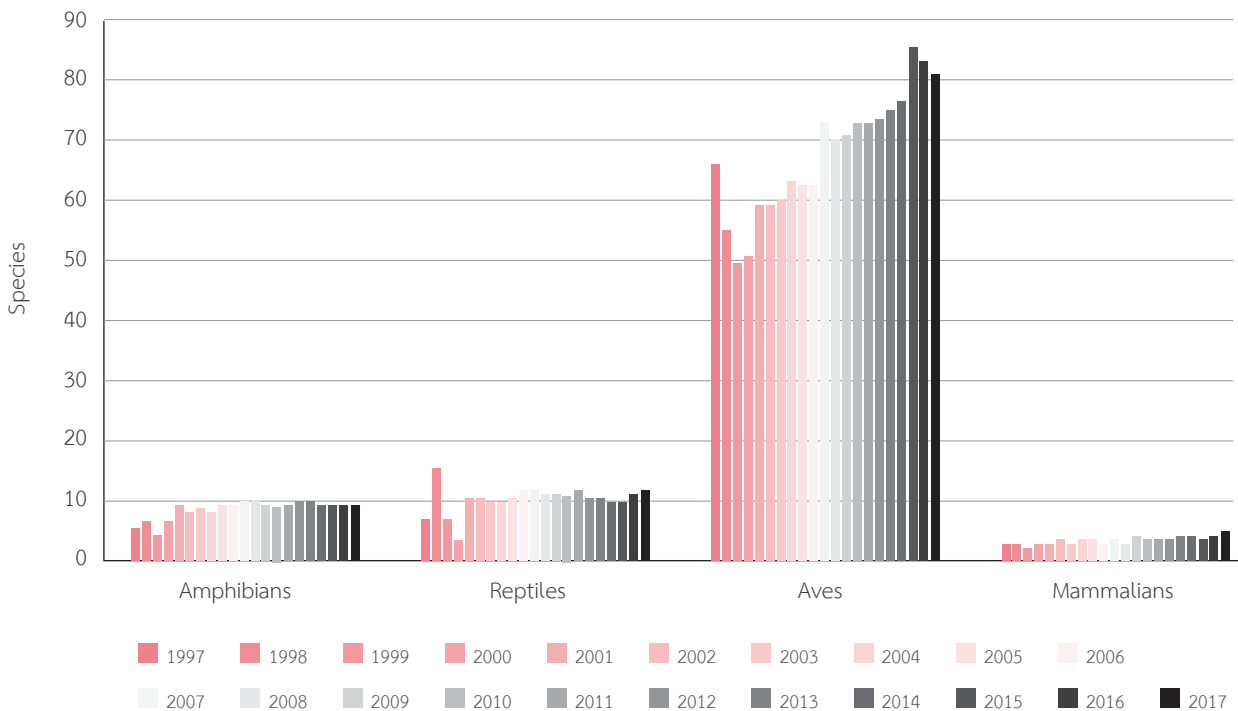
- 1) 1 endangered species: Oriental darter (*Anhinga melanogaster*)
- 2) 4 near-threatened species: Watercock (*Gallicrex cinerea*), Indian shag (*Phalacrocorax fuscicollis*), Streaked Weaver (*Ploceus manyar*), Baya Weaver (*Ploceus philippinus*)
- 3) 2 vulnerable species: Asian Golden Weaver (*Ploceus hypoxanthus*), Purple Heron (*Ardea purpurea*)
- 4) 21 least-concern species

IUCN Red List (2016) (Conserved)

97 Listed Species

2 near-threatened species: Oriental Darter (*Anhinga melanogaster*) and Asian Golden Weaver (*Ploceus hypoxanthus*)

Wildlife Survey Outcomes around Ratchaburi Power Plant, 1997-2017





Four more species of wildlife were found this year: Pied harrier (*Circus melanoleucos*), a migratory bird which was found at the 350-rai agricultural demonstration plot on the right side of the power plant in December 2017, while three other local species, namely Bronzed Drongo, Hair-crested Drongo and Brahminy Kite were spotted at the right and the rear of the plant in both seasons. Moreover, it was reported that Monocled Cobra (*Naja kaouthia*) was found in 2002, 2007, 2008 and 2010. Although decreases of three bird species were reported this year, one reptile and one mammalian were newly found.

The discovery of a number of wildlife for only one or 2-4 years led the difference in the total species of wildlife found each year. Nevertheless, the finding did not indicate the change in wildlife living near the power plant as they were living around the plant's area. Some of loss wildlife could be found in following years. This should depends on many involving factors, such as whether condition, season,

the use of land, quality and volume of food sources, human's disturbance and other relevant factors at the plant and neighboring area.

The findings indicated that wildlife diversity was increasing steadily reflecting that Ratchaburi power plant's operation was carried out along with environmental care. It is clear that since the construction and commercial operations in 2000, Ratchaburi power plant has improved and added much green space that is attractive as an animal habitat. The green area of the plant occupies 472 rai, which accounts for 23.4 % of the total compound.

Since 1997, the Ratchaburi power plant has attracted 174 accumulated species of wildlife. These include 9 species of mammals, 125 species of aves, 28 species of reptiles, and 12 species of amphibians. With 17 years of accrued experience, we will continue striving to sustain our ecological balance over the next 25 years of our operations.



Oriental Darter
(*Anhinga melanogaster*)



Asian Golden Weaver
(*Ploceus hypoxanthus*)



Pied Harrier
(*Circus melanoleucos*)



Achievement in 2017

Greenhouse gas reduction				Greenhouse gas storage
Renewable power generation	Increased production efficiency and reduced energy consumption in power plants	Energy saving in Head office	Promote renewable energy in community	Community forests
= 773,771.37 MWh = 503,818.05 tCO ₂ e	= 42,134.57 MWh = 24,526.53 tCO ₂ e	= 59 MWh = 34.34 tCO ₂ e	= 7.7 tCO ₂ e	= 267,597.92 tCO ₂ e

Thailand has prepared a master plan for climate change to demonstrate its willingness to contribute to the global community in reducing greenhouse gas (GHG) emissions. The master plan clearly defines goals and objectives. In addition, GHG or climate change is about sustainability. It is the goal of sustainable development specified by UN. Thailand has used both as a framework for sustainable development of the country. Goal 12 is about sustainable consumption and production, and Goal 13 is on climate change. Both of them are directly related to GHG management.

The impact of Thailand’s policy and climate change has become a challenge to long-term business operations. RATCH has dedicated its efforts to maximize the benefit of energy and natural resources by managing internal operating processes and encouraging all stakeholders to realize and efficiently use their valuable resources and energy. It is part of RATCH’s social and environmental responsibility to reduce GHG emissions. RATCH’s intention is to mitigate the effects of climate change and extend the use of resources to the next generation. This includes adjusting the internal operational paradigm to embrace and respond to climate change that might affect future business.

An electricity-generating business utilizes a lot of energy sources, especially fossil fuels, including natural gas, fuel oil, diesel and raw water. It also releases air and water pollution into the environment, especially carbon dioxide generated from fossil fuel combustion and related processes.

RATCH strives to reduce GHG emissions from both internal initiatives and in cooperation with government and private sectors. Efforts have been made to implement projects such as Greenhouse Gas Emissions Reduction Program, Greenhouse Gas Storage Project and Carbon Credit and Trading. RATCH has developed comprehensive a GHG inventory as a basis for efficient GHG reduction planning. It reinforces RATCH’s commitment to conducting its businesses with social responsibility and for sustainable development. It also responds to government policy that will drive Thailand into a “Low-Carbon Society”

Recognizing the importance of this subject, RATCH has established a framework for managing GHGs based on the “Embracing Global Climate Change Principle” described in the Code of Conduct. The framework ensures that initiatives, implementation, development activities and projects are in alignment with the principle and the intent.

Code of Conduct

GHG Framework

Recognize issues and impacts of global climate change



- Establish Sustainability Development policy in alignment with Code of Conduct by incorporating global climate change and GHG management.
- Determine targets and indicators for GHG reduction
- Develop GHG inventory (Head Office and power plants)

Reduce GHG emissions by regulating power generation, maximizing efficiency and promoting internal and external energy conservation.



- Increase power generation efficiency
- Implement energy conservation program (Head Office and power plants)
- Implement carbon offsetting, carbon neutral and CDM
- Implement TVETS/TVER , Carbon Footprint (CFO) under TGO
- Implement CSR-after process

Increase GHG storage by supporting forest conservation areas and increase green areas.



- Implement TVER related to forestry
- Green area management in buildings and power plants
- Implement CSR-after process related to forestry

Build knowledge and understanding by stakeholders so that they may contribute to efficient GHG management



- Use green/eco products in the office
- Reduce paper usage and paper waste segregation
- Waste management using the 3Rs principle
- Training and technical visits

Prepare and respond to impacts of climate change to business in the future, including water management, flood protection



- Managing risks from disasters and resource shortage
- Develop Business Continuity Plan
- Develop renewable energy

The framework was reviewed and approved by management for implementation in 2018.

Greenhouse Gas Emissions

In 2017, RATCH's main power plants, namely Ratchaburi, Tri-Energy and NNEG power plant released 7,888,154 tCO₂e. For Ratchaburi and Tri Energy power plant from 2015 to 2017, the amount of GHG emissions is as follows.

(Calculation based on carbon footprint for organization methodology by TGO)

Power Plant	Power Generation (net) (MWh)			GHG (tons)			GHG generation per power generation (ton/MWh)		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
1) Ratchaburi	15,669,732	17,109,010	13,800,989	7,156,433	7,584,010	5,679,603	0.4567	0.4433	0.4115
2) Tri Energy	3,515,689	3,118,851	4,465,487	1,458,142	1,290,819	1,807,044	0.4148	0.4139	0.4047

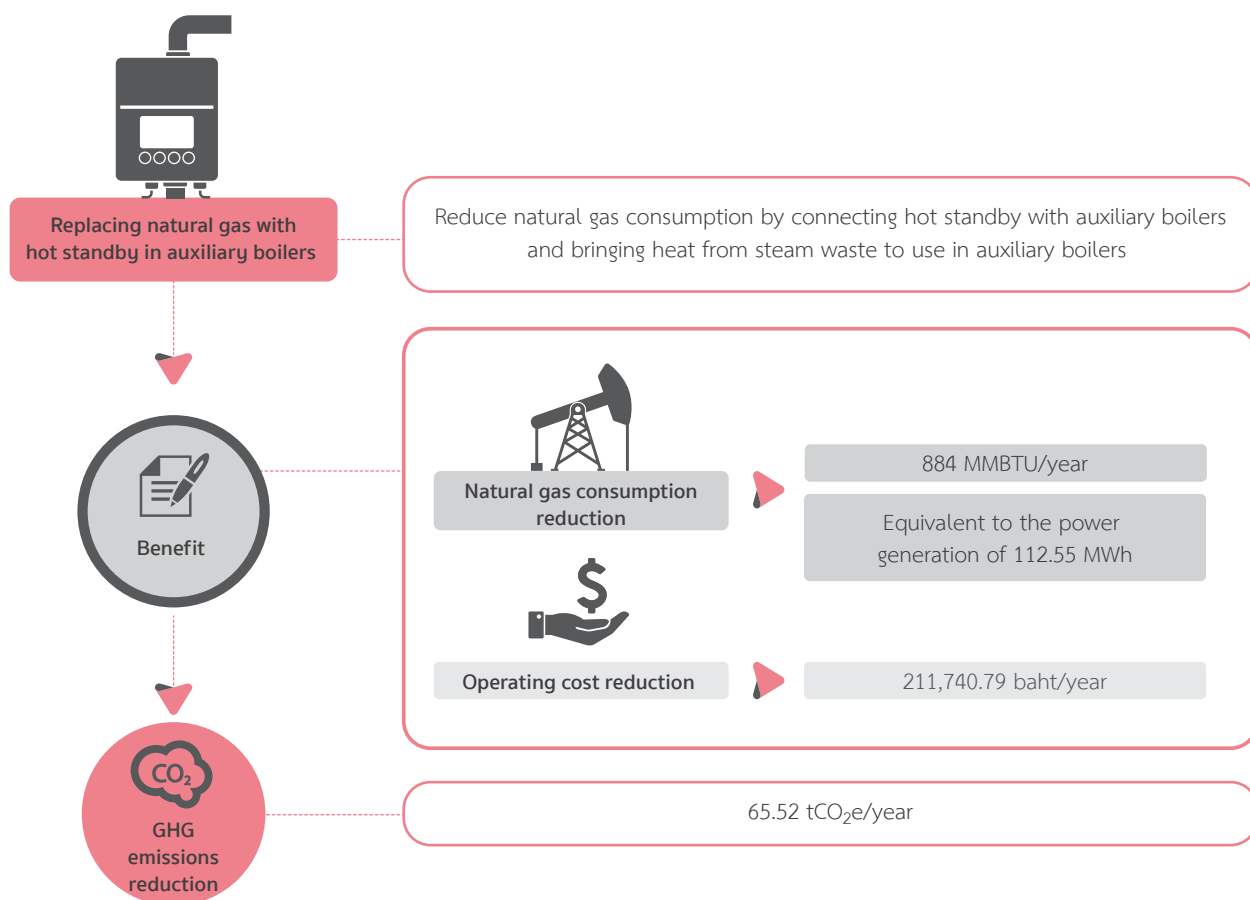
Greenhouse Gas Reduction Approach

With the power plants being the main sources of GHG emissions, RATCH focuses on reducing GHGs in power plants by increasing power generation efficiency and reducing process energy and office building consumption. In addition, RATCH has expanded this idea to communities by promoting participation in reducing GHG emissions.

Improving Power Plant Efficiency to Reduce GHG Emissions

Using Hot Standby Steam in Auxiliary Boilers instead of Natural Gas ... NNEG Power Plant

NNEG power plant with an equity capacity of 55.65 MW started commercial operation in 2015. It has reduced fuel consumption by replacing natural gas with hot standby steam in the boiling water of auxiliary boilers. In 2017, the boiler was connected to the auxiliary boilers to heat the boilers.



Energy-Saving Projects

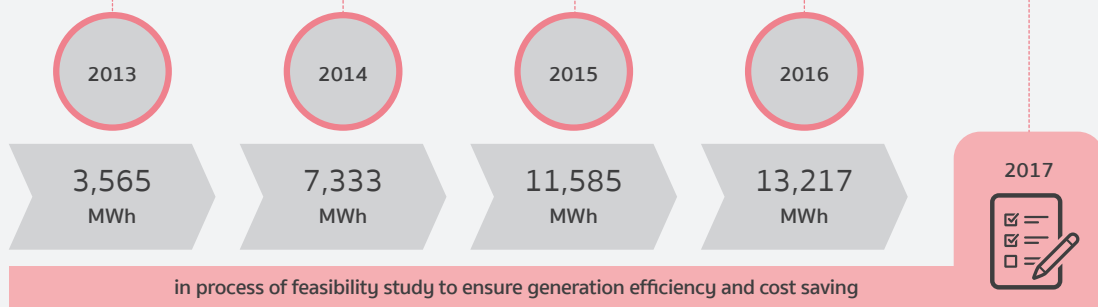
Energy Consumption Reduction Program: Ratchaburi Power Plant

Throughout 2017, Ratchaburi power plant continuously implemented energy-saving measures. The program, driven by Energy Management Working Group which comprised Ratchaburi Electricity Generating Co., Ltd., and EGAT's Ratchaburi Operation and Maintenance Unit, aimed to reduce energy consumption to meet the goal described in the five-year energy conservation program (2013-2017). The goal is to reduce no less than cumulative 20,941 MWh at the end of the 2017 with 2011 as a base year.

In 2017, Ratchaburi power plant conducted a feasibility study for four projects of enhancing generation efficiency or energy reduction, scheduled to implement by 2018.



Results of the efforts to forge awareness of energy conservation and energy saving device usage



Energy Efficiency Projects that are during feasibility study	Expected Outcome		Starting Year
	Electricity Reduction (MWh/Year)	Cost Saving (Baht/Year)	
Change of Air Handling Unit (AHU) to Variable Refrigerant Flow (VRF) in FGD building	467.00	1,410,000	2018
Additional installation of Water Chiller Unit for supporting the stability of AIR Compressor	16,096.50	48,289,500	2018
Change of 1,000-Watt High Bay lamp to be 500-Watt High Bay Lamp (LED)	536.11	Electricity fee 1,635,141 Maintenance fee 1,410,000	2018
A 2-MW floating solar farm on a reservoir at the plant	4,380.00	16,640,000	2018

If four projects that are now in the process of study by Ratchaburi power plant become effective, they will help reduce energy consumption by 21,479.16 MWh, thus leading to the accumulating electricity reduction (during 2013-2018) of 34,696.16 MWh, higher than the five-year target of 20,941 MWh.

Energy Consumption Reduction Project: Tri-Energy Power Plant

In 2017 Tri-Energy power plant had a target to reduce 25 MWh through the implementation of three projects. This effort has reduced 953.68 MWh of electricity consumption 3,495,768 baht of operating cost and 555.14 tCO₂e.

Energy Consumption Reduction Project: Tri-Energy power plant (2017)

Project	Energy consumption reduction (MWh)	Operating cost reduction (Baht)	GHG emission reduction (tCO ₂ e)
Shut down ventilation fans in the Generation Building	773.45	2,707,068	450.22
Shut down space heaters of gas turbines (while operating)	136.08	476,250	79.21
Replace HPS type of lighting of road and warehouse with LED type	44.15	312,450	25.70
Total	953.68	3,495,768	555.14

Energy Consumption Reduction: NNEG Power Plant (2017)

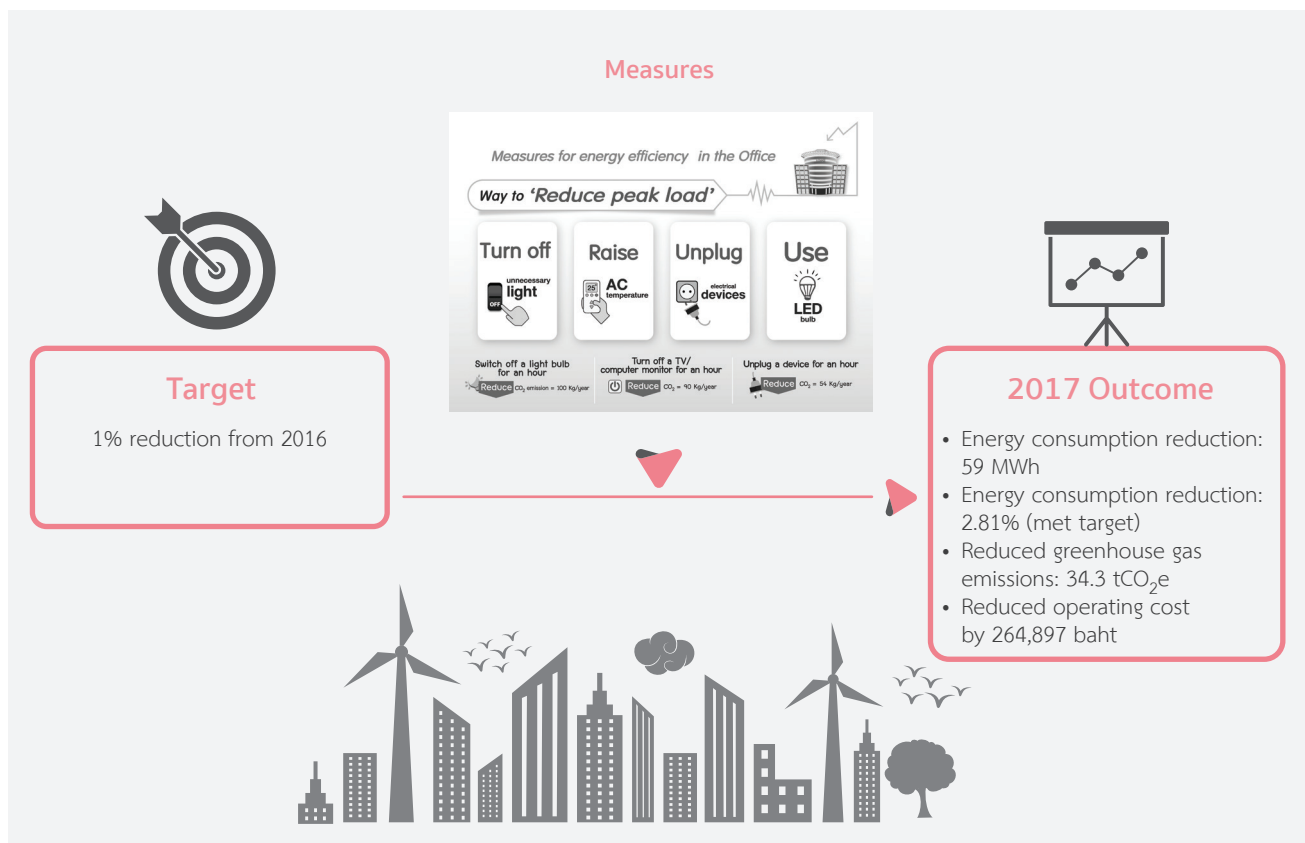
In 2017, NNEG power plant reduced electricity consumption by 123.81 MWh. This effort also resulted in operating cost reduction of 417,164.32 baht and reduction of 72.07 tCO₂e.

Energy Consumption Reduction Project: NNEG power plant (2017)

Project	Energy consumption reduction (MWh)	Operating cost reduction (Baht)	GHG emission reduction (tCO ₂ e)
Energy consumption reduction of electric chillers in gas turbine	123.81	417,164.32	72.07

Energy-Saving Measures: Head Office

The Head Office energy saving campaign aims to reduce energy consumption by focusing on reducing the peak load of electricity with four measures by turning off unnecessary power, adjusting the temperature of air-conditioners by 1 degree Celsius, unplugging power cords when not in use, and replacing power-saving devices to reduce power consumption during the peak load. The results are as follows:

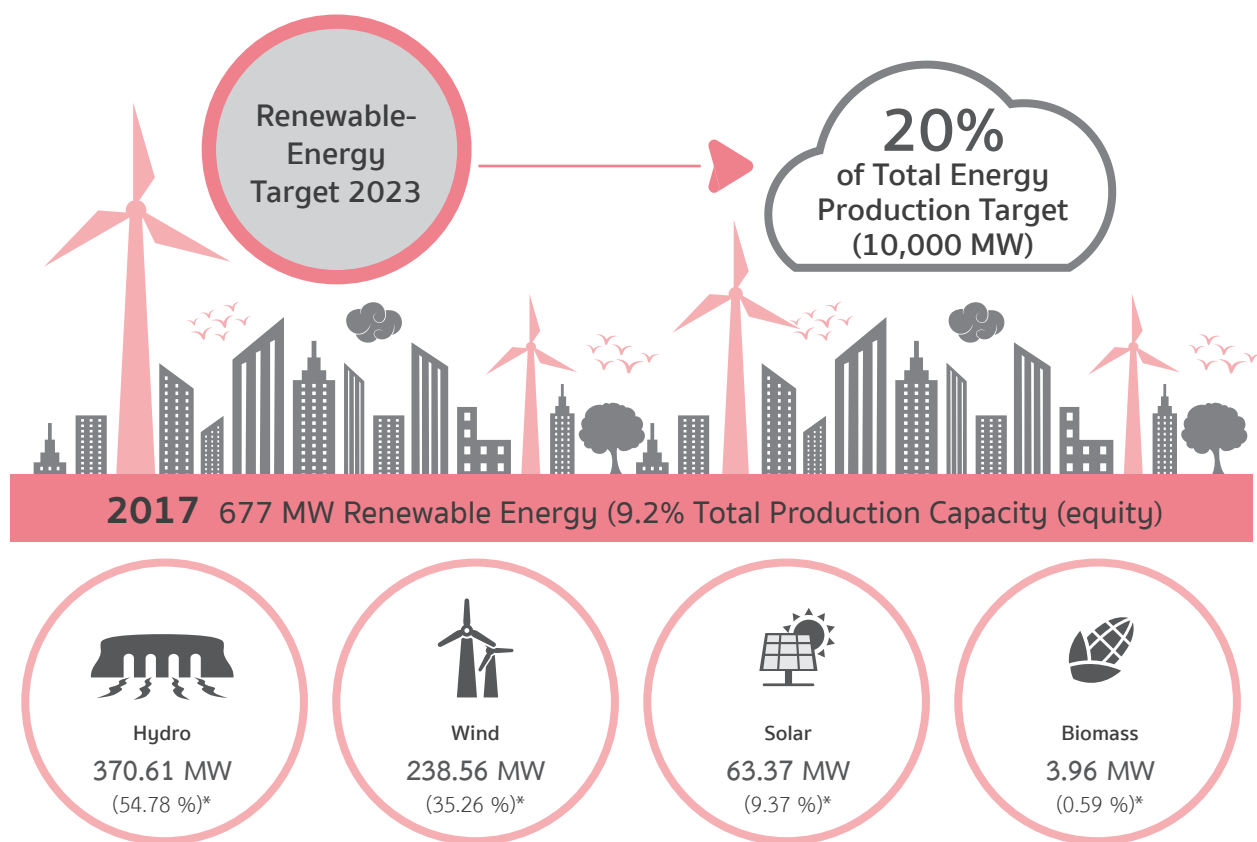


Greenhouse Gas Reduction with Renewable Energy

Development of Renewable Energy for Power Generation

According to its business strategies, RATCH plans to develop renewable energy sources to generate up to 20% of its 10,000 MW in 2023. Apart from business expectation, the benefit to the environment is reduction of GHG emissions. Therefore, it reduces the impact of global climate change. This is in alignment with Goal 13 of the Sustainable Development (SDGs) as well.

RATCH's renewable energy development partially helped reduce the consumption of fossil fuel in power generation for Thailand. The GHG reduction depends on the power generation volume specified in PPA. In 2017, RATCH's share of renewable energy investment was 677 MW from wind, solar, hydro and biomass energy in Thailand, Lao PDR and Australia. This represented 9.2% of RATCH's total equity capacity of 7,380 MW.



Remark: * of the total renewable capacity

2017 Total greenhouse gas reduction by renewable source generation

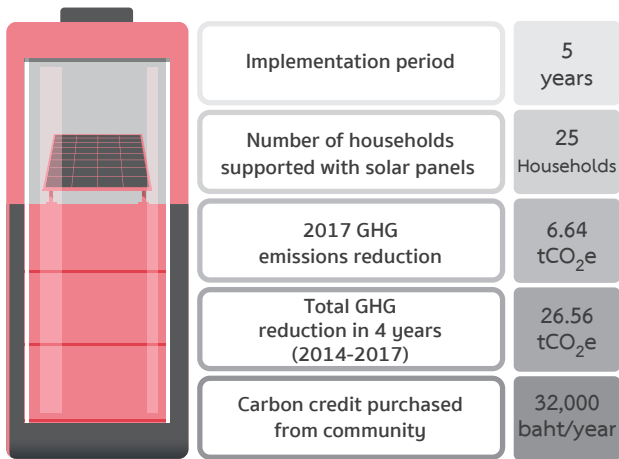
Country	Power generation (equity) (MWh)	GHG reduction (tCO ₂ e)
Thailand	145,167.14	84,501.79
Australia	119,868.75	123,181.34
Lao PDR*	508,735.48	296,134.92
Total	773,771.37	503,818.05

Remark: * Excluding EDL-Gen generation

Promotion of Community Renewable Energy

Ban Hua Ha Community Solar Energy Project, Amphoe Khun Yuam, Mae Hong Son

This project is a collaboration between RATCH and the Foundation of Thailand Environment Institute, implemented during 2014-2017 to improve the life quality of community by installing solar panels for 25 households. Usage of solar energy reduced carbon dioxide generated from burning wood and tree-felling.



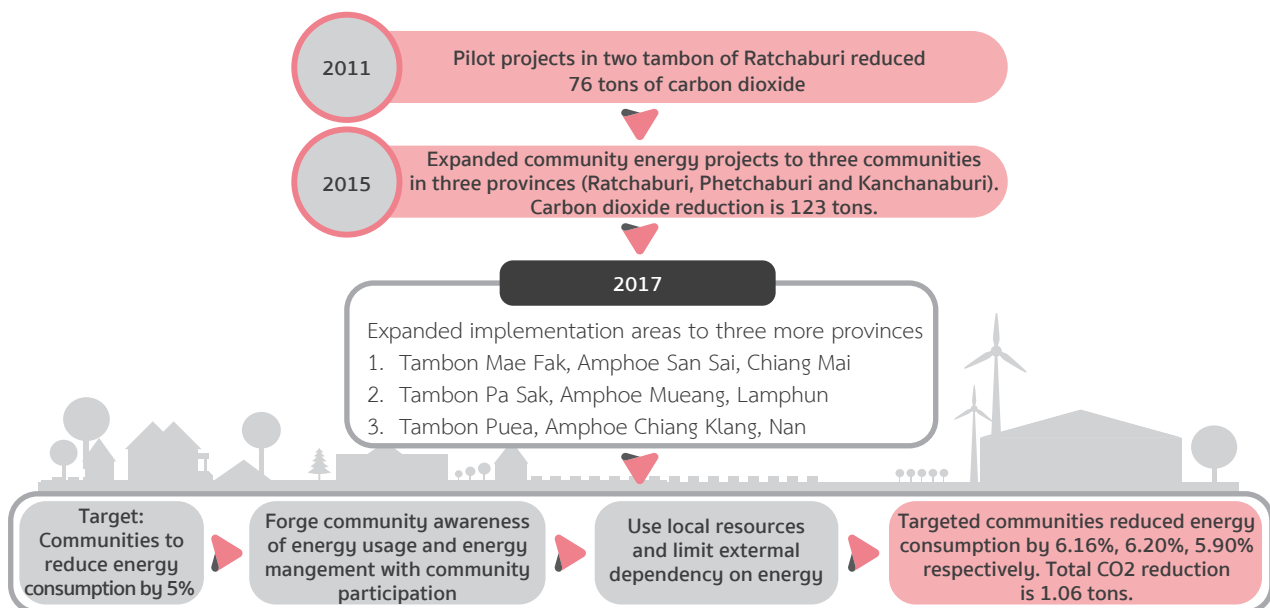
Throughout the project period, RATCH purchased carbon credits certified by Thai Voluntary Emission Reduction (T-VER), which is a voluntary carbon credit scheme under Thailand Greenhouse Gas Management Organization (Public Organization) (TGO) to provide communities with a fund to maintain the power system continuously and effectively.

Community Energy Projects

RATCH together with the Provincial Energy Office has promoted and expanded community energy projects continually since 2011 by initiating projects in two tambon of Ratchaburi and three tambon in Ratchaburi, Phetchaburi and Kancharaburi. Last year the project expanded to three other areas in Chiang Mai, Lamphun and Nan.

This project supports communities' learning and evaluating their own energy usage. It generates awareness of the amount of energy used and the costs of relying on external energy sources that may not necessarily based on real needs. In addition, the project brought in communities from different areas to learn, share and inspire among themselves on the energy consumption reduction of their communities and households.

The company planned to give technology and equipment supports based on the established work plan. This year, people was equipped with energy-related knowledge for forging understanding, with study visit for the community, thus allowing them to apply knowledge in their daily life. Meanwhile, it aims to achieve the energy cost saving goal of at least 5%, thanks to the change in energy use by the community, thus leading to the GHG reduction of 1.06 tCO₂e.



Increasing GHG Storage

Community Forest Conservation Promotion

RATCH together with the Royal Forest Department, Ministry of Natural Resources and Environment, has implemented a project entitled “Love the Forest and Community” for 10 consecutive years since 2008. There are three main activities: Forest Contest, Community Forest Leadership Seminar and Forest Youth Camp. RATCH expected to encourage communities to participate in forest management in a sustainable forest model and maintain the forest area as a natural GHG storage.

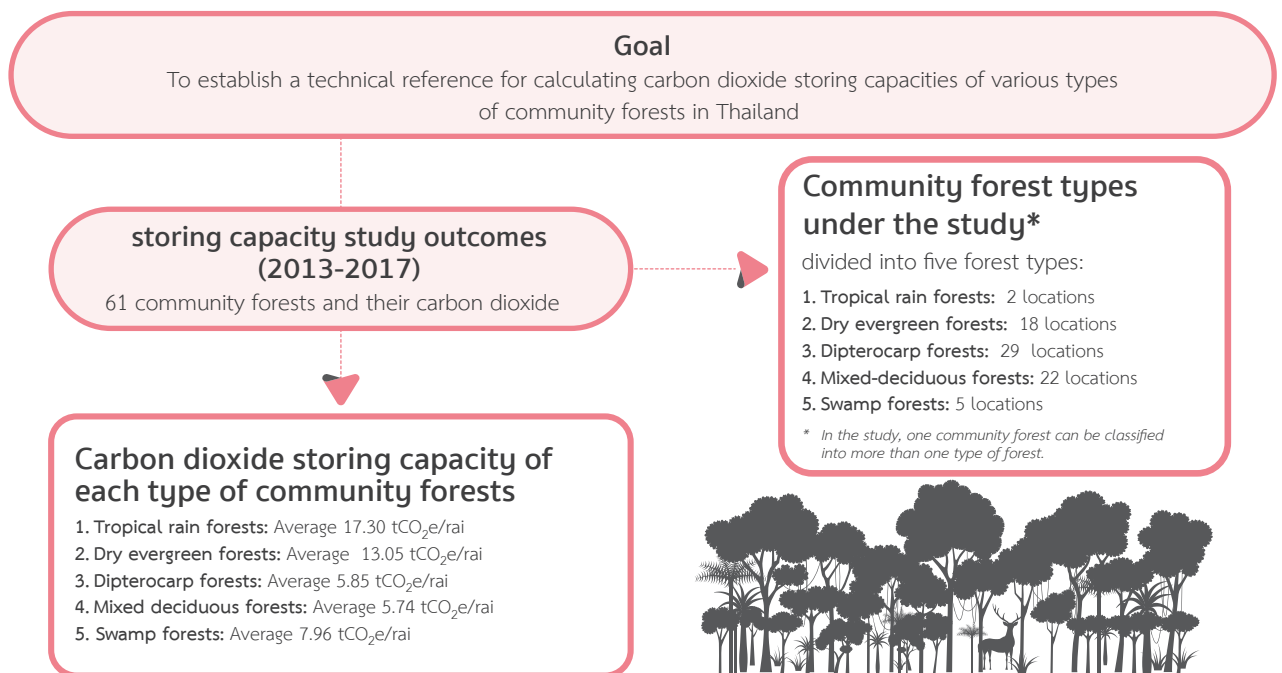
2017 Sponsored community forests: 139 Total area: 133,798.96 rai	Total CO₂ stored: 267,597.92 tons (Carbon dioxide storage capacity = 2 tons/rai/year, Royal Forest Dept.)
Goals <ul style="list-style-type: none"> Establish stewardship of community forests, inspire and expand ideas to other communities Develop community forest leadership and youth forces to sustain community forest conservation. Establish carbon dioxide storage 	Other co-benefits <ul style="list-style-type: none"> Establish community forest leaders and youth networks. Shared knowledge and best practices of community forest among communities Cost reduction and income increase from products generated from community forests Strengthened family and community unity

GHG storage through community forests

Project duration	Number of community forests	Area (rai)	CO ₂ storing capacity* (tCO ₂ e/year)
2017	139	133,798.96	267,597.92
Implementation period (2008-2017)	1,392	1,252,053.42	2,504,106.84

Remark: * Carbon dioxide storing capacity = 2 tons/year (Royal Forest Dept.)

In addition, RATCH has supported the Royal Forest Department to study carbon sequestration and biodiversity in community forests for five years (2013-2017). Up to date this project studied and assessed the amount of carbon captured and biodiversity in 61 community forests across Thailand. Data were compiled and used as a database of the carbon capture capacity of each type of community forest, including knowledge transfer in tree-planting plot planning, biodiversity and calculation of the amount of carbon sequestration each year. This is beneficial to laying a groundwork for community carbon credit in community forests in the future.



GHG Inventory and Application of Relevant Standards

Carbon Footprint Assessment of Power Plants

Carbon footprint measurement in accordance with TGO’s guidelines is a way to measure and report the emission and offset information of GHGs generated by various activities within an organization. Data are used to identify significant sources of GHG emissions for effective GHG management. The data must also be reviewed and verified for future reference.

Ratchaburi power plant and Tri Energy power plant have been measuring their carbon footprints continuously since 2015. In 2017, the carbon footprint calculation was completed, assessed and certified with limited level of assurance of GHG data Scope 1, Scope 2 by Bureau Veritas (Thailand) Co., Ltd., without any significant error (5%).

Scope 1
Direct emission and recovery of GHGs

- Fuels used in production processes, i.e. natural gas, fuel oil and diesel
- Fuel used in vehicles
- Lime used in sulfur dioxide removal system (Ratchaburi power plant)
- Carbon dioxide used in fire suppression system
- SF₆ and coolant leakages

Scope 2
Indirect emission and recovery of GHGs from energy consumption

- Total energy consumption in the organization

Power Plant	2016 greenhouse gas emission verified in 2017 (tCO ₂ e)	
	Scope 1	Scope 2
Ratchaburi	7,555,977.09	28,028.05
Tri Energy	1,288,019.68	2,581.21

Application of Relevant Standards

Clean Development Mechanism (CDM) Project: Solarta Solar Project

Since 2012, Solarta Co., Ltd., a 49%-owned joint venture company, has developed a project to calculate the reduction of GHG emissions from all eight solar projects with a total capacity of 42.31 MW. The company has registered the project under Clean Development Mechanism (CDM) on October 12, 2012.

Solarta maintains its Gold Standard to increase the value of carbon and considers an appropriate approach and time for verification and certification during the absence of trading because Certified Emission Reduction (CER) prices are not enough incentive. As of January 2018, prices remain about EUR 0.17/tCO₂.

During 2012-2019, all projects can reduce GHG emission by 233,203 tons or 33,315 tCO₂e per year

Disseminating GHG Data

Carbon Disclosure Project (CDP) is a nonprofit organization. It has developed a system to measure, report and disclose environmental information and employ marketing incentives for companies to disclose their environmental information and measures to mitigate environmental impacts.

Ratchaburi power plant, as a pilot power plant, has participated in the disclosure of GHG emissions under Carbon Disclosure Program (CDP) since 2014. As a result, RATCH was fully informed of the current status of Ratchaburi power plant on GHG emissions, resulting in better GHG management.

Adaptation Strategy for Climate Change

In addition to efforts to reduce GHG emissions and promote an increase in GHG storage, power plants also prepared to respond to disasters caused by climate change. It may halt production, especially during drought or floods that directly affect the generation processes.

RATCH has included climate change as an issue of operational risks at the enterprise and project levels. The Risk Management Working Group and the Risk Management Committee monitor the situation and review opportunities and risk impacts at both levels every three months.

Risk	Implementation	Result
Temperature rising	<ul style="list-style-type: none"> Analyze production data to determine impacts of temperature increases on generation efficiency and fuel consumption rates. Ratchaburi power plant to identify methods to reduce air temperatures before feeding into the air inlet filter to increase the capacity of gas turbines. Tri Energy power plant to use a water spray system to reduce ambient air temperature before entering the combustion system. Continue monitoring meteorological data and global climate change 	<p>Minimize probability and impacts on generation processes.</p> <p>power plants to plan for increased production when the temperature is lower instead.</p>
Flood	<ul style="list-style-type: none"> Assess risk and impacts of floods during the rainy season. Design a plant layout to include drainage around the facility. Raise the topography to a higher level than the previous maximum flood level. Regular inspect drainage and bunds around power plants to ensure readiness for use. Develop an emergency manual and plan in case of floods. Provide training regarding responsibilities. Conduct drills and exercises every year. Install a rain gauge system in Ratchaburi power plant for monitoring and advising relevant parties. 	<p>Minimize impacts on production processes</p>
Drought	<p>Ratchaburi Power Plant</p> <ul style="list-style-type: none"> Monitor water consumption rations in Mae Klong Watershed monthly to evaluate impacts on the processes. Improve the water quality control system of Ratchaburi power plant's cooling tower to better water recycling. <p>NNEG Power Plant</p> <ul style="list-style-type: none"> Monitor drought and high-tide situations of Chao Phraya River to assess risks and mitigate impacts of drought and brackish water which affects recycling capacity 	<p>Minimize impacts from drought and water shortage to generation processes.</p>

Research to Increase Generation Efficiency of Ratchaburi Power Plant

As a result of climate change when the average temperature increases, Ratchaburi power plant, EGAT's Ratchaburi power plant Operation and Maintenance Unit, Kasetsart University and Thammasat University teamed up to initiate a research and development project entitled

“Improving Performance of Gas Turbines by Reducing Air Temperature before Feeding into Air Inlet Filter”. The 12-month research period runs from November 16, 2017, until November 15, 2018, with a budget of 195,000 baht.



Challenge:

Ratchaburi power plant's gas turbines cannot produce electricity to the load demanded by National Control Center when the temperature is very warm.



R&D to improve the capability of gas turbines by lowering the air temperature before air inlet filter
Research period: 16 Nov 2017-15 Nov 2018



Objective:

To determine optimal temperature before air inlet filter of gas turbines



Goal:

Increase generation capacity of Ratchaburi power plant's gas turbines to meet monthly contractual capacity



Expected outcomes:

- 1) Increased capacity of gas turbines to meet contractual agreement
- 2) Improve heat rates of power plants to reduce fuel consumption
- 3) Results can be leveraged for further application to EGAT's other power plants.

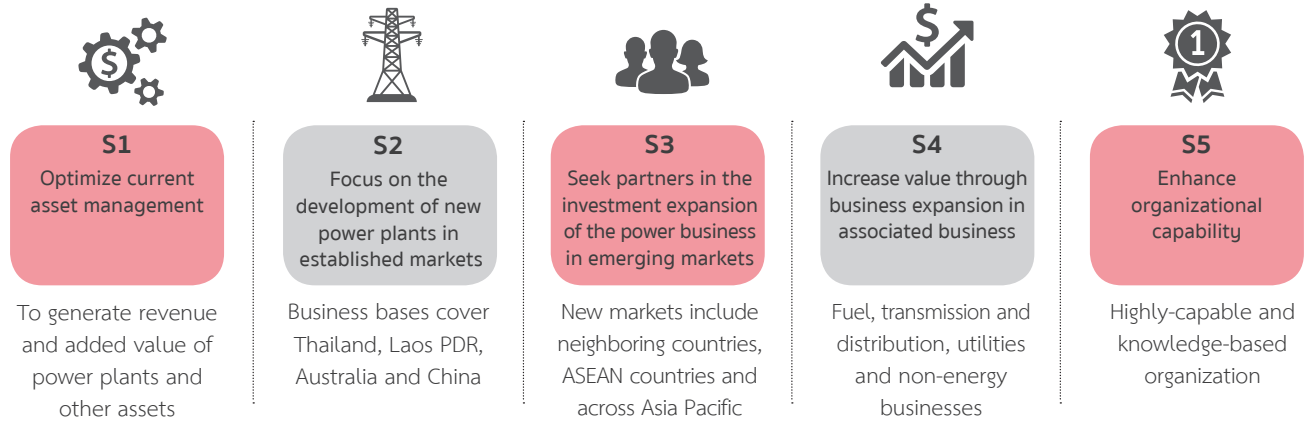


Mitigate impacts from global climate change

Economic Performance

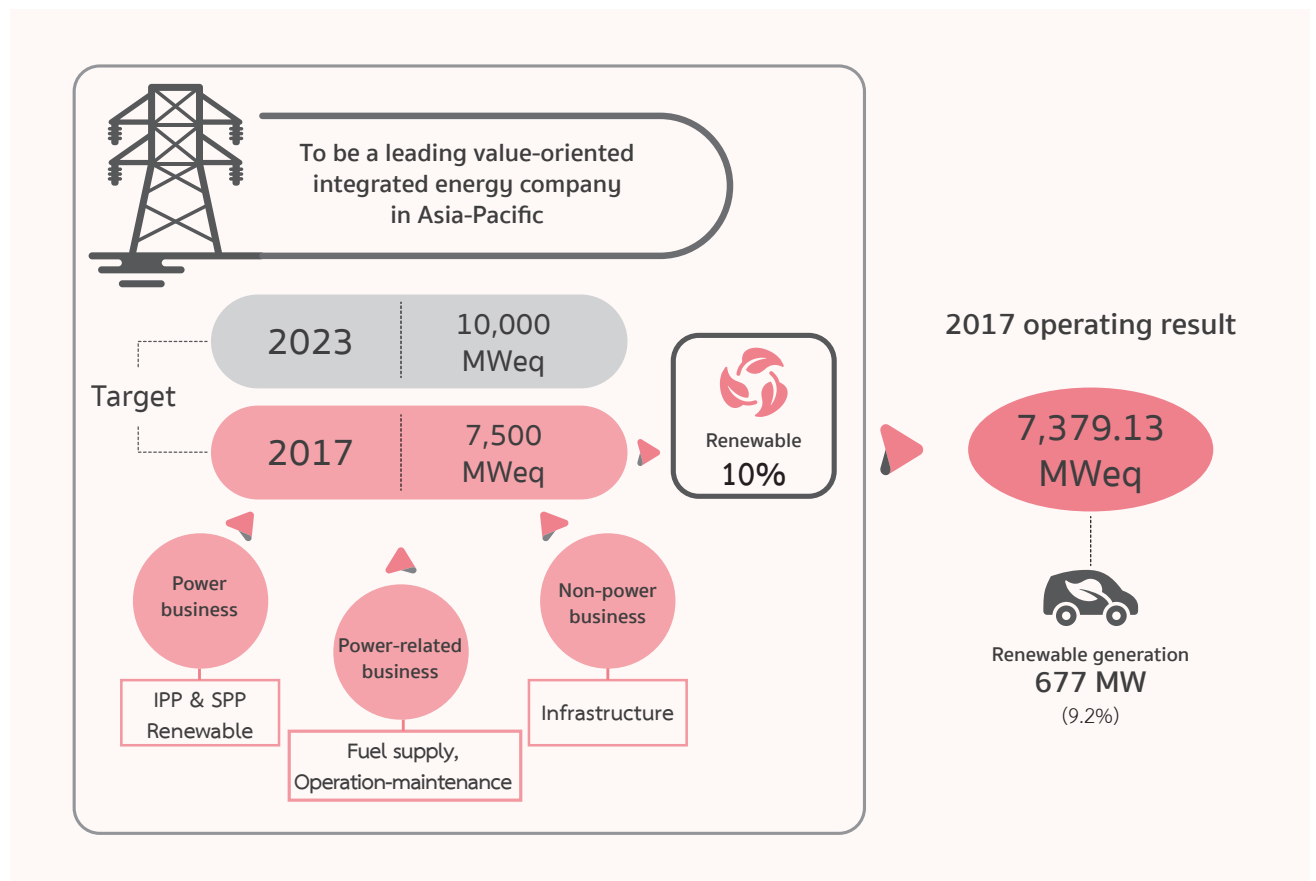
RATCH's business operations in 2017 remained geared towards growing the Company's economic values sustainably and continuously, to achieve the paramount goal which is to be a leading value-oriented integrated energy company in Asia Pacific. RATCH laid down the following 5 strategies to achieve the goal.

Growth Strategies



Growth Target

Guided by long-term strategies, RATCH sets sight to expand the installed capacity to 10,000 MW in 2023; at least 60% in Thailand and at least 40% overseas. Of this, the renewable power generation capacity is targeted at 20% of the installed capacity accordingly to equity participation.

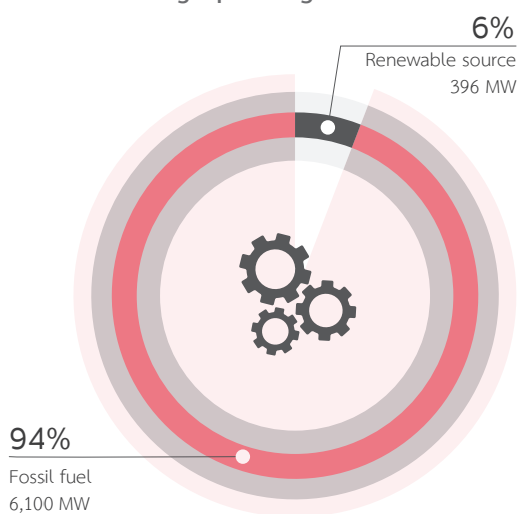


RATCH targeted to grow the installed capacity to 7,500 MW in 2017 and the renewable power generation capacity to 10%. At the end of the year, additional investment raised the total installed capacity to 7,379.13 MW while renewable capacity stayed at 9.2%. The targets could not be achieved because of later-than-expected approvals from relevant regulatory agencies which promptly delayed new investments. However, the decrement will be added to the 2018 target for further implementation.

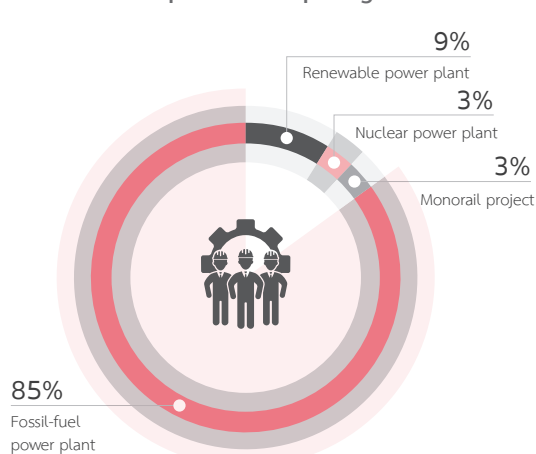
Installed Capacity

In 2017, RATCH's installed equity capacity reached 7,379.13 MW equivalent, including 6,495.51 MW commercially commenced, of which 6,216.71 MW is under power purchase agreements (contractual capacity). The installed equity capacity under development and construction totaled 884 MW equivalent (the Yellow Line and the Pink Line Monorail Projects constitute 191 MW equivalent in generation capacity).

Commercially Operating Plants in 2017



Total Equivalent Capacity in 2017



Total capacity	=	7,379.13	MWeq
Fossil-fuel power plant	=	6,275.63	MW
Renewable power plant	=	676.50	MW
Nuclear power plant	=	236	MW
Monorail project	=	191	MWeq

Adding Value through New Investments

Five investment projects were successfully invested in 2017 with 510.39 MW equivalent in installed equity capacity. All 5 green-field projects were co-invested by local partners who have local market insight and experience in the business.

Country	Project	Project information	Success indicator
Thailand	Pink line monorail	<ul style="list-style-type: none"> The 75:15:10 joint investment by BTS Group Holdings Public Company Limited, Sino-Thai Engineering & Construction Public Company Limited, and RATCH Total investment including land, construction and electrical system costs at 53.790 billion baht To be implemented under PPP Net Cost framework The public sector to finance land rights transfer and subsidize the construction works at the combined sum of no more than 20.135 billion baht. 	<ul style="list-style-type: none"> 2 joint ventures were established: “Northern Bangkok Monorail Company Limited” to operate Pink Line monorail and “Eastern Bangkok Monorail Company Limited” to operate Yellow Line monorail. Northern Bangkok Monorail Company Limited signed concession contract with MRT for the Pink Line Project.

Country	Project	Project information	Success indicator
		<ul style="list-style-type: none"> • Concession period: 33 years and 3 months • Counterparty: Mass Rapid Transit Authority of Thailand (MRT) • Running from Khae Rai to Min Buri with total track length of 34.5 kilometers • Detail: Straddle Monorail to support the main public transport network • 750-volt Direct Current supply is required. • To accommodate 300,000 passengers/hour/trip • Construction period: 3 years and 3 months • Operating period: 30 years • Scheduled completion: 2021 	<ul style="list-style-type: none"> • Eastern Bangkok Monorail Company Limited signed a concession contract with MRT for the Yellow Line Project. • Credit Facility Agreement for Pink Line Project and Yellow Line Project worth 63.360 billion baht was signed. • Construction contract for civil works was signed. • Contract to secure mechanical and electrical elements as well as railcars was signed.
	Yellow line monorail	<ul style="list-style-type: none"> • The 75:15:10 joint investment by BTS Group Holdings Public Company Limited, Sino-Thai Engineering & Construction Public Company Limited, and RATCH • Total investment including land, construction and electrical system costs at 51.810 billion baht • Counterparty: Mass Rapid Transit Authority of Thailand • Running from Lat Phrao to Samrong with total track length of 30.4 kilometers • Detail: Straddle Monorail mass transit system • To be implemented under PPP Net Cost framework • The public sector to finance land rights transfer and subsidize the construction works at the combined sum of no more than 22.354 billion baht. • Concession period: 33 years and 3 months • Construction period: 3 years and 3 months • Operating period: 30 years • Scheduled completion: 2021 	<ul style="list-style-type: none"> • Preparation of construction works
Australia	Mount Emerald wind farm	<ul style="list-style-type: none"> • To be operated by 80%-owned subsidiary, RATCH-Australia Corporation Company Limited • Installed capacity 180.45 MW: RATCH's proportion is 144.36 MW • Located in Queensland • Project value: 380 million Australian dollars • Power purchaser: Ergon Energy Queensland (EEQ) for a 12-year period (2018-2030) • 53 wind turbines with 3-MW capacity each to be installed • Commercial commencement date: September 2018 • To accommodate 75,000 households 	<ul style="list-style-type: none"> • Foundation concreting completed for 44 wind turbines • Installation of wind turbines are underway. To date, the installation of 7 turbines is completed.

Country	Project	Project information	Success indicator
	Collinsville Solar PV power station	<ul style="list-style-type: none"> To be operated by 80%-owned subsidiary, RATCH-Australia Corporation Company Limited To generate power with solar photovoltaic Project Value: 95 million Australian dollars Government subsidy: 9.5 million Australian dollars Location: Collinsville coal-fired power plant which is decommissioned, at the center of Queensland Installed capacity: 42.5 MW (RATCH's proportion is 34 MW) 70% of power to be sold to Braemar Power Projects for a 12-year period (2018-2020) and 30% in Australia's National Electricity Market 180,000 solar panels to be installed To accommodate 15,000 households Commercial commencement date: July 2018 	<ul style="list-style-type: none"> Credit facility agreement worth 57 million Australian dollars was signed with Clean Energy Finance Corporation Construction works is underway, 79% completed to date, prior to the installation of solar panels.
Indonesia	Riau Gas-Fired power plant	<ul style="list-style-type: none"> Co-investment with PT Medco Power Indonesia Project type: combined-cycle Main fuel: natural gas Located in Riau province of Sumatra Island Installed capacity: 287.81 MW (RATCH's proportion is 141 MW) Contractual capacity: 275 MW (RATCH's proportion is 135 MW) Power purchaser: Perusahaan Listrik Negara (PLN) Project value: around 300 million US dollars Generation capacity: approximately 1,446 million KWh per year Commencement date: 2021 	<ul style="list-style-type: none"> 20-year power purchase agreement was signed. PT. Medco Ratch Power Riau was established as a joint venture, owned 49% by RATCH. In the process to buy land for the power plant In the process to secure a loan for the project

Project Construction Management

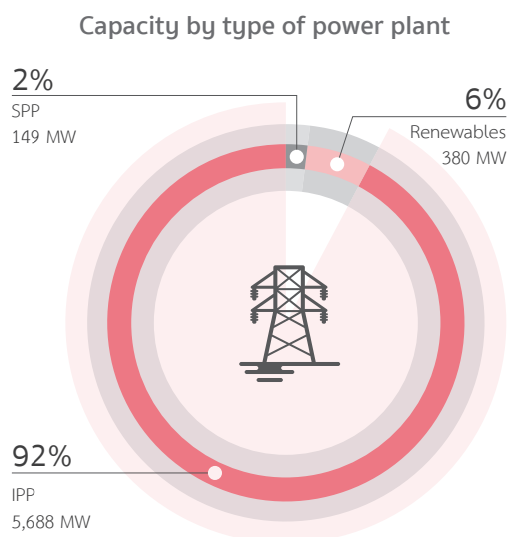
RATCH's main mission is to ensure the construction works progress as planned and the power plants can commence commercial operations as scheduled in power purchase agreements, to generate more revenue and solidify the Company's cash flow. In 2017, 3 power plants were under construction with installed capacity proportional to equity participation at 373.23 MW. The progress is summarized as follows:

Power plant	Progress of key points	Commercial commencement date
Xe-Pian Xe-Namnoy <ul style="list-style-type: none"> Hydroelectric power plant installed capacity: 410 MW (RATCH's proportion is 102.5 MW) Owned 25% by RATCH Location: Attapue and Champasak provinces in Lao PDR Purchaser: Electricity Generating Authority of Thailand and Electricite Du Lao, Lao PDR 	<ul style="list-style-type: none"> Overall construction is 85% completed. Turbines and generators for Unit 1,2 and 3 are installed. The high-voltage transmission lines operating at 230KV, 500KV and a sub-station are constructed. Water is being stored into the reservoir. 	2019

Power plant	Progress of key points	Commercial commencement date
<p>Berkprai cogeneration power plant</p> <ul style="list-style-type: none"> Installed capacity: 99.23 MW (RATCH's proportion is 34.73 MW) 35% owned by RATCH Location: Tambon Berkprai, Banpong district, Ratchaburi. Purchaser: Electricity Generating Authority of Thailand 	<ul style="list-style-type: none"> Feasibility study and environmental impact assessment was approved by the Office of Natural Resources and Environmental Policy and Planning The Engineering, Procurement and Construction contract was signed. The credit facility agreement was signed. All approvals and licenses as required by laws are secured. Construction is underway, progressing as planned. 	2019
<p>Fangchenggang nuclear power plant, Phase II, People's Republic of China</p> <ul style="list-style-type: none"> Installed capacity of 2,360 MW (RATCH's proportion is 236 MW) 10% owned by RATCH Location: Guangxi Autonomous Region 	<ul style="list-style-type: none"> A joint venture is established in China. The construction of generators Unit 3 and Unit 4 is progressing as planned. 	<ul style="list-style-type: none"> Unit 3: 2021 Unit 4: 2012

Asset Management

Power plants remained the assets contributing the biggest revenue to RATCH and fueled RATCH's business growth. The power plants commercially operated in 2017 controlled contractual capacity of 6,216.71 MW. They are categorized as follows;



Revenue structure of the 3 types of power plants in 2017

- IPP = 12,652.61 million baht (83.8%)
- SPP = 452.84 million baht (3.0%)
- Renewable power plants = 1,190.06 million baht (7.9%)

RATCH generated 46.438 billion baht in total revenue in 2017. Excluding income deriving from energy payment, RATCH's total revenue was tuned at 15.094 billion baht.

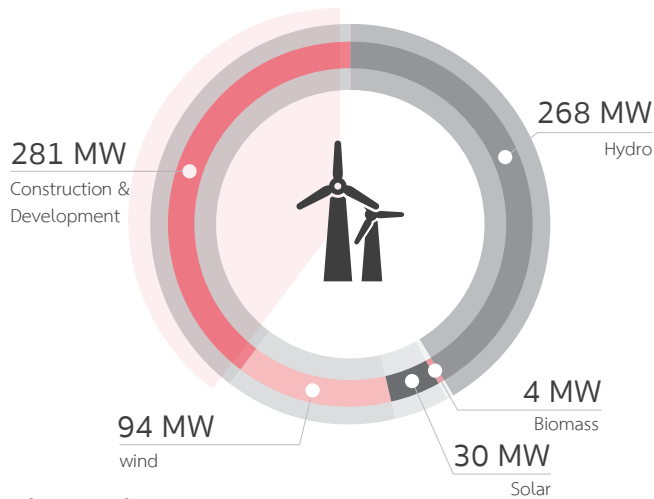
In addition, the company cancelled the joint investment in Iwaki and Ueda solar farms, with the combined capacity of 20.11 MW and sold the shares to the existing shareholder. The divestment was made according to asset management strategy in order to avoid any impact from unexpected progress of the projects. However, the transaction rarely has significance on the company's operation overall.

Renewable Power Development

RATCH aims to grow the number of renewable power plants in line with increasing demand for environmental-friendly energy. While renewable energy offers economic growth opportunity to RATCH, it also contributes environmental and social benefits.

As guided by corporate strategies, RATCH targets to grow renewable power to 20% of 10,000-MW combined installed capacity in 2023, against the 10% target in 2017.

Equity Capacity of Renewables

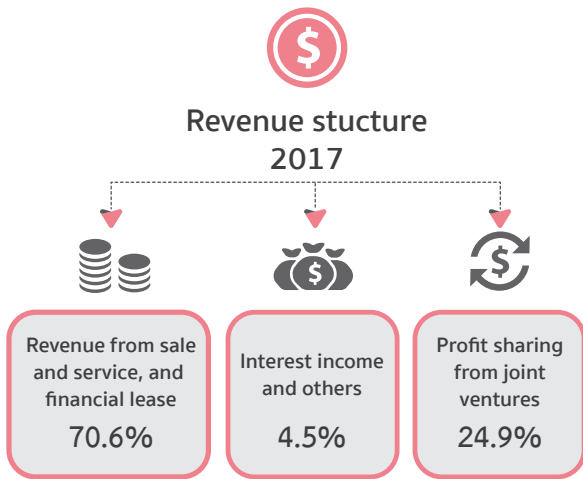


Operating Results in 2017

- Renewable installed capacity reached 676.50 MW or 9.2% of total installed capacity in 2017. The ratio was below target because the projects invested in 2017 were high-capacity fossil fuel power plants, pressuring down the proportion of renewable power. However, RATCH is determined to focus more investment in renewable power in the next year.

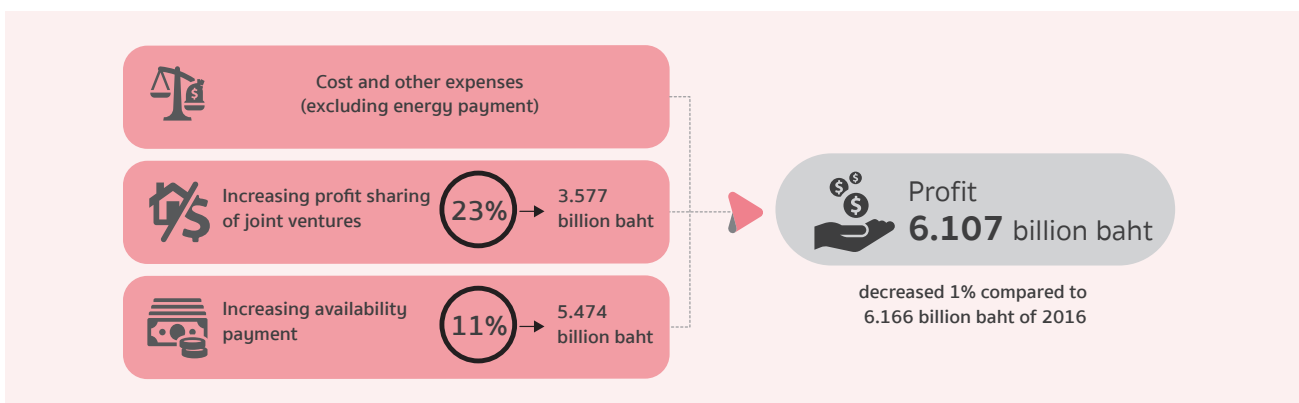
Financial Performance

RATCH generated 46.438 billion baht in total revenue in 2017. Excluding energy payment (which was mostly deducted by energy costs), RATCH’s total revenue was tuned at 15.094 billion baht. The revenue structure and ratio is as follows:



RATCH registered 6.107 billion baht in 2017 net profit, down by 1% from the previous year because of increasing cost and expenses. Expenses increased partially due to the planned outage of Ratchaburi and Tri Energy power plants, a principal asset of the company.

However, the share of profit of associates and joint ventures jumped significantly by 23%, chiefly because of Hongsa power plant’s improved generating efficiency and an 11% increase in availability payment income of Ratchaburi and Tri Energy power plants.



Economic Value in 2017

RATCH's economic performance in 2017 contributed positive impacts on the Company and stakeholders and constantly supported the supply chain.

Item	Value (million baht)
Economic Value	
Revenues from sales and services	38,000.52
Share of profit of joint ventures	3,577.16
Interest receivables	165.96
Dividend receivables	188.90
Economic value distributed to stakeholders	
Energy Payment	31,041.95
Operation and maintenance service fee	1,558.26
Cost of power plants' parts and equipment	1,917.08
Power plants' insurance fee	455.62
Administrative expenses and remunerations	1,686.26
Financial costs	1,502.50
Income tax	870.89
Dividend to shareholders	3,480.00
Community and social investment	50.07
Economic value retained by RATCH	
RATCH's net Profit	6,106.70



180.45-MW Mount Emerald Wind Farm, Victoria, Australia



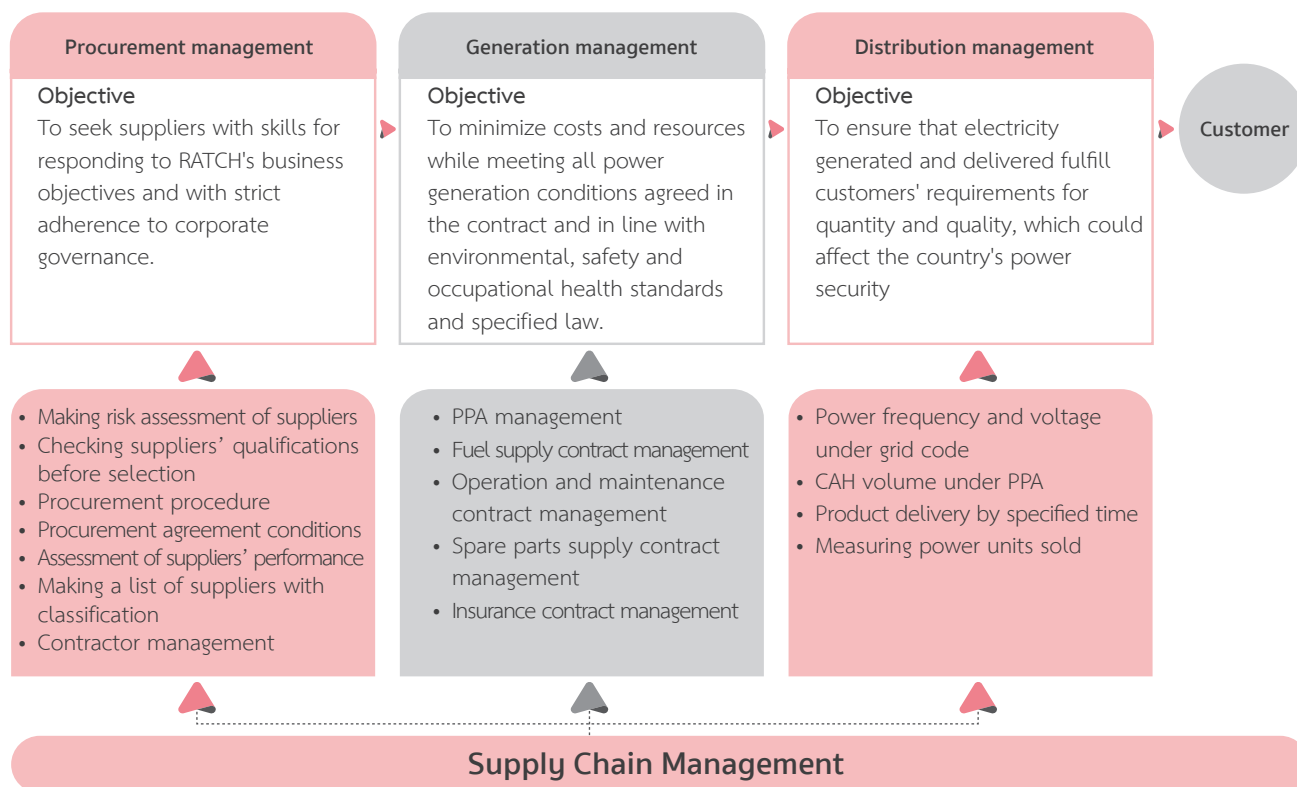
42.5-MW Collinsville Solar PV Project, Queensland, Australia

Supply Chain Management

As RATCH's core business is power production, involvement with suppliers is vital to the success of the business in various aspects along the supply chain, divided into:

- Procurement management
- Generation management
- Product distribution (electricity transmission).

Key Supply Chain Procedures in RATCH's Power Production Business

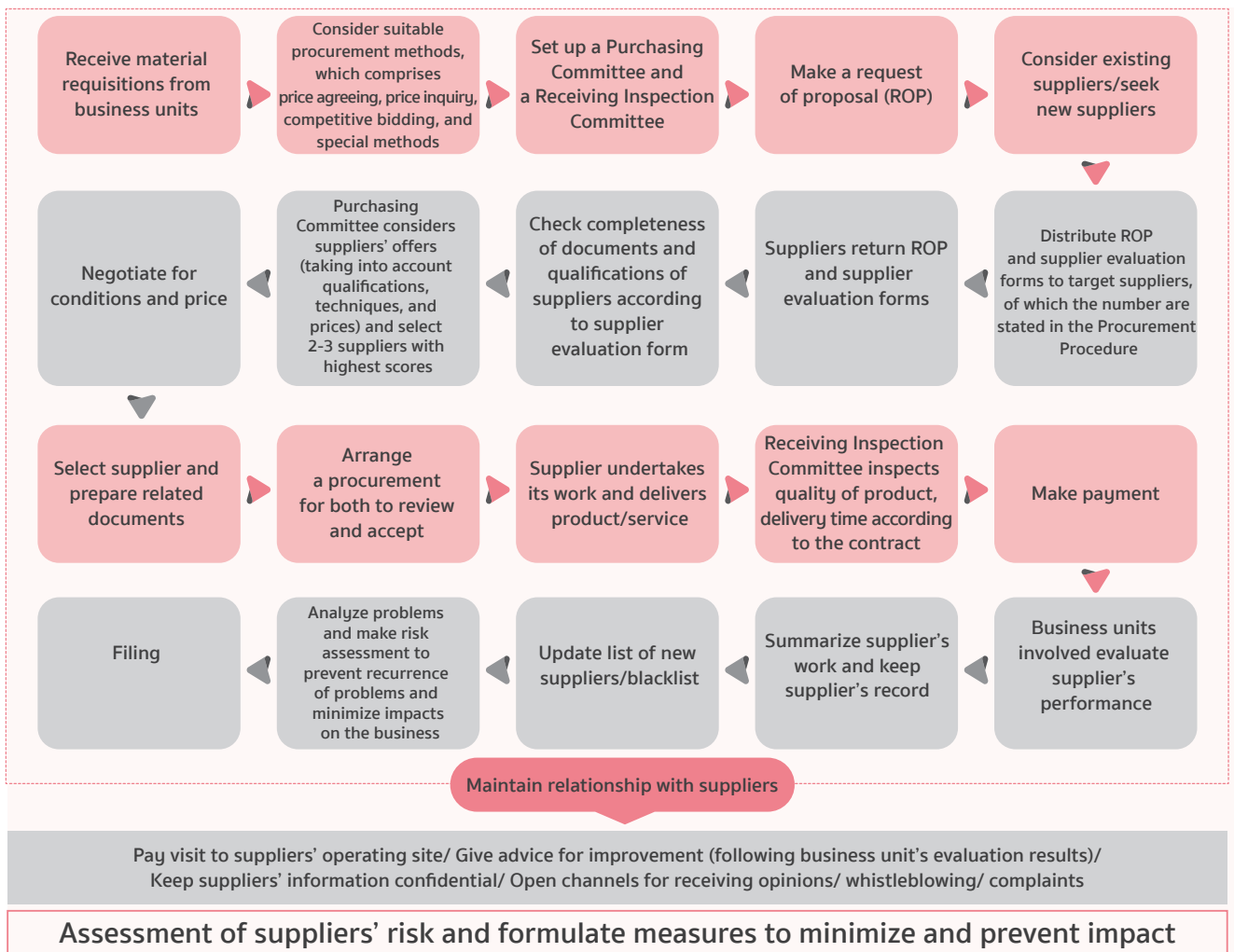


Procurement management

In procurement management, RATCH recognizes its suppliers as good business partners under the principles of transparency, fairness, and equality. Practice is clearly stated in the company's Code of Conduct on supplier treatment, highlighted below:

1. The management and staff of RATCH must always bear in mind its best interests.
2. RATCH gives equal opportunities for all suppliers to compete: small enterprises and enterprises belonging to the disabled, minority groups, and veterans.
3. RATCH encourages price competition among suppliers and engages in fair and appropriate supplier selection.
4. RATCH has a supplier evaluation and selection procedure and arranges for making appropriate contracts as per international standards.
5. RATCH establishes contract management and monitoring systems to ensure full compliance with the contract and prevent corruption as well as misconduct at all stages of the procurement process.
6. RATCH develops and maintains sustainable relationships with suppliers, who pay close attention to technical quality, value of products and services, and value for money under mutual trust.
7. The management and staff of RATCH honor obligations to suppliers within the extent of fair competition.
8. The management and staff of RATCH neither demand, nor receive, nor give any undue benefit to suppliers.
9. In any case that RATCH is unable to comply with any condition, it will inform suppliers in advance to jointly work out solutions.

RATCH's Procurement Process



Procurement Management Performance for 2017

1. Expanding supplier evaluation criteria to subsidiaries

To select suppliers, RATCH developed a supplier evaluation form which covers key areas for consideration, namely economic, social, and environmental aspects, in addition to suppliers' techniques and expertise as well as prices. These key areas account for 10% of the total score of 100 in the selection process. In 2017, RATCH expanded this evaluation method to Ratchaburi Electricity Generating Co., Ltd., the subsidiary operating Ratchaburi power plant, the key asset of RATCH. The company now uses the same supplier evaluation Form and criteria as RATCH for selection process.

Key Attributes in Supplier Evaluation



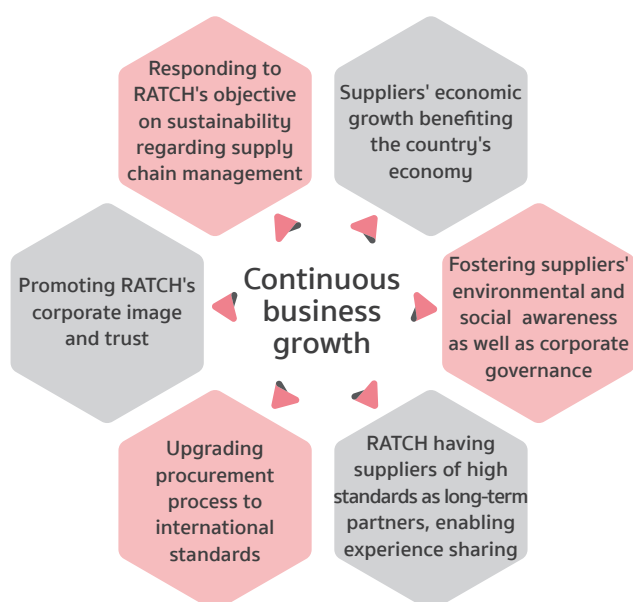
Supplier Inspection Results in 2017

This year, there were up to 134 suppliers (accounting for 97.10%) of the entire number of 138 suppliers passing the company's evaluation process which can be divided into 83 existing suppliers and 55 new suppliers. Moreover, all new 55 suppliers (accounting for 100%) met evaluation criteria in social, economic, environmental and governance issues.

Results of Supplier Evaluation for 2017

Evaluation criteria	Number of suppliers passing evaluation (Total number of suppliers passing evaluation: 134 suppliers)			
	Existing supplier	New supplier	Total	%
1. Integrity/transparency/accountability				
• Having no record of all sorts of corruption	79	52	131	97.76
• Having no record of job abandonment	80	54	134	100.00
2. Environmental management and responsibility				
• Qualified for environment standards or operating in compliance with regulations (ISO 14001/EIA)	8	4	12	8.95
• Abiding by laws and regulations concerning the environment and management of environmental impacts	79	52	131	97.76
3. Labor and social responsibility				
• Having no child labor nor illegal migrant workers	77	54	131	97.76
• Respecting labors' human rights with no abuse of basic human rights	80	54	134	100.00
• Operating a business with social responsibility, making no impact on the neighboring communities	80	54	134	100.00
4. Conflicts of interest				
• Executives/board members holding no position in companies joining bidding	79	53	132	98.51

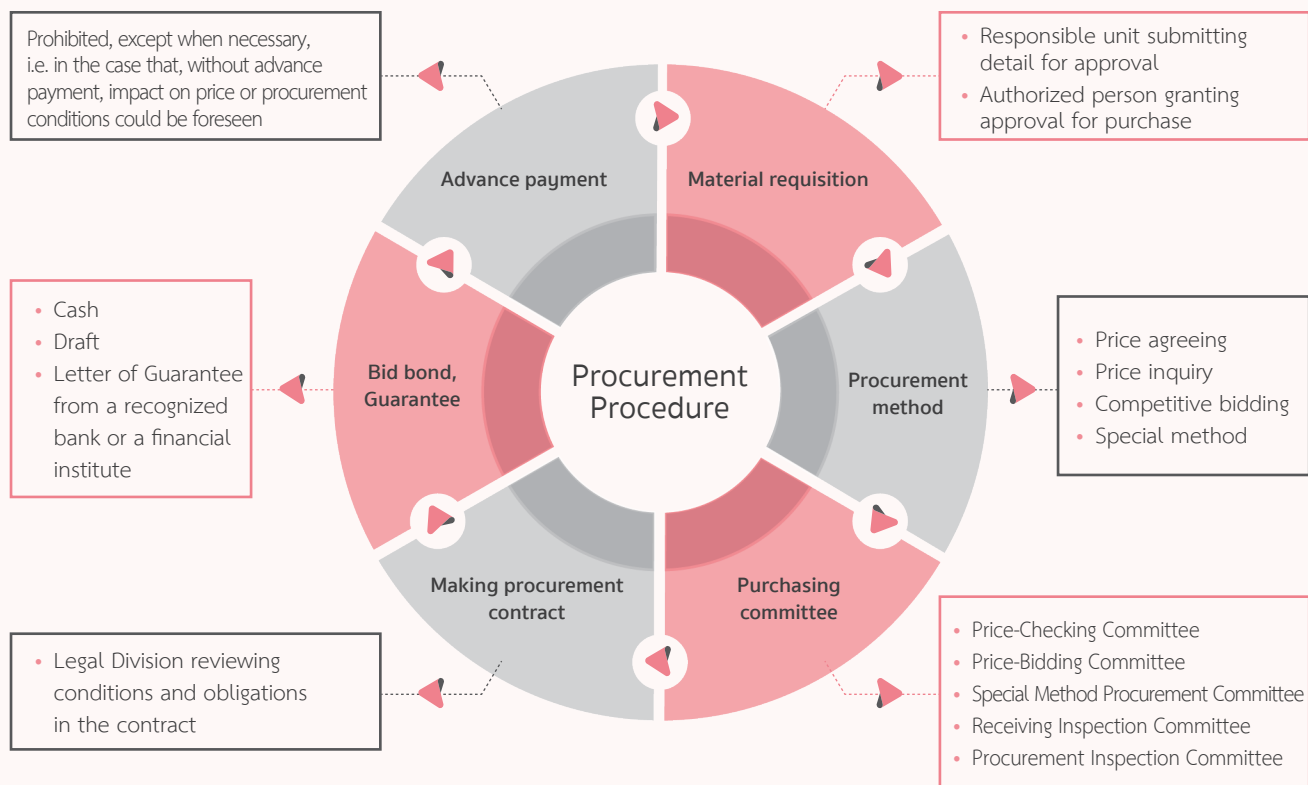
Benefit from Supplier Evaluation



2. Reducing procurement by special method, increasing sourcing of green products

In 2017, RATCH aimed to reduce procurement through the special method to increase the likelihood of selecting suppliers of the desired qualifications while increasing its negotiation power to achieve the best prices, quality, and products/services with the best value for money. Essentially, RATCH endeavored to procure more environment-friendly products.

The practice under RATCH's Procurement Procedure, which is intended to create fair, transparent, and fraud-free competition, is highlighted below:



2017 Performance


Objective	Result	Type of work / product / service
To reduce procurement through special method	The procurement through special method decreased by 16.36% over year and accounted for 16.55% of 278 items, with a value of 59,233,142 baht.	Community products, special products, services requiring specific expertise, and consultant service by an expert.
To increase procurement of green products	The procurement of 95 items of green products increase by 21.79% over year and accounted for 14.87% of 639 items, with a value of 33,164,776 baht.	Office supply, stationary, cleaning equipment, energy saving light bulb and environmentally-friendly service.

RATCH will retain these goals into its 2018 operations.

3. Risk assessment on power plant contractors

In compliance with the laws on safety at work and labor protection as well as prevention of emergencies, RATCH must perform risk assessment on contractors after entering into a contract with RATCH, both before and during their operations at the power plant. Requirements for safety and environmental control are presented in the diagram below:

 **Issues for Evaluation**

 **Requirements**

Human rights abuse and use of illegal workers



- No use of alien workers
- No use of underaged workers (under 18)
- No use of overaged workers (over 60)
- Workers must be insured with Social Security Office.
- Workers must go through a health check-up according to job risk.
- Workers having to drive in the premises of the power plant, do mail delivery, and do driving service, must have a driving license.

Safety and environmental awareness



- Workers have to attend an orientation on safety, occupational health, and environment provided for contractors and suppliers as required by the job before work starts.
- Complete attendance at the orientation session is required.

Risk assessment of work and preventive measures



- Risk factors involving the job must be reviewed. In the case of working at height, workers' thorough understanding must be ensured.
- All protective gear required for each particular job must be checked before work starts.
- Safety equipment must be checked before work starts.
- Whenever there are less than 50 workers, a Safety Officer at Supervisory Level must be present.
- Whenever there are 50 workers or more, a Safety Officer at Professional Level, with official appointment from the company, must be present.

Contractor inspection



- Contractors must have full compliance with relevant laws as well as OHSAS 18001 and ISO 14001 for power plants.
- A safety officer or the committee dealing with safety, occupational health, and environment carries out a random check on contractors.
- Upon any non-compliance or risk, supervisor will order a halt for improvement.
- Evaluation is required after work.

2017 Performance

Contractors evaluated	20 times	63 items need improvement
Areas of work found with risk	<ol style="list-style-type: none"> 1. A sign of confined space 2. A sticker showing equipment examination result 3. Installation of scaffolding with damaged floor/tile 	<p>Improvement</p> <ol style="list-style-type: none"> 1. Posting a sign showing correct work area 2. Posting a sticker showing equipment examination result 3. Removing from area with installation of floor/tile that was checked.

4. Supplier performance evaluation

Criteria for supplier/contractor evaluation:

- The unit sponsoring the work takes charge of supplier/contractor evaluation
- Work quality, delivery, and methods are key areas for evaluation
- Results of the evaluation are to be recorded in the suppliers' list for future procurement
- Suppliers/contractors who fail the evaluation will be given recommendations for improvement. If they are found negligent and refuse to improve as recommended, RATCH will blacklist them.

In 2017, RATCH assessed 136 suppliers/contractors, None of them failed.

5. Management of suppliers' risk

RATCH values the management of risk associated with suppliers, particularly those whose roles are vital to RATCH's business continuity. Risk factors considered influencing opportunities and impacts include the nature of business, major problems found in the operations, results of supplier evaluation, and outside factors. The assessment covers all possible impacts regarding economic, social, and environmental aspects. Then measures to prevent risks associated with suppliers are drawn.

In 2017, the company and Ratchaburi Electricity Generating Co., Ltd. (RGCO) conducted risk assessment for suppliers having transaction with the company, with details summaries as following:

Risk factor	Impact	Probability	Severity of impact	Control and management	2017 result
Supplier with high value contract	Economic	Low	High	<ul style="list-style-type: none"> • Demand collateral • Review contract compliance and work delivery • Set terms of payment according to work progress • Visit to supplier's site 	For suppliers with the procurement value of more than 5 million baht: <ul style="list-style-type: none"> - 2 suppliers of RATCH - 14 suppliers of RGCO
Supplier with product/service specialty	Economic	Low	High	<ul style="list-style-type: none"> • Arrange long-term contractual service agreement • Arrange insurance 	6 suppliers of RGCO
Untimely delivery of products/services	Economic	High	Low	<ul style="list-style-type: none"> • Set fines • Seize collateral • Blacklist 	49 suppliers of RGCO were late on delivery of goods and service
Job abandonment	Economic	Low	High		No work abandonment by supplier.
Financial status	Economic	Low	Low	<ul style="list-style-type: none"> • Demand collateral or bank guarantee • Demand financial statements of the last two years 	No suppliers having financial instability
Conspiracy, price collusion, and conflicts of interest	Governance	Low	High	<ul style="list-style-type: none"> • Set criteria for supplier evaluation • Verify documents and seek information from peers in the industry or close contacts • Examine letters of certification • Blacklist 	None

Risk factor	Impact	Probability	Severity of impact	Control and management	2017 result
Use of child labor and illegal migrants	Society	High	High	<ul style="list-style-type: none"> Set criteria for supplier evaluation Visit to supplier's site 	None of supplier using child labor and illegal migrants
Abuse of human rights or labor rights	Society	Low	High	<ul style="list-style-type: none"> Ask for names/records/copies of workers' ID cards Arrange work permits for alien workers Blacklist 	None of supplier committing abuse of human right
Subcontractor management	Economic Society	Low	High	<ul style="list-style-type: none"> Arrange for safety assessment before work starts Set ESG conditions for subcontractors in the contracts made with major suppliers Check for compliance with safety measures 	4 sub-contractors of RGCO
Safety Occupational health of labor	Society	Low	High	<ul style="list-style-type: none"> Arrange for safety assessment before work starts State requirement for safety gear, as suitable for the job, in the contract 	14 suppliers of RGCO passing risk evaluation
Environment and waste management	Environment	Low	High	<ul style="list-style-type: none"> Set conditions in the contract with follow-ups Visit to supplier's site Set criteria as part of supplier evaluation 	14 suppliers of RGCO having conditions in the contracts

6. Relationship development for long-term strategic suppliers

In 2017 RATCH took the following actions:

- **Paying visit to suppliers' site**

Ratchaburi Electricity Generating Co., Ltd., a subsidiary, closely monitored the operations of two contractors:

- The Siam Gypsum Industry (Songkhla) Co., Ltd., whose operations involve production of concrete mix, gypsum products, and cement plaster: The company is a contractor that buys materials derived from the desulfurization process in Ratchaburi power plant's power generation process for use in its production since 2016
- Permsap Co., Ltd., whose operations involve waste separation to obtain non-hazardous waste for recycling: The company has been a contractor since 2016

- **Promotion of anti-corruption awareness**

RATCH promoted awareness of anti-corruption practices in a continuous effort from the previous year.

Certain criteria involving conflicts of interest have been set as qualifications of suppliers. Moreover, all suppliers were informed of proper practices about anti-corruption and fraud after contracts were signed. Suppliers were also informed about RATCH's gift policy and the No Gift policy on New Year's occasion.

Production Management

Since RATCH's core product is electrical power, which has to be produced and delivered on demand, the essence of generation management is management of the various contracts made with both customers and suppliers. These contracts are:

Contract	Contract Party
Power Purchase Agreement (PPA)	Customer
Fuel Supply Contract	Supplier
Operation and Maintenance Contract	
Spare Part Supply Contract	
Insurance Contract	

1. Power Purchase Agreement (PPA)

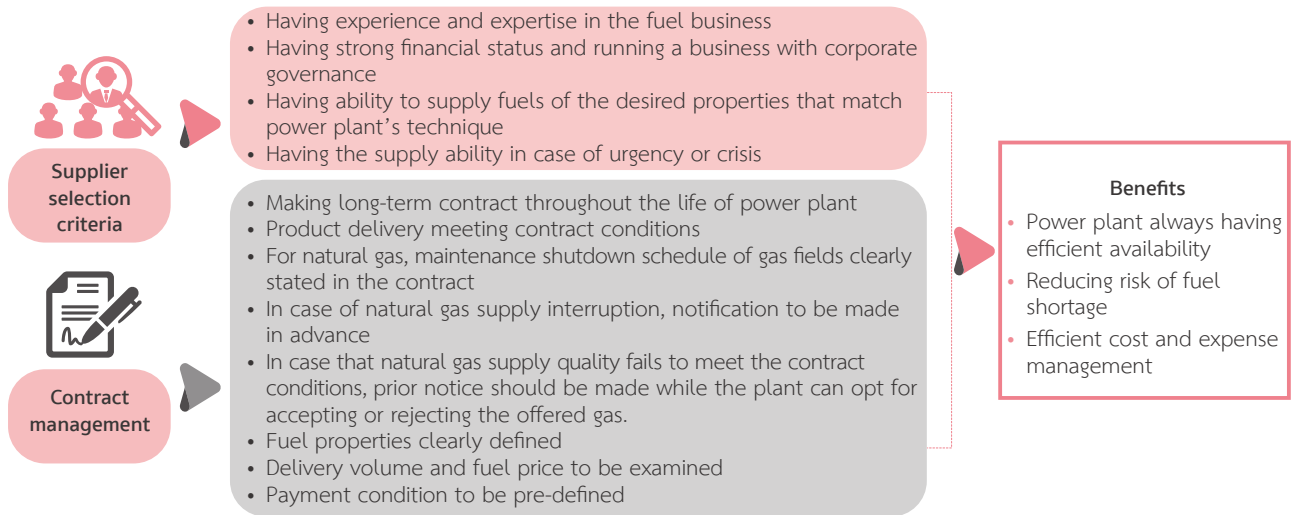
Ratchaburi power plant, which is managed by a subsidiary, has EGAT as its customer. PPA management adheres to contractual conditions, of which major issues are:



Since PPA is a long-term contract of 25 years through the life of the power plant, the prime objective of contract management is to ensure that the generated volume always conforms to contractual conditions. The ability to fully meet these conditions will produce a significant effect on RATCH's income and expense incurred from fines if the production volume fails to meet the contract conditions (as detailed on page 97).

2. Fuel Supply Contract

Fuel is a major production factor for Ratchaburi power plant, where two types of fuel are used. Natural gas is the primary fuel. Diesel and fuel oil are secondary fuels, the former for the combined-cycle power plant and the latter for the thermal power plant. Since electricity is a unique product, of which the production will only be carried out when demand arises, fuel supply has to be secured by engaging in contracts through the life of the plant as a guarantee that PPA can always be fulfilled. Ratchaburi power plant has PTT as its major fuel supplier. Vital to power generation, management of the fuel supply contract is summarized as follows:

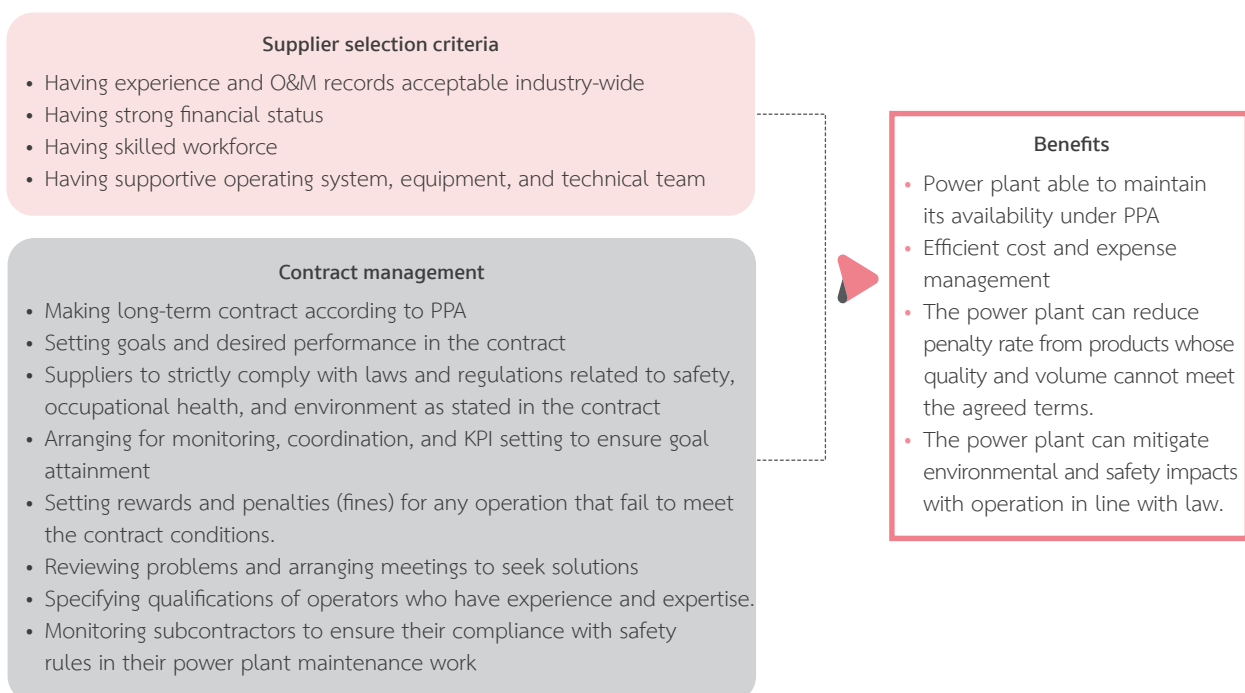


Amount of fuel delivered to Ratchaburi power plant during 2017

Type of fuel	Volume	Value	Units of electricity produced
Natural gas	98,039,517 MMBTU	23,342.12	13,783.41
Diesel	486,262 liters (consumption without additional purchase)	-	2.10
Fuel oil	Purchase of 27.06 million liters Consumption of 26.70 million liters	306.58	15.48

3. Operation and Maintenance (O&M) Contract

In the operation and maintenance of Ratchaburi power plant, RATCH employs suppliers with experience and expertise. This is considered significant to the power generation process in order to respond to customer's order in a timely way, reflecting the plant's ability to maintain its availability under the PPA. Management of O&M contracts is therefore vital to the company's income and expense. Principles for O&M management are shown in the diagram below:



Results of O&M contract management for 2017

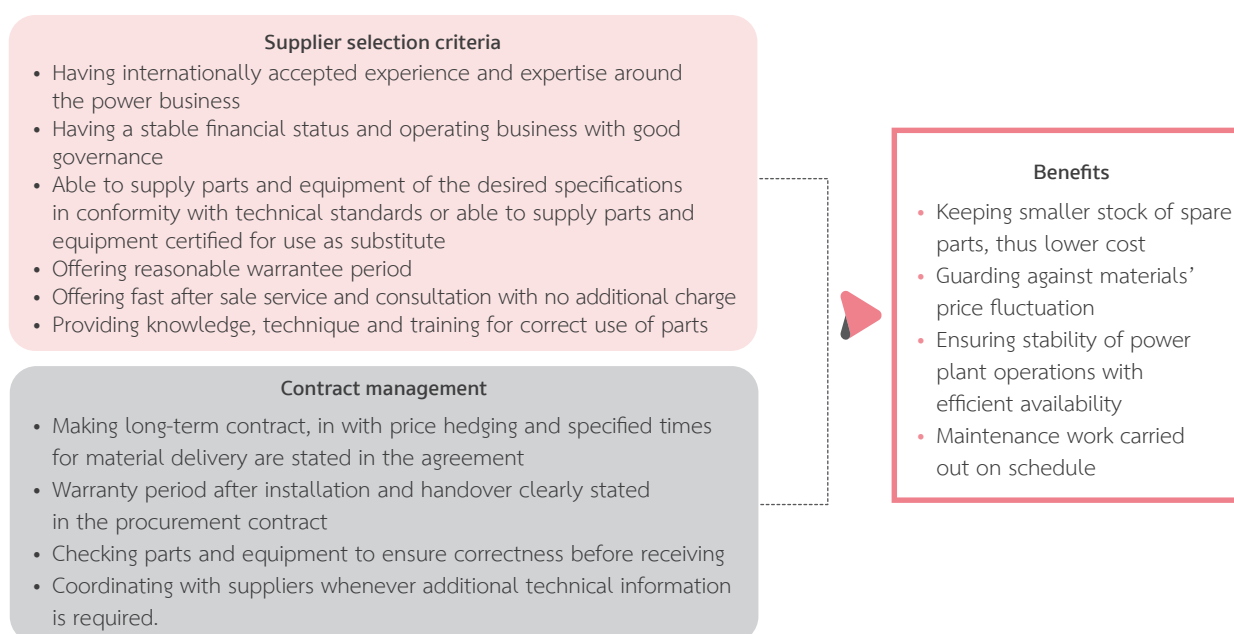
Goal	Performance	Remarks (Revised)
Operation for power generation	Contractual operation is based on contract available hour reflecting through a profit margin from fuel cost and revenue.	Finding out ways to improve/solve or manage operation to reduce loss of fuel that may cause loss of fuel income.
Maintenance	Planned outage to meet projected power sales.	Finding out approaches for improving/solving or managing problem to reduce repeated maintenance and estimate the proactive maintenance to mitigate any damage for equipment.
Problem-solving / corrections in the operation	Cause of generation-related problems/mistakes can be identified.	Length of time for investigating reasons or way to solve program varies on a case by case basis. Meanwhile, there are supporting units involved.
Fines	A fine was found.	Fines from incentives considered based on Key Performance Index

4. Spare Parts Supply Contract

The management of a spare parts supply contract is intended to maintain the power plant's availability while reducing maintenance periods and minimizing risk for shortage of spare parts. Ratchaburi power plant works with suppliers who are the sellers of key parts to power plants on Vendor Management Inventory (VMI) to minimize stock keeping of parts to reduce costs and speed up maintenance work. Both sides agreed on:

- Management of stock of spare parts—Supplier provides spare parts for Ratchaburi power plant in the form of a consignment stock
- Ratchaburi power plant acts as the central site for parts distribution. Power plants in the network can ask for parts on loan
- Material issuing and payment will be as actual
- The inventory management plan will be carried out annually with the O&M unit.

Practice in Spare Parts Supply Contract Management



These have been in practice since 2003, providing the following benefits:

- Cost-saving from stock of spare part of 13.5 million baht
- Spare part delivery takes 1-3 days for purchasing volume of not over maximum level for reserves as specified by the agreement.

5. Insurance Contract Management

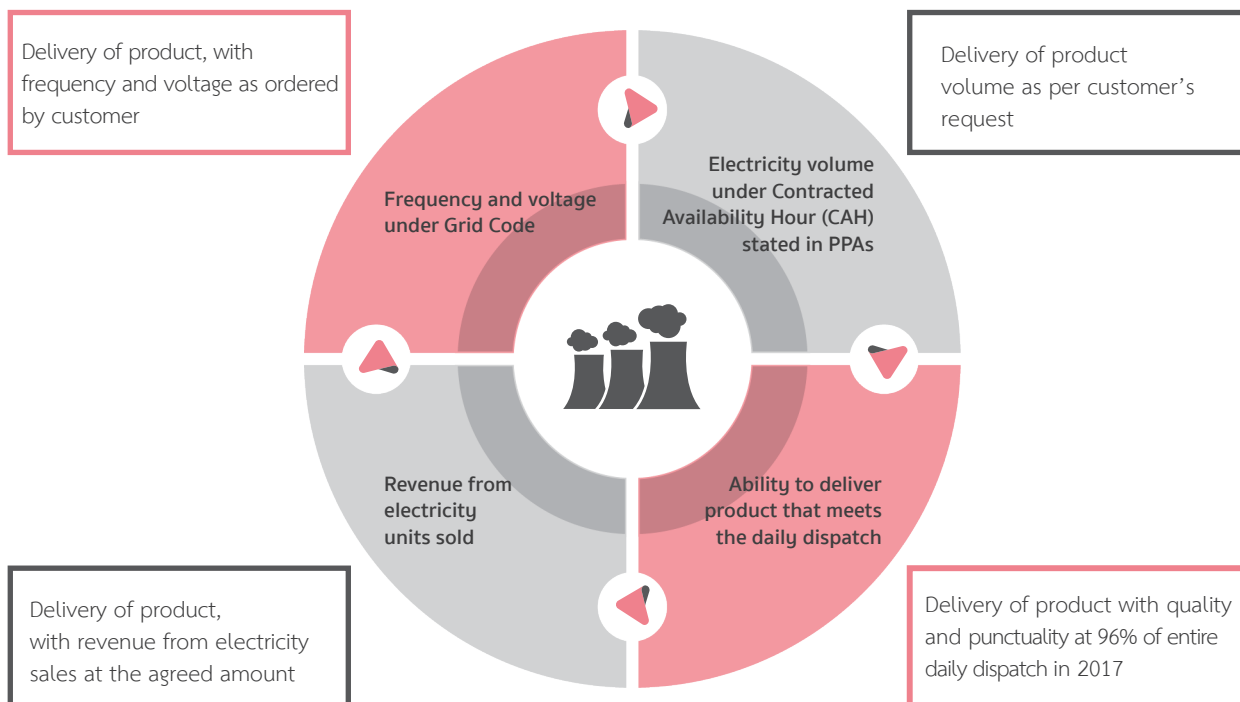
Since the operation of a power plant requires intensive investment costs while risks in the production process could bring about the unexpected and affect both revenue and expenditure, insurance is a preventive measure against such risks so as to minimize economic impacts on the business. Conditions in an insurance contract are mainly derived from those in PPA. Insurance contracts made with different suppliers are based on their financial status. Insurance coverage is intended for both physical assets and business interruption. Moreover, such coverage must be flexible and complete with a high coverage limit for machinery damage. Also included in the insurance contract are consultation on technical issues and risk management and an efficient customer relationship team.

In 2017 Ratchaburi power plant filed no insurance claim.

Product Distribution

This is the final part of the supply chain of the power production business. Product distribution particularly involves suppliers in charge of operation and maintenance because the product to be distributed to customers is electrical power. RATCH's product to be delivered to EGAT, PEA, and industrial customers must fulfill customers' requirements for quantity and quality as stated in PPAs. An efficient production distribution benefits not only customers, but the overall economy as well.

The product distribution process of Ratchaburi Power plant in 2017 is shown below:



Customer Relationship Management



RATCH implemented its principles concerning customers in its code of conduct as detailed below:

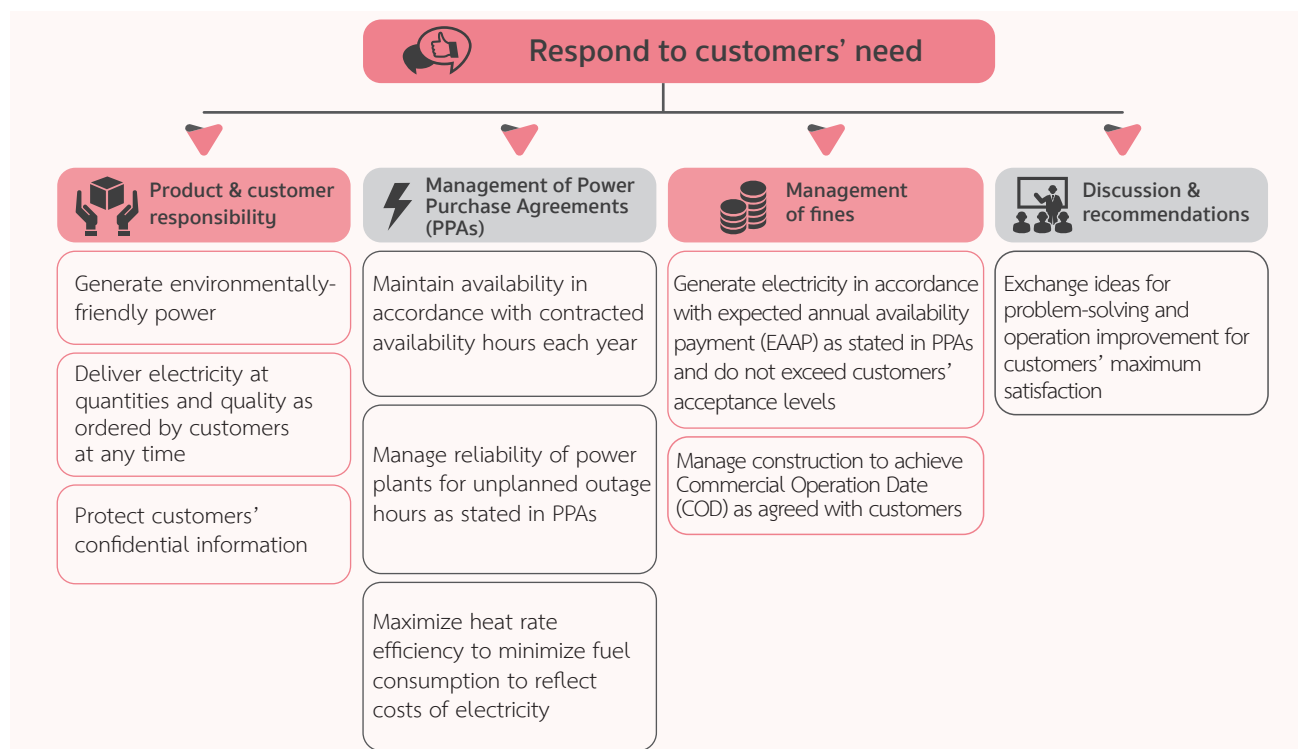
- To produce and deliver good quality of products and be responsible to customers by focusing on upgrading standard continually
- To disclose accurate and complete information about products and services.
- To provide warranty for products and services with appropriate conditions.
- Executives and employees must maintain customers' confidential information and not abuse it for the benefit of their own and others.
- Executives and employees must not ask, accept, or pay for illegal benefits to customers
- To strictly comply with customers' conditions, in case of failure, inform customers to obtain for solutions together.

RATCH's goal for customer relationship management is to respond to customers' expectations for the maximum satisfaction. RATCH or the power plants must generate electricity with responsibility for the environment and communities at quantities and quality any time as ordered by customers as well as maintaining the security of the country's electricity supply system

The ways to achieve its goals are divided into four prime areas as detailed below:

- 1) Responsibility for products and customers
- 2) Management of Power Purchase Agreements (PPAs)
- 3) Management of fines
- 4) Discussion and problem-solving.

Ways to Respond Customers' Expectation and Satisfaction



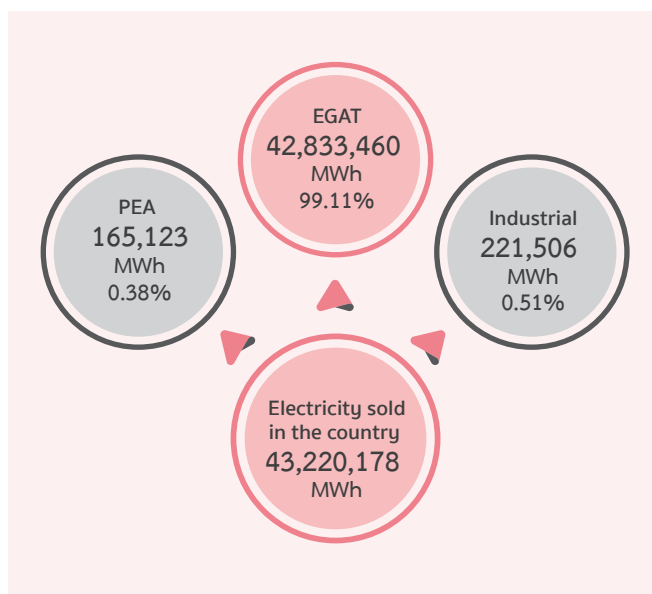
EGAT is RATCH's major customer and purchases electricity from RATCH's group of power plants with a combined capacity of 5,560.95 MW or 89.4% of RATCH's total generating capacity of 6,219.39 MW under long-term PPAs lasting 20-25 years as agreed. The following are nine power plants of RATCH that generate and sell electricity to EGAT in 2017:

Power plant distributed power to EGAT	Equity (%)	Contracted capacity* (MW)	Installed capacity* (MW)	PPA period (Year)
Ratchaburi power plant	99.99	3,481.00	3,645.00	25
Tri Energy power plant	99.99	700.00	720.00	20
Ratchaburi-Power power plant	25.00	350.00	372.50	25
Huay Bong 2 & 3 Wind farms	20.00	36.00	41.40	25
Ratchaburi World Cogeneration	40.00	93.60	93.60	25
Nava Nakorn Electricity Generating (NNEG)	40.00	56.65	55.65	25
Nam Ngum 2 Hydro power plant	25.00	149.15	153.75	25
Hongsa Thermal Plant	40.00	701.20	751.20	25

Remark: * Equity capacity.

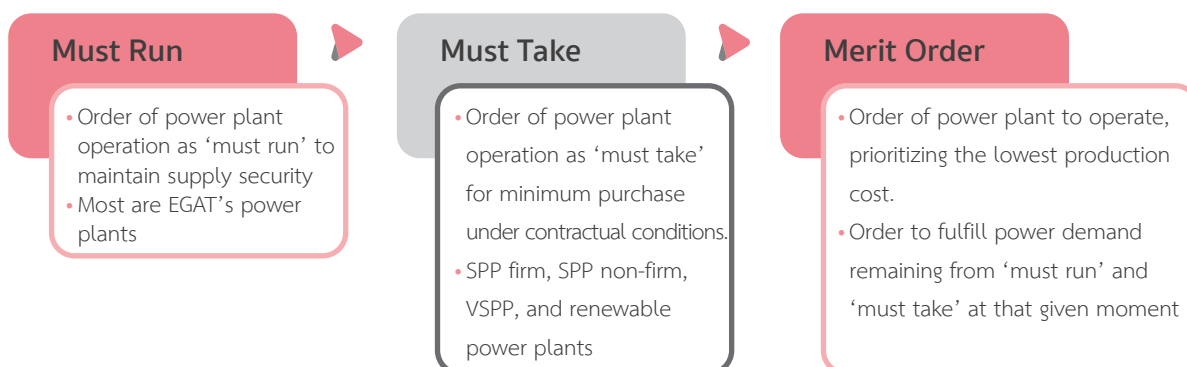
In 2017, the electricity generated and sold to EGAT from nine power plants totaled 42,833,460 MWh or 99.11% of RATCH Group's total generation and distribution.

Electricity Sold to Customers in Thailand in 2017



RATCH's product is "electrical power". Therefore the generation, sale, and maintenance of power plants each year are stated in the PPA in order that management of electricity supply system may be efficient, without brownouts or blackouts, that impact the country's economy and society.

The power plant must be able to generate power at any time as commanded by the customer. EGAT's National Control Center (NCC) is responsible for planning, control over the plant as well as types of fuel, taking into account the country's power supply security, appropriate cost, and environment friendliness. EGAT's generating order and conditions are as follows:



Electricity generated by order of NCC will be distributed to Metropolitan Authority of Thailand (MEA) and Provincial Authority of Thailand (PEA) and neighboring country.

Product Responsibility

RATCH implements its principles for generating power to meet the objectives of customers as follows:

1. Environment-friendly power generation

Before construction and operation of all power plants, environment impact assessment (EIA) is legally carried out and takes into account the mitigation measures stated in the EIA report. Monitoring reports are strictly submitted to the concerned regulatory agencies. Moreover, environmental quality management standard ISO 14001 is implemented to upgrade environmental management systems to efficiently and optimally prevent, control and ease operation impacts. Under the operation of all power plants over the past years, the quality of the environment including air, water, waste, noise, and biological diversity have been in line to better than legal criteria. (Please read Environmental Quality Management, page 49)

2. Delivery of electricity at quantities and quality dictated by customers at any time

RATCH Group values the maintenance and efficiency improvement of the power plants to ensure the ability to generate power at the required frequency and voltage at any time when dictated by customers' order as stated in PPAs, in response to the mission of customers to maintain the security of the national power supply system. Each year, reliability and availability targets are set at a level to assure power generation is bound by PPAs as much as possible.

3. Protect confidential information of customers

Under the company's code of conduct, executives and employees must protect confidential information and not abuse it for the benefit of their own or others. In case of necessity to disclose information or as required by law, the customers in question must be informed and authorize such disclosure in writing, in order to build trust and confidence between each other, which lead to good business relationship in the long run.

PPA Management

The PPA terms and conditions are agreed between customers and RATCH, which must fulfill customers' satisfaction throughout the contractual periods. Below are the power plants' three main concerns.

Availability	Reliability	Heat Rate
<ul style="list-style-type: none">• Target Availability will be set each year in line with Contracted Availability Hours (CAH).• In case of failure, the power plant must be fined by customers.	<ul style="list-style-type: none">• Reliability means the number of operating hours versus hours spent on unplanned outages.• PPA indicates the unplanned outage of power plants at 3-5% of availability hours.• Unplanned outage is major factor of the availability of power plants.	<ul style="list-style-type: none">• Heat rates reflect a given customer's cost of electricity.• Power plants must operate at their maximum efficiency with minimum fuel consumption• The heat rate is part of PPA, meaning the amount of fuel consumed for producing one unit of electricity, including additional fuels required for starting up the generator• Heat rates are normally set in accordance with plant efficiency. In general, the lower the heat rate, the higher the plant efficiency.

Performance of RATCH Power Plants' PPA Management in 2017

1) Availability

Target Availability Factors in 2017

Power Plant	Installed Capacity (MW)	Equivalent Availability Factor : EAF	
		Target	Actual
Ratchaburi Thermal power plant Unit 1	735.00	85.01	83.50
Ratchaburi Thermal power plant Unit 2	735.00	85.01	89.04
Ratchaburi Combined cycle power plant Block 1	725.00	87.68	91.85
Ratchaburi Combined cycle power plant Block 2	725.00	87.68	89.19
Ratchaburi Combined cycle power plant Block 3	725.00	85.20	88.69
Tri Energy power plant	720.00	89.59	92.44
NNEG power plant	139.13	97.50	98.70

Remark: Actual EAF of Ratchaburi thermal plant is under the target due to sharing of generating hour allowed by PPA.

2) Reliability

Target of Reliability Factors in 2017

Power Plant	Reliability Factor: RF	
	Target	Actual
Ratchaburi Thermal power plant Unit 1	95.47	93.78
Ratchaburi Thermal power plant Unit 2	95.47	100.00
Ratchaburi Combined cycle power plant Block 1	92.96	97.42
Ratchaburi Combined cycle power plant Block 2	92.96	95.27
Ratchaburi Combined cycle power plant Block 3	92.83	96.63
Tri Energy power plant	91.68	97.18
NNEG power plant	None	-

Remark: The actual performance of Reliability Factor (RF) of the Ratchaburi thermal power plant, unit 1 was lower than the target due to sharing of operating hours between the thermal power plant, unit 1 and unit 2.

3) Heat Rate

The Average heat rates of RATCH's power plants in 2017 fall into each type of fuel as follows:

Power Plant	Average Heat Rate (BTU/KWh)					
	Natural Gas		Fuel Oil		Diesel	
	Target	Actual	Target	Actual	Target	Actual
Ratchaburi Thermal power plant Unit 1	10,093	10,662	-	10,597	-	-
Ratchaburi Thermal power plant Unit 2	10,406	10,663	-	10,418	-	-
Ratchaburi Combined cycle power plant Block 1	7,157	7,092	-	-	-	7,868
Ratchaburi Combined cycle power plant Block 2	7,163	7,118	-	-	-	8,305
Ratchaburi Combined cycle power plant Block 3	7,132	7,069	-	-	-	8,958
Tri Energy power plant	7,208	7,126	-	-	-	-
NNEG power plant	7,950	7,854	-	-	-	-

Remark: 1. Heat rate target of fuel oil was not set due to no plan of fuel oil fired generation.

2. Diesel heat rate target was not set due to no plan of diesel fired generation.

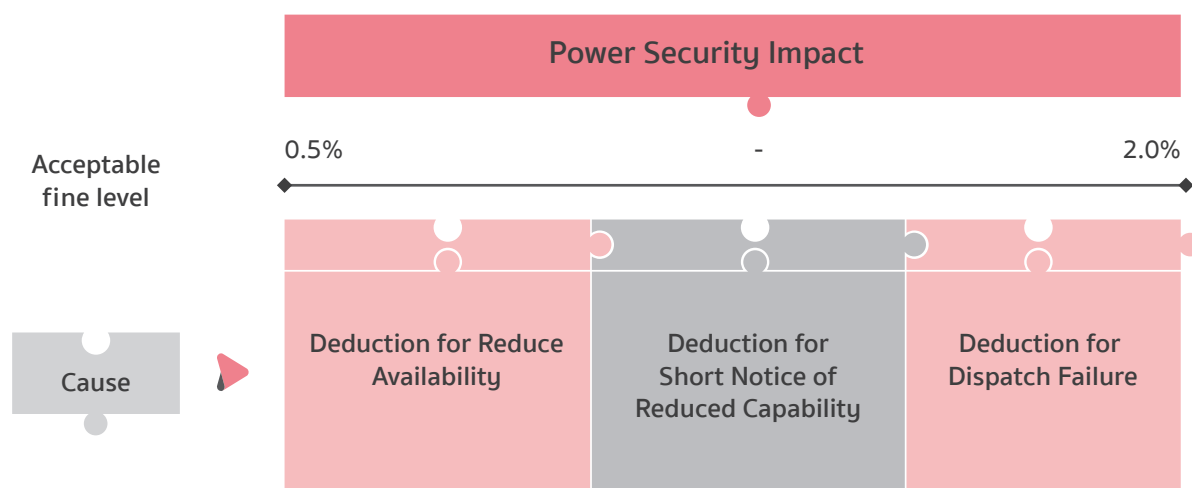
Management of Fines

Electricity is a type of energy and must be produced when receiving customers' orders that depend on the country's electricity demand. Though a power plant is well maintained, there are uncontrollable external factors causing inevitable outages and inability to respond to customers' expectations. The number of unplanned outage hours is normally fixed at 3-5% of the total hours of availability. Therefore, unplanned outage hours must be managed not to exceed an acceptable level of the customers to avoid fines, which consequently reflect availability payment income.

Management of Fines of Ratchaburi Power Plants

Ratchaburi power plants consist of two types, namely thermal and combined-cycle, with a total installed capacity at 3,645 MW, and the total capacity sold to EGAT is 3,481 MW. Management of fines at an acceptable level to customers is as follows:

- Fines ceiling versus availability payment is set annually.
In PPAs between power plants and customers, fines normally range between 0.5%-2.0% of the expected annual availability payment (EAAP), which varies with impacts on customers but still meets customers' acceptance. In 2017, RATCH managed to keep EAAP at 0.32%, lower than the ceiling target of 0.64% EAAP.



Ratchaburi power plants' performance of fine management during 2013-2017

Year	Contracted fines rate (%)	Ceiling (%)	Actual (%)	
2013	0.5 - 2.0	0.64	0.61	Lower than ceiling
2014	0.5 - 2.0	0.64	0.28	
2015	0.5 - 2.0	0.64	0.53	
2016	0.5 - 2.0	0.64	0.59	
2017	0.5 - 2.0	0.64	0.32	

- Management of construction projects**
Electricity is a product with special characteristics, unable to be stored and must be used once produced. Completion of construction and operation is thus significant to the security of the power supply system, which is customers' mission.

Moreover, in PPAs, a power producer is obliged to place a guarantee for contract compliance before the commercial operation date (COD). In case of failure, RATCH must pay for fines in the amount of such guarantee as stated in the contract as well damages or other expenses.

Therefore, project management must be prudent and watertight, from selecting skilled, experienced contractors of engineering, procurement, and construction (EPC) to setting methodical work plans as well as monitoring the system for work progress to ensure that project reaches COD under the timeframe stated in PPA, to meet customers' satisfaction.

Management of fines during construction is through penalty, incorporated in the EPC contract. The EPC contractor must meet the construction schedule under the agreed milestones with a guarantee for the project price and the handover period to assure completion of the construction as stated in the PPA.

Discussion and Problem-solving

In general power plants hold discussions with customers to listen to their problems, suggestions, and expectations for improvement of the operation.

For Ratchaburi and Tri Energy power plant, meetings with EGAT are held annually. This year, both power plants took its suggestions and recommendations to improve processes and efficiency to meet the customer's demand and satisfaction as follows:

Customer's suggestions/ recommendations	Action
Ratchaburi power plant	
Operation and testing of Ratchaburi Thermal's boiler: In case of long periods of outage, EGAT requested Ratchaburi power plant to specify the testing procedure, period and cost for EGAT's consideration.	The company arranged information, procedures and durations for testing boiler as required by law, with relevant expenditure data provided to support EGAT's decision in resuming the thermal power plant operation after the stoppage for more than 6 months. This will help facilitate EGAT's power purchase at the lowest rate as prescribed by law to prevent any impact on the power security.
Tri Energy power plant	
Requested the power plant for the operation model and dispatch factor during PPA enforcement.	RATCH prepared for EGAT the operation model of Tri Energy in accordance with EGAT's system.

Safety and Occupational Health

RATCH actively strives to be a leader in operational excellence as guided by its mission. Safety, occupational health and the environment for all are thus the Company's priority. To this end, RATCH conducts preventive safety and occupational health initiatives, targeting "zero accident" which means successful operations without accident or losses to employees' life and the properties of employees, their families and the organization.

Road to Zero-Accident Goal



Safety Requirements and Standards

Aside from compliance with laws which highlight precautionary principles and shape RATCH's strictly-followed rules and conditions, RATCH has put in place the written principles and operational framework on safety, occupational health and environment and applied international standards.

RATCH's Code of Conduct defines operational excellence guidelines covering safety rules, the prevention and tackling of drug use in office, as well as safety measures as summarized in the following diagram:



Safety, Occupational Health and Environment at Work

- Highlight safety as a priority agenda by establishing safety rules and standards which at least meet legal requirements and international standards. Employees must study and strictly follow the related laws, policies, rules and standards.
- Undertake measures to control and prevent losses caused by accidents, fires, injuries, work-related

illness, property loss/damage, safety rule violations, incorrect work procedures, and errors. The work environment is kept safe with appropriate and sufficient equipment. Executives and employees are required to report accidents and incidents accordingly to the prescribed procedure.

- Carry out public relations-communications activities to educate staff, contractors’ staff and related stakeholders about RATCH’s policy, regulations, procedures, practices and safety cautions, to ensure correct implementation which will prevent harmful impacts on health, properties and environment.
- Temporarily suspend unsafe activities or activities in violation to safety rules and standards and demand corrections by related persons, supervisors and responsible departments.

Prevention and Tackling of Drug Use in Office

- Set rules and related measures.
- Demand employees’ engagement in preventing and solving drug use in office.
- Demand supervisors to be good role models, monitor and take actions against drug-related violations.
- Cooperate with the authorities through the submission of information and behaviors of individuals involved with drugs.

Safety Measures

- Set rules and practices and sufficiently and appropriately prepare safety equipment to prevent loss of life and properties to employees and the company.
- Keep work environment safe, identifying and reporting signs of violence at workplace.
- Verify the history of new employees and contractors as allowed by law, to watch out against possible violence/terrorism.
- Notify supervisors if witnessing any irregularities which may affect safety measures.

RATCH has regularly improved the policy and measures on safety, occupational health and environment, while tackling below-standard circumstances and putting strict control on activities risking danger from machinery, equipment, fire and chemicals. Focus is placed in particular on the operations at power plants, where offensive or preventive measures are imposed and all staff are repetitively reminded of “Safety First” to limit and reduce possible risks to life, properties and the Company’s reputation.

Operational Risk Management

Hazard level of risky jobs at Headquarter and power plants are evaluated, particularly power plant maintenance which involves a large number of staff and outsiders and demands strict compliance with safety-related risk management process.

At Headquarter, danger is identified in 27 jobs, chiefly involving the maintenance of electrical equipment, the cooling system, passenger elevators and ceilings. The assessment in 2017 showed the hazard level of the 27 jobs was low to very low, thanks to appropriate and sufficient operational measures as well as necessary safety equipment.

At Ratchaburi power plant and Tri-Energy power plant, RATCH’s principal power plant and a subsidiary which have been running for more than 10 years, international risk management practices have been applied to ensure full generating efficiency and safety to workers, communities and the environment.

Ratchaburi Power Plant’s Operations

In 2017, Ratchaburi power plant reviewed job risks and arranged them in new categories. A total of 1,006 tasks were reviewed and 345 were found to carry medium to high risks. Special safety measures and practices were set accordingly.

Accidents from any tasks which are assessed for possible risks and have special risk prevention and reduction measures demand an investigation by all involved and risk reassessment, to define additional preventive measures and prevent recurring accidents.



Sample of personal injuries in 2017: 1 incident

Incident: A gutter cleaning worker slipped from a beam and fell off to the gutter.

Impact: The worker suffered minor injuries and returned to work after treatment.

Correction: Identify further risk factors

- Preventive measures:**
- 1) Adjusting work process, by having weeds in gutters removed by cranes rather than human. Workers no longer need to stand on beams and clearing the weeds.
 - 2) Educating workers about risks and safety measures.

Next Operational Planning

In 2018, Ratchaburi power plant plans to conduct a new round of risk assessment of all activities/tasks, to ensure the comprehensiveness of safety measures and maximum efficiency and effectiveness of accident-prevention measures.

Tri Energy Power Plant's Operations

Tri Energy power plant assessed the risks of 291 tasks in 2017 and 109 tasks posed medium to high risks. Additional safety measures were improved accordingly.

Sample undertakings

Task	High Voltage Maintenance
Risk level	Medium
Danger points	<ul style="list-style-type: none"> • Workers are physically unfit. • Insufficient skill and knowledge • Inspecting equipment is damaged. • Material misuse (tapes and power conduits) • Static electricity caused by dry weather • Equipment is wet due to rain.
Prescribed measures	<ul style="list-style-type: none"> • Check workers' physical fitness and arrange annual medical examination for staff and contractors • Train employees, seal the areas from unauthorized persons, and install warning signs • Check equipment before use • Finish wire grounding and check the ground and equipment connection • Wear suitable personal protective equipment prior to embarking on any high voltage-related tasks
Control and monitoring measures	<ul style="list-style-type: none"> • Review annual medical examination results • Check equipment inspection stickers before starting work • Conduct job safety analysis and assign supervisors to narrate the type of jobs, process, duties, danger, risks and the must-do and must-not-do lists. (Tool Box Talk) • Review the grounding inspection report • Check wire grounding prior use

The undertakings significantly rendered safety and reduced work-related incidents to staff and contractors.

Safety Rules for Suppliers and Contractors

RATCH is determined to continually ensure safety to the workers of suppliers and contractors, as part of responsibility to stakeholders as stated in the Code of Conduct and a material factor towards corporate sustainability.

RATCH lays down clear rules and practices for contractors or outsiders working in office or power plants for the safety of life and properties of the contractors' and the Company's staff.

For work at Headquarter, the practices laid out for contractors cover 9 main points.

- Strict compliance with safety laws and RATCH's regulations on safety, occupational health and environment.
- All workers must attend the building's safety training.
- Workers must wear personal protective equipment suitable for their work.
- Preventive measures are required for use of

flammable materials or flammable chemicals inside the building and hot work, they must strictly follow the procedure.

- They must produce legal permits for risky jobs such as work in high places or in confined spaces and must strictly follow legal procedures.
- Workers below 18 years or illegal workers are prohibited from working inside the premise.
- All are prohibited from drinking all kinds of alcoholic beverages and using all kinds of narcotics inside the premise or prior to entering working areas
- All must follow the building's safety regulations like the wearing of personal badges at all time while performing their jobs or inspection of all vehicles entering or exiting the building.

At power plants, general safety rules are in place which must be strictly followed by all workers, contractors and outsiders, to prevent accidents or alleviate the severity of possible dangers. Key practices are as follows:



Check and use good-conditioned tools and equipment suitable for the jobs. Damaged tools and equipment is prohibited.



Follow safety rules, regulations, orders, warning signs, advice and safety symbols, as well as specific job rules and specific area rules.



Risk jobs like those involving sparks or heat, high places and confined spaces require danger identification, risk assessment and asking permission every time.



Always wear personal protective equipment suitable for their jobs.



Properly dressed, wearing organization uniforms.



Supervisors at all levels must ensure their subordinates' strict compliance with safety rules.



Immediately notify supervisors when witnessing unsafe or below-standard incidents, circumstances or actions, so that further corrective and preventive measures can be defined.

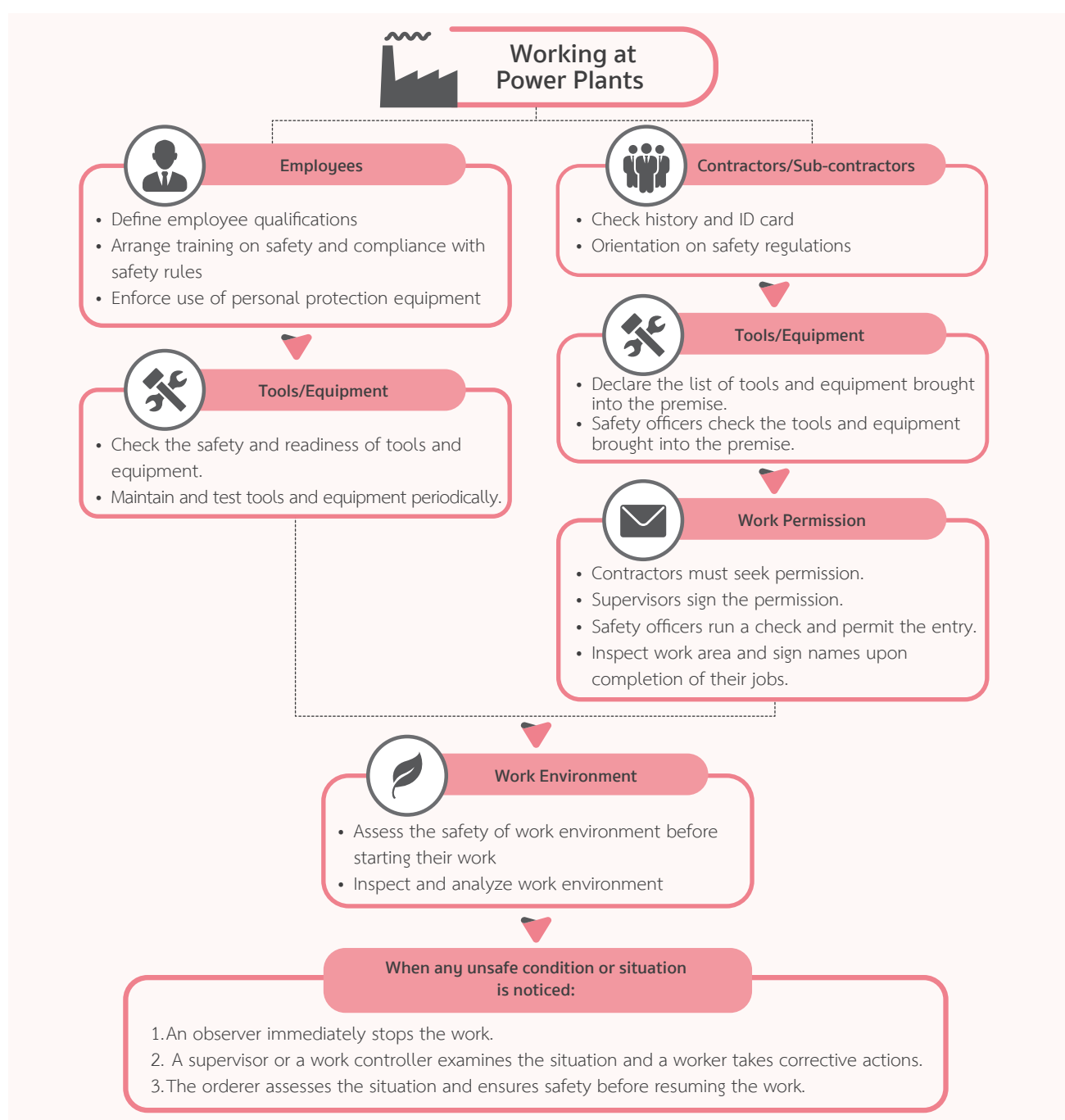
Work Instruction for Safety

For safety, work periods must be set, aside from safety measures and equipment to reduce accidents or the severity. RATCH sets suitable work procedures accordingly to work periods, properly sets rules on equipment, and prepare work environment and monitoring process to ensure operations in the safest and standard condition.

During the daytime when the building is filled with people, contractors are advised to avoid causing disturbances like noise, smells, or dust. Any jobs to cause the pollution must be carried out after office

hours, including hot work which may cause fire and requires control on the moving of flammable objects, fuels and indoor welding. Strict control measures on such activities are necessary.

Whenever work condition seems unsafe, the supervisors must immediately suspend the jobs and have workers correct the situation. The jobs can resume only when the condition is corrected. Job inspection has played a key role in reducing accidents.



Promote Corporate Safety Culture

RATCH and all power plants have continually run campaigns to raise and instill safety awareness, covering knowledge sharing, training, seminars and activities. Guiding the campaigns is the Safety, Occupational Health and Environment Committee through which RATCH and employees work together in changing attitudes and behaviors and establish

a safety trait when safety is incorporated into their life at work and at home.

RATCH and power plants also stage annual Safety Day to further educate and raise awareness in danger and risk prevention and hygiene at work and in everyday-life activities.

Key Activities in 2017

Safety Talk at Ratchaburi Power Plant

Principle

The activity was kicked off in 2017 as a channel to communicate and educate workers on the power plant's safety practices and measures, particularly on power plant maintenance that involves a large number of the Company's staff and staff of contractors and sub-contractors as well as various tasks with various risk levels.

Process

- In 2017, Ratchaburi Thermal power plant unit 1 underwent minor inspection for a period of 40 days.
- Safety and occupational health officers at supervisory and professional levels meet workers every day before kicking off the power plant maintenance.
- Possible dangers were explained along with preventive measures applicable to all, particularly ones involving machinery, personal protective equipment and safety rules and regulations that all must strictly follow.
- The talk was aimed at preventing work-related accidents and establish positive safety culture.

Outcome

- Throughout the minor inspection period, Safety Talk was conducted by officers at supervisory level at the start of the day every day.
- Zero accident occurred during the minor inspection of Ratchaburi Thermal power plant Unit 1.



Executive Meeting with Staff, Ratchaburi Power Plant

Principle

The power plant's minor inspection involved a massive number of staff and machinery. Ratchaburi power plant's executives took this opportunity in communicating and exchanging opinions with staff as well as restressing the importance of safety at work and everyday life, viewing this as a start of quality and safe operations.

Process

- Weekly activities were held during the minor inspection, from August through December 2017.
- The executives of Ratchaburi Electricity Generating Company Limited and EGAT's Operation & Maintenance unit held a meeting with staff, discussing compliance with safety rules and measures and their routines like working in high places and confined spaces and safe use of vehicles in the premise.
- A contest was held to award internal units or contractors which met safety standards through 2 assessments. In working in confined spaces, for example, the form must be completely filled and supervisors must be presented along with a sign designating the confined spaces. In working in high places or erecting scaffolds, operators must follow through the scaffolding safety manual by wearing safety belts and showing a permission sign.
- The executives discussed safety and occupational health issues with operators and responded to their queries.

Outcome

- No accident leading to work stoppage occurred during the minor inspection in 2017.

- The executive and staff meeting opened ground for discussions. While executives saw points to be improved, operators became less doubtful and worried. The meeting improved work atmosphere and operators were more aware of safety.
- The units in charge of work in confined space and in high places/scaffolding met basic requirements and won 14 awards.



“The executive and service worker meeting was recognized by our executives and those at EGAT, our contractor, as a key campaign to promote safety. Full attendance was registered at weekly meetings. This campaign is to reiterate the management’s concerns about all those working at the power plant and our goal to ensure the safety of all. We open to service workers’ recommendations, to build positive working relationships and improve the work atmosphere.

“... Once safety is always in their mind, that reflects zero accident, as witnessed during the minor inspection in 2017.”

Mr. Nimit. Lekcharoensuk, Managing Director of Ratchaburi Electricity Generating Company Limited, shared his view about the meeting with minor inspection service workers at Ratchaburi power plant in 2017.

Safety Walk Down at Ratchaburi Power Plant

Principle

This program is designated as a measure to supervise, monitor and inspect compliance with the power plant’s safety rules concerning the operation and maintenance at Ratchaburi power plant during the major overhaul, minor inspection and unplanned outage.

Process

- The Safety, Occupational Health and Environment Committee, consisting of the company’s executives, operators and safety officers as well as EGAT’s O&M unit representatives, explored the safety and work environment at maintenance areas on a weekly basis.
- Key points to watch:
 - Sealing off the work area
 - Equipment placement
 - Scaffolding
 - Equipment or work area tagging
 - Chemicals deployment
 - Complete use of personal protective equipment
- Unsafe situations were reported to related persons for immediate rectification.

Outcome

- 35 unsafe situations were spotted including no sign at a confined space, placement of hazardous waste in the work area, and below-standard scaffold erection.
- The spotted unsafe situations were 100% rectified.

Near Miss Reporting at Ratchaburi Power Plant

Principle

This program is designated as a measure to prevent accident or incidents at the power plant, covering the generating and maintenance operations which involve a massive number of machinery, tools, equipment and service workers. The preventive measure is necessary as such operations have the potential to cause undesirable incidents or near misses.

Process

- A writing contest “See Near Miss, Report it” was organized.
- All operators are engaged to prevent accidents.

Outcome

- 3 near misses were reported.

<p>Near miss 1</p>	<p>A sub-contractor's truck hit a CCTV post while taking a turn in a narrow spot.</p>	<p>Correction-Prevention</p> <ol style="list-style-type: none"> 1. Replace the damaged post and camera bracket. 2. Use trailers to transport equipment at next maintenance rounds.
<p>Near miss 2</p>	<p>Unstable voltage was found at the control room's computer cover. Incomplete electrical grounding was suspected.</p>	<p>Correction-Prevention</p> <ol style="list-style-type: none"> 1. Suspend printing. 2. Replace the computer power cord, using one with grounding connection. 3. Check printers at all units. 4. Fix electrical cords connected with ground wires and the main electrical system box's neutral point. Inspect remaining boxes.
<p>Near miss 3</p>	<p>Equipment fell from the 5th floor while a sub-contractor adjusted the support beam. No injuries were reported as the ground area was sealed off for the movement of equipment.</p>	<p>Correction-Prevention</p> <ol style="list-style-type: none"> 1. Always review the work process with service workers before the work starts. 2. Install blankets to reduce accident risks.

EHS Stand-down Day 2017 at Tri Energy Power Plant

Principle

This is organized under the concept "Life Saving principles...Follow safety rules to stay safe", to communicate life saving principles to executives and operators and engage them with the work-related risk assessment.

Process

- The Hazard Hunt and Risk Reduction Projection Project Activity was organized to brainstorm staff's ideas in assessing and spotting work related dangers as well as recommending preventive measures to reduce risks or the severity.

Outcome

- All operators attended the activity.
- All hazards discovered were awarded and included in preventive measure planning. For example, the overhead crane safety warning light was not working while the crane was functioning, and damaged electrical system was found as the cause.
- To prevent/reduce risks, the mechanic was called in and the crane working overhead sign was clearly installed. The hand signs for crane operation were correctly set.

Tri Energy power plant prides itself as an exemplary world-class power plant in terms of safety management, through the full-scale adoption of the protocol of General Electric, a leading power plant operation and maintenance service provider.

In 2017, Tri Energy power plant maintained the statistics that throughout **2 million man hours**, no accident causing work stoppage was reported.

EHS STAND DOWN DAY 2017

2.0 million man-hours without LTI celebration

23 May 2017

Life Saving Principles

“ปฏิบัติตามกฎ SAFETY ชีวิตดีมีความปลอดภัย”

STOP WORK
You are the last line of defense.

Promote Safety Knowledge Among Operators

Process

To enhance knowledge and understanding in safety among employees and contractors, ensuring their ability to assess and prevent risks and dangers at work and at home.

Process

- 6 safety training courses were organized for employees at Headquarter and Ratchaburi power plant.
 - Legal Knowledge in Safety for the Safety, Occupational Health and Environment Committee.
 - Defensive Driving for employees.
 - Automated External Defibrillator (AED) for employees.
 - Basic Fire Fighting for employees.
 - First Aid & CPR for employees.
- A technical training on scaffold erection and inspection for the staff at Ratchaburi power plant and EGAT's Operation and Maintenance unit. Attended by 32 participants, the training aimed to improve equipment safety.

- To ensure safe driving at Ratchaburi power plant and Tri Energy power plant, executives, operators, contractors and sub-contractors are required to wear safety belts while driving. Motorcycle riders must wear helmets, turn on head lights and keep speed at 40km per hour at Ratchaburi power plant or 20km per hour at Tri Energy power plant.
- Prepare personal protective equipment at Headquarter and power plants, including anti-smoke face masks for employees, contracted employees, security officers, and cleaning workers and organize training for correct use and maintenance of the personal protective equipment.

Outcome

- The activities were attended by 145 employees.
- Attendants included 3 contractors/outsideers.

Safety Statistics in 2017

Due to the aforementioned safety activities, RATCH and its 2 principal power plants-Ratchaburi power plant and Tri Energy power plant-witnessed no accident that led to work stoppage or loss of life among employees and contractors' staff.

Tri Energy Power Plant

No. of accidents leading to loss of life among employees and contractors' staff

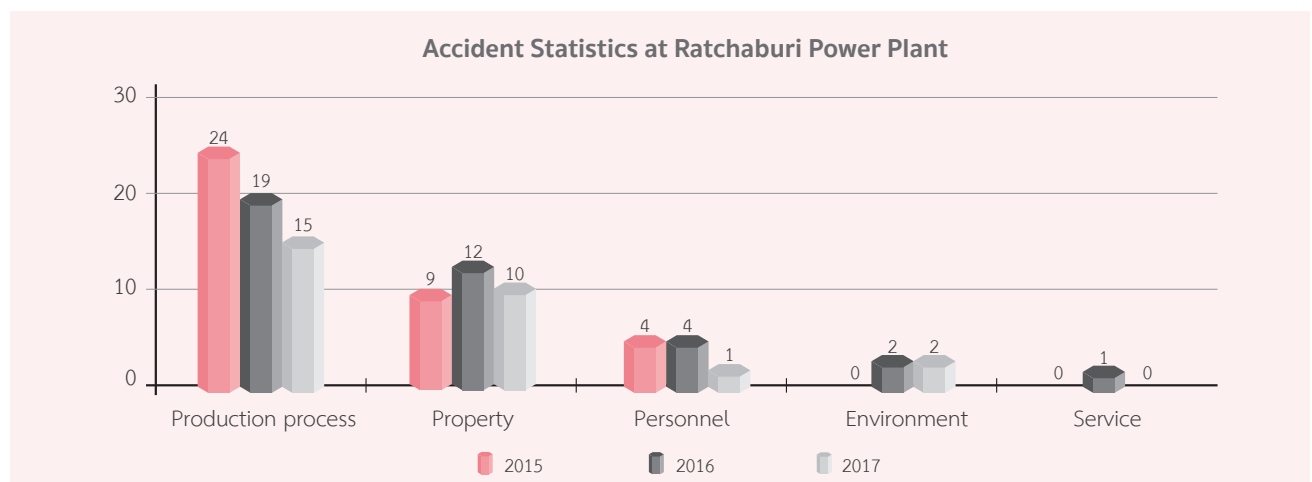
0 per 2 million man hours

No. of accidents leading to work stoppage among employees and contractors' staff (Disabling Injury Frequency Rate)

0 per 2 million man hours

Ratchaburi Power Plant

Ratchaburi power plant witnessed 28 accidents in 2017, a 36% decrease from 10 accidents in the previous year. Only 1 personal accident was reported, involving a contracted cleaning worker at the thermal power plant who slipped but needed not to stop working. As such the Ratchaburi power plant's Disabling Injury Frequency Rate (IFR) remained at 0.



Headquarter

The strict enforcement of RATCH's safety rules on operators, contractors and sub-contractors performing their duties at the Headquarter kept the Disabling Injury Frequency Rate (IFR) at 0.

Contingency Plan

RATCH has regularly reviewed and improved the contingency plan along with regular emergency exercises to ensure operators' understanding and efficient preparation for emergencies, aside from safety measures covering multi-faceted operations in line with the OHSAS 18001: 2007 standard.

Emergency exercises conducted in 2017 were as follows:

Emergency	Ratchaburi power plant	Tri Energy power plant	Navanakorn power plant	Headquarter
	No. of exercises			
Fire and Explosion Level 1	29	1	3	1
Fire and Explosion Level 2	2	-	1	-
Fire and Explosion Level 3	-	-	-	-
Gas leak	4	-	2	-
Oil leak	1	-	2	-
Chemical leak	4	1	3	-
Radiation leak	1	-	-	-
Waste/sewage transfer	-	-	-	-
Natural disasters (storm/flood/earthquake)	1 (Flood)	-	1 (Flood)	-
Epidemic	-	-	-	-
Snake bite	-	1	-	-
Sudden elevator stop	-	-	-	12
Bomb threat	1	-	-	-
Community demonstration	-	-	-	-

Promote Employees' Quality of Life

Aside from safety, RATCH encourages employees to maintain their physical and mental health while improving the work environment for employees' hygiene and safety, to guarantee employees and contractors' staff a quality of life.

In 2017, RATCH launched various activities to raise awareness in well-being among employees.

Headquarter

- **5S and Big Cleaning Day activity**

Calling for all employees' engagement in regularly keeping their workplace in order and sustaining workplace hygiene helps reduce work-related diseases.

A number of 159 employees or 94.08% of all working at Headquarter passed the 5S practices.

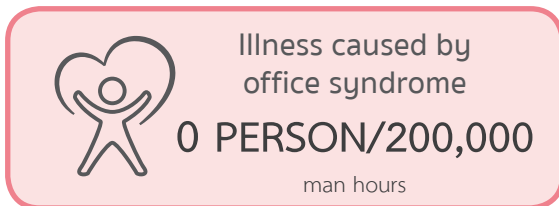
- **RATCH GO GREEN @Work activity**

This project promotes awareness in work related safety, healthcare, work environment and energy conservation to alleviate global warming. This year’s activity emphasized office syndrome and noncommunicable diseases (NCDs). 129 attendants covered employees, contracted employees and building tenants.

At Best Suggestion Award 2017, all employees were given an opportunity to submit their recommendations how RATCH should improve work environment, safety and occupational health. The recommendations collected through the activity covered 19 areas.

The recommendation awarded and turned to action concerned a safety issue: RATCH was recommended to switch the entrance and the exit on holidays as the visibility of the original entrance and exit was blocked by a bridge and trees.

Headquarter’s Illness Statistics



Ratchaburi Power Plant

Stay Healthy, Safe for One’s Well-Being

Principle

To promote employees’ well-being, reduce NCDs and injuries, and keep them safe from work and environmental impacts while sustaining mental health.

Process

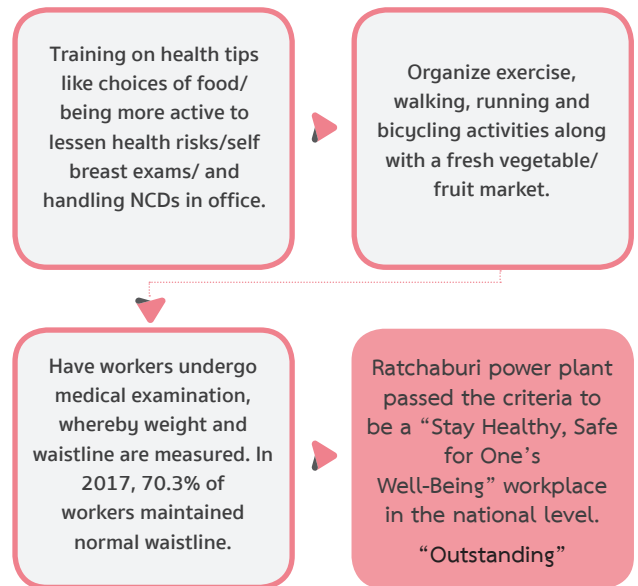
- Participating the “Stay Healthy, Safe for One’s Well-Being” project initiated by the Department of Disease Control, Ministry of Public Health, which entails public and private-sector networks.
- Assess risk factors that cause illness and major health risks of employees.
- Assess and tackle health risks in an integrated way, having operators’ engagement in health and environmental undertakings between the organization and communities.
- Provide medical examination to employees and keep all individual employees’ medical records.

- Define measures to continuously monitor employees’ health like the schemes to prevent drug use or to help them quit smoking.

Outcome

- Ratchaburi power plant’s health activities under the “Stay Healthy, Safe for One’s Well-Being” passed the project’s criteria, recognized “Outstanding” at the national level.

Activities under this project



Hearing Conservation Program

Principle

A running program to lessen work-related hearing-loss risks in the initial stage and to define measures to maintain operators’ hearing ability.

Target

Reduce the hearing loss of operators exposed to high noise levels to under 15 dB(A) on either side

Results achieved in 2017

- Noise levels were tested at 428 points inside the power plant.
- Noise levels at 75 points did not pass the standard. The causes were fixed and specific-area measures were launched like installing a warning sign at areas where noise was above maximum legal permissible levels, wearing personal protective equipment and limiting a period of work in areas with high noise levels to lessen the exposure.
- The hearing test of all operators exposed to high noise levels showed hearing loss under 15 dB(A) compared to the previous year, in line with the target.

Organizational Development and Employee Engagement



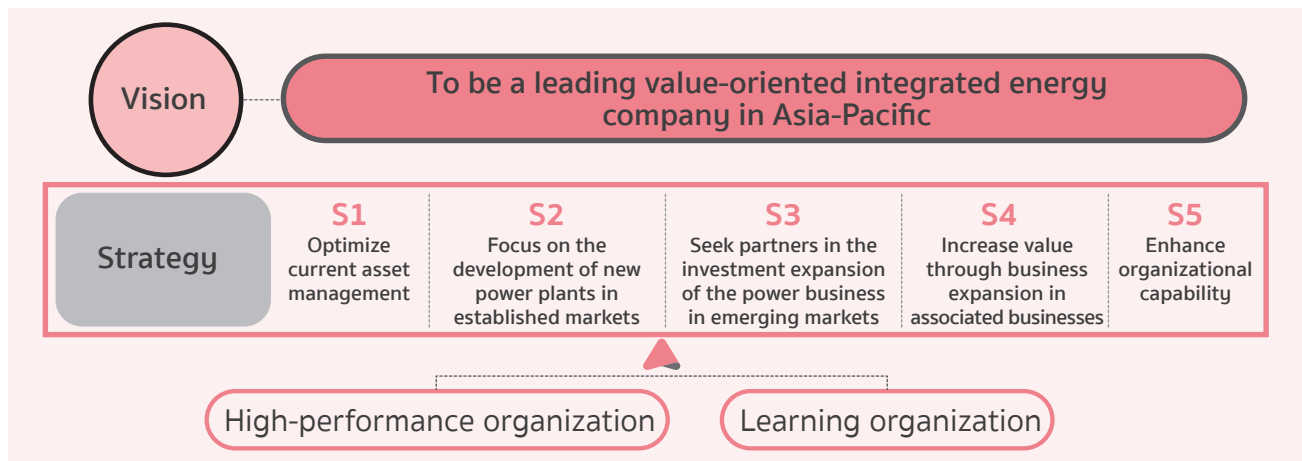
Employees constitute a crucial force that drives a company's success and sustainability. Equitable and fair treatment is therefore the norm for treating employees and other stakeholders. RATCH has set clear guidelines on employee treatment in its Code of Conduct as summarized below:

- Focusing on thorough and regular personnel management and development to ensure that all employees are skilled and knowledgeable
- Providing fair remuneration and welfare competitive with other leading companies
- Strictly complying with labor-related laws and regulations
- Maintaining a safe and accommodating work environment under occupational health principles
- Fairly and equitably appointing, rotating, rewarding, and penalizing employees in good faith based on

their knowledge, capability and qualifications

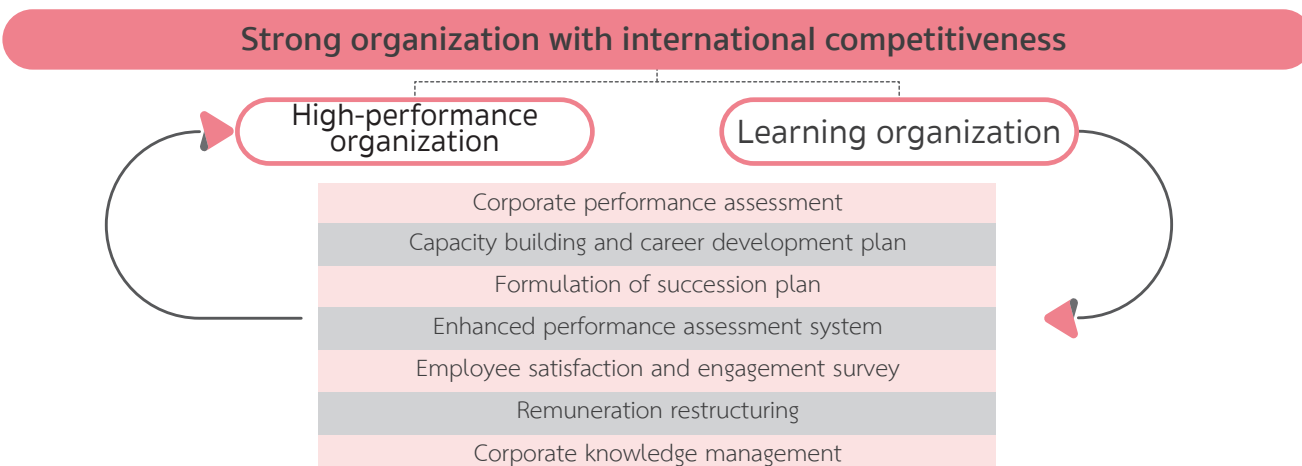
- Listening to comments and suggestions based on employees' professional knowledge
- Treating employees with respect for individuality and human dignity
- Avoiding unfair practices that may affect employees' job security, threaten their mental state, or pressure them
- Employees can file complaints if they do not receive justice as indicated in RATCH's system and process.

Human resource management mainly responds to the corporate strategy to strengthen the organization, which will expand the business and drive RATCH's growth. The goal is to create a high-performance organization and learning organization, leading to the corporation's higher competitiveness.



Performance in 2017

The implementation focused on enhancing and developing the system of human resource management and development, to turn RATCH into a high-performance organization and learning organization. Below are the key tasks implemented in 2017:



Corporate Performance Assessment

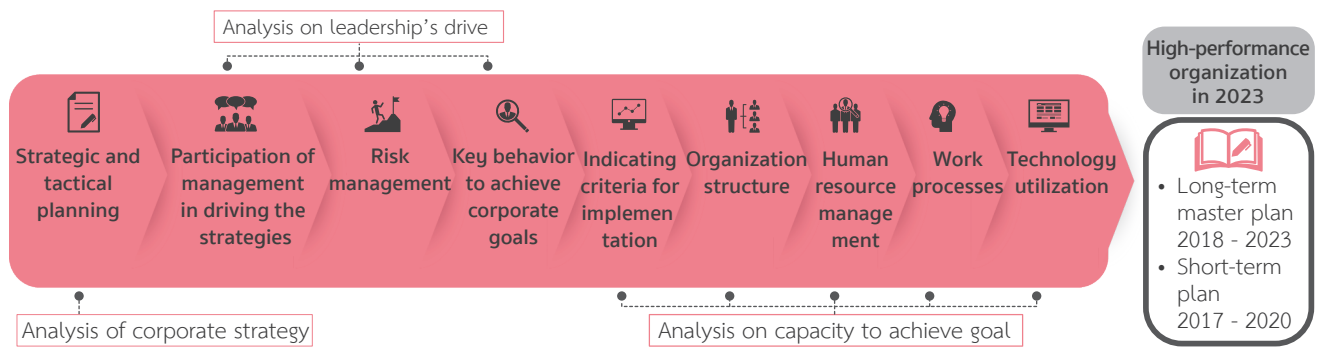
RATCH's adjusted strategies geared toward business growth and market expansion, leading to more investment opportunities. However, competition and rapid technological change pressured RATCH and challenged its capacity to achieve goals and meet expectations. Therefore, reinforcing the internal strength was a pivotal strategy that must be driven in line with business goals.

RATCH introduced the concept of high-performance organization to develop and enhance the efficiency of every part of the organization. This idea was jointly driven by leading consulting specialists and implemented this year.

Performance

To assess its gaps, RATCH analyzed nine key components of a high-performance organization by comparing its current status with leading domestic and international organizations.

Corporate Performance Assessment Process



By analyzing and evaluating the potential gaps that prevent it from being a high-performance organization, RATCH formulated a long-term master plan (2018–2023) and a short-term stimulating plan (2017–2020) with three key points as seen below:

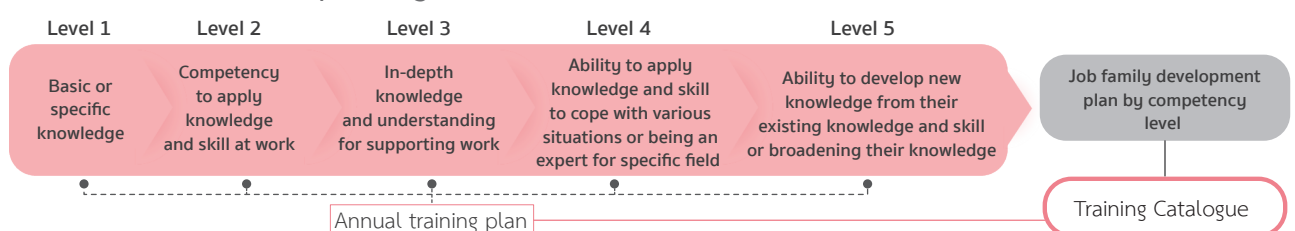
- 1) Alignment of strategy: Every part of the organization must head toward the same direction to achieve shared goals.
- 2) Building future capabilities: This aims to enable the employees to efficiently and effectively serve corporate strategies and growth targets.
- 3) Communication and collaboration enhancement: It focuses on cross-functional team and the flow of information to related departments to ensure effective operation and achieve corporate goals.

Three issues were used to define division, department and individual KPIs to seriously turn the plan into action, which will later evolve into a corporate culture.

Capacity Building and Career Development Plan

All employees expect career advancement, the key to retain the talents in the long term. RATCH has followed a career development plan, divided into 9 job families and 5 job groups, since 2016. In 2017, it continued the plan by enhancing the competency of each job family, classified into five levels. Based on this, RATCH would formulate a human resource development plan for each functional competency level.

Level of functional competency



In preparing career development plans, RATCH considers work-related knowledge and skills essential for each function from three channels: 1) Academic knowledge and skills essential for each competency level and acquired from additional study or courses, 2) knowledge transferred from internal and external coaching, 3) knowledge and skills gained from work experience, special assignment, rotation and on-the-job training.

The relationship between the goals of a career development plan and a functional development plan

Goal		
Organization	Career Development Plan	Training Road Map
Enabling employees to work	-	Employees should be trained to ensure that they have the knowledge and skills required for their duties
Enabling employees to work better	-	Employees should be trained to enhance their knowledge and skills and work better
Providing employees with career advancement	How can employees in each position grow? How long do they take to get better in each step?	Employees should be trained to make sure that they are ready to grow or advance as planned in the career path

Both plans will be fully implemented in 2018 as individual development plans (IDPs), together with the results of performance assessment and dialogue and feedback.

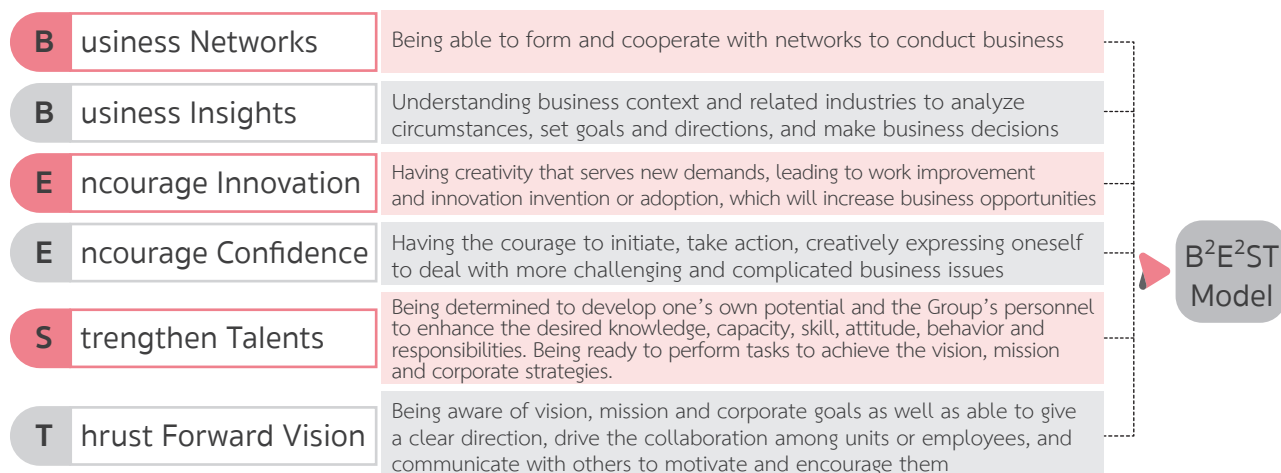
Formulation of Succession Plan

During 2017-2019, the retirement of 7 managerial employees (Executive Vice President and above) represents 50% of the management. RATCH therefore prepared a human resource development plan for the employees nominated as successors to enable them to seamlessly perform duties under their scopes of responsibility.

	2017		2018		2019	
	People	%	People	%	People	%
Number of managerial personnel to retire	2	14.29	4	28.57	1	7.14

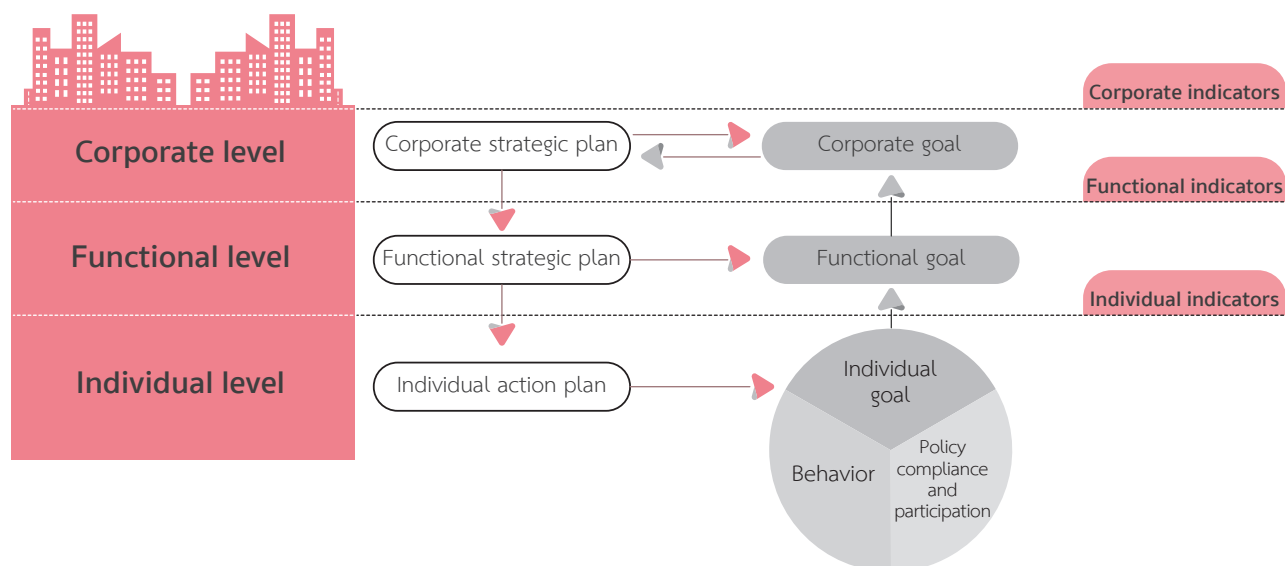
Outcomes

In 2016, middle-management executives (Division Head) attended courses instructed by leading institutes to not only enhance their knowledge and skills, but also exchange experience on hard and soft skills. They would then be promoted to top management to replace 3 positions as planned. In addition, RATCH prepared the employees to grow from generation to generation to ensure continuity at each level. The selected employees must pass RATCH’s Leadership Competency Evaluation under the B²E²ST Model so that RATCH has qualified leaders who better suited the new business approach.



Enhanced Performance Assessment System

In 2017, RATCH established the Performance Assessment Committee to set goals, oversee employees, propose guidelines, and monitor the evaluation to ensure proper and effective performance and engagement of every unit. It also enhanced the system to fairly assess the performance of management and employees in line with the Group's goals. RATCH cascaded KPIs from corporate goals to functions, units and individual employees to ensure that the work is aligned and moves in the same direction as corporate goals. This will help drive RATCH's mission to meet objectives and goals.



Aligned performance measurement throughout the corporation

Indicator (%)	Top Management	Operational Level		
		Division	Department	Employee
1. Corporate KPIs	70	30	15	10
2. Functional KPIs/assignment KPIs	30	20	15	10
3. Division's KPIs	-	30	20 (30)	10 (20)
4. Departmental KPIs	-	-	30 (-)	20 (-)
5. Individual KPIs	-	5	5 (25)	30 (40)
6. Activity/participation	-	10	10	10
7. Behavioral assessment	-	5	5	10
Total weight	100	100	100	100

Remarks: The figure in () represents the percentage weight in the absence of a department level.

In addition, RATCH developed an online human resources information system which allowed all employees to store, access, and learn these KPIs from corporate, function, unit to individual levels. This led to more effective overall evaluation. Behavioral assessment and employee participation were included in the new performance assessment system.

RATCH formulated a plan to promote more communication between supervisors and subordinates through dialogue and feedback so that the assessor and assessee might have a common understanding. This also served as a coaching channel to improve work effectiveness. Employees also received individual development plans (IDPs) to enhance their knowledge, capacity and skills under the career development roadmap in 2018.

Remuneration Restructuring

In 2017 RATCH studied the wage or remuneration structure by benchmarking it against peers. This aimed to evaluate gaps and make compensation rates more competitive so that RATCH would become an Employer of Choice. By the beginning of 2018, RATCH will adjust its remuneration base to suit each position and work experience.

For new hires, RATCH set criteria in compliance with labor laws. Business suitability, ability to motivate, economic conditions and the average wages of employees at all ages in every country were taken into account to fairly and equitably treat female and male employees.

In the past, RATCH paid more remuneration than the minimum wages and it suited the cost of living in each country. It also provided welfare that promoted the employees' life safety and security. In addition, employees assigned to work abroad received extra welfare such as home leave, life insurance for risky areas, health insurance, SOS assistance, and accommodation.

The remuneration rate of new hires compared to the minimum wage.

Level of Education	2017	2016	2015	2014
Lower than bachelor's degree (Time)	1.6	1.6	1.6	1.5
Bachelor's degree (Time)	1.4	1.4	1.4	1.3

Employee Satisfaction and Engagement Survey

High-potential employees are valuable assets of every organization. As a result, RATCH focuses on retaining this high-quality group, especially during this time when the labor market is highly competitive and causes a high job-changing rate.

In 2017, RATCH conducted its first employee engagement survey with the following objectives:

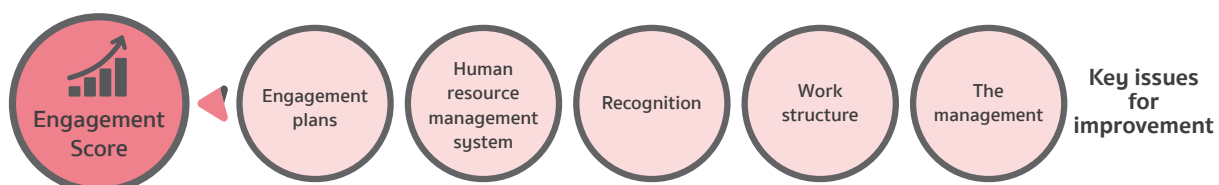
- To know the level of employee satisfaction and engagement with the organization.
- To apply the findings to define an engagement level equal to those of leading domestic and international organizations.
- To formulate a plan to significantly improve the engagement level.

Adopting a universally accepted assessment methodology, RATCH worked with a leading

consultant firm specialized on employee engagement and came up with 18 issues.

Performance

- Based on the findings, four key issues that must be addressed included those concerning the management, work structure, recognition, and human resource management system.
- Top executives attended a workshop with the consulting firm to develop an engagement plan.
- A goal to keep the employee engagement level aligned with peers' standard was set as the top priority.
- The findings of the engagement survey were communicated to all staff members.
- This issue was incorporated into work plans of functions, units and individual employees to tangibly drive engagement together.



Corporate Knowledge Management

RATCH has organized activities to enhance knowledge within the organization for three consecutive years. In 2017 it focused on not only knowledge and experience-sharing among employees, but also development of new knowledge by external organizations. RATCH focused on the trends of disruptive technology, which is affecting its business diversification patterns into new and related businesses.

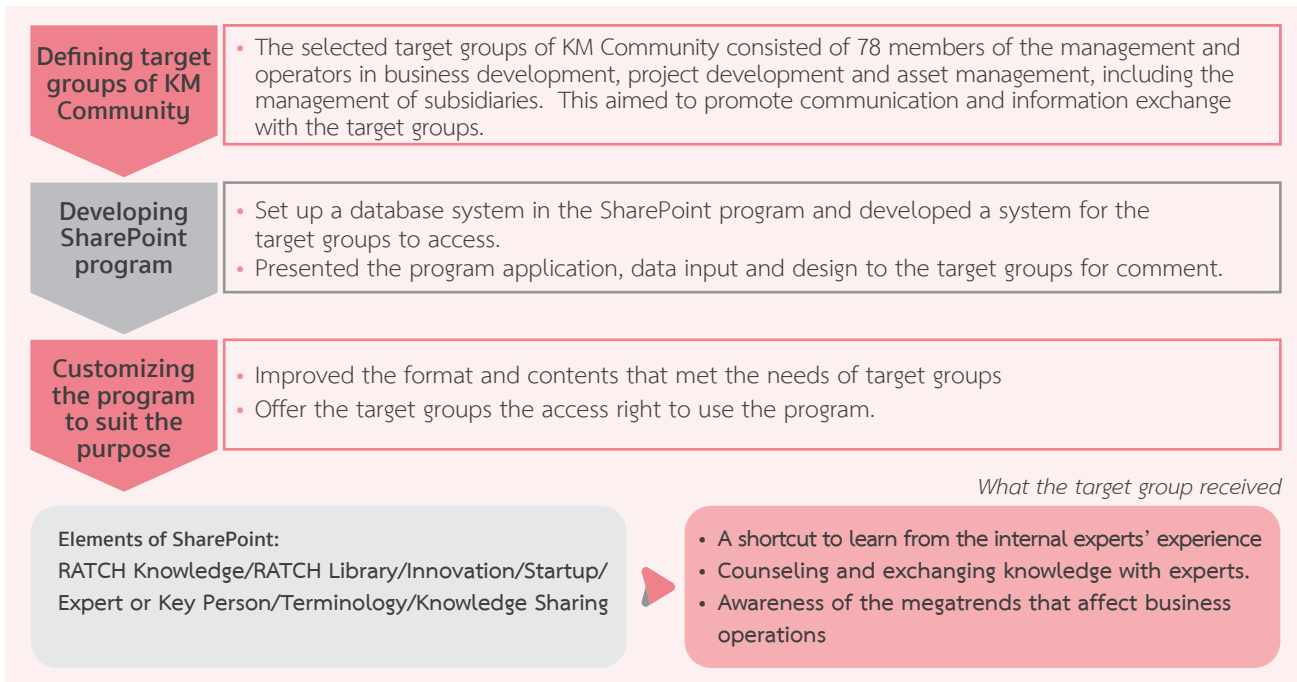
Last year RATCH organized three in-house and three outsourced knowledge-sharing sessions, which targeted the participants' satisfaction level and knowledge application at 75%. The results revealed a mean value of 93.5% as targeted. After each activity, the comments of target group, opportunities and challenges were summarized and proposed to the management for further consideration.

Topic	Expert's Name	Expert		Target Group (Function)	Level of Satisfaction and Work Benefit
		Internal	External		
1. Significance of power plant maintenance and enhancement of asset management efficiency	Mr. Rum Herabat Chief Executive Officer (27 March 2017)	✓		<ul style="list-style-type: none"> Domestic Business Development International Business Development Asset Management Plant Operators 	63% were very satisfied 34% were moderately satisfied
2. Disruptive technology	Pipat Luengnaruemitchai, Phd. Assistant Managing Director Phatra Securities Plc. (20 June 2017)		✓	<ul style="list-style-type: none"> Business Development Project Development Asset Management Mid-Management 	63% were very satisfied 25% were moderately satisfied
3. Risks and corporate risk management	Mr. Somnuk Jindasup Chief Asset Management Officer (5 July 2017)	✓		<ul style="list-style-type: none"> All functions 	75% were very satisfied 21% were moderately satisfied
4. Start-Up Business Model- case study of AddVenture by SCG	The management of AddVenture, SCG (28 July 2017)		✓	<ul style="list-style-type: none"> Business Development Project Development Asset Management 	40% were very satisfied 40% were moderately satisfied
5. Corporate Innovation through Design Thinking	Dr. Supachai Parchariyanon, RISE Academy (1-2 December 2017),		✓	<ul style="list-style-type: none"> Business Development Project Development Asset Management 	75% were very satisfied 25% were moderately satisfied
6. Inspection and supervision of hydroelectric power plant construction	Mr. Sirichai Aryuwat Advisor of Xe-Pian Xe-Namnoy hydro power project (21 December 2017)	✓		<ul style="list-style-type: none"> Business Development Project Development Asset Management Plant Operators 	93.3% were very satisfied 6.7% were moderately satisfied

KM Database Development with SharePoint

Because of the continuous knowledge-sharing sessions instructed by internal and external experts, RATCH switched the knowledge storage system from the Kool Keeper to the SharePoint program to ensure two-way communication with the target groups. This promoted knowledge-sharing between the experts and operators and among operators themselves and create the learning community.

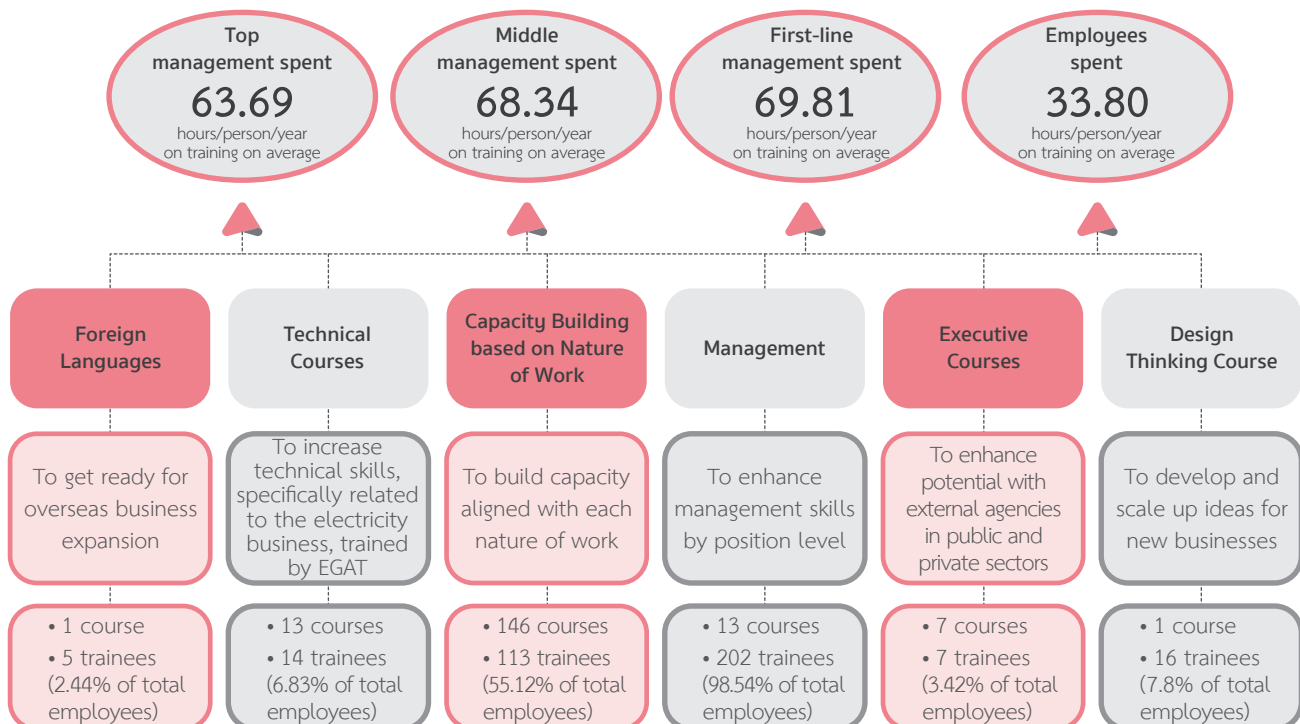
Step to Build KM Community



Personnel Development in 2017

RATCH is determined to enrich the required knowledge and skills for employees' work based on their position levels and nature of work. In 2017 the employees who attended in-house and external training sessions represented 94.15% of the workforce, exceeding 93% in the previous year.

- 181 courses and training sessions were divided into six categories, namely foreign language, technical courses, capacity building based on the nature of work, management, executive courses and Design Thinking course to transform RATCH into an innovative organization.
- Site visits were staged to enhance employees' experience and allow them to exchange ideas with experts who had hands-on experience, such as development of startup businesses with Bangchak Corporation PLC. and Siam Cement Group PCL.



In 2017 RATCH increased the target to enhance the essential knowledge, skills and abilities of operators at each level to improve their efficiency. At least 50% must attend training and the average performance was at 91.26%, which exceeded the target.

Position Level	No. of Operators	No. of Trainees	Target in 2017	Performance in 2017
			(% of Staff at Each Level)	
Top management	14	12	50	92.85
Middle management	38	32		86.84
First-line management	61	60		98.36
Employees	92	89		96.70

Remarks: RATCH had 205 employees (as of 31 December 2017)

Employee Stewardship

RATCH adheres to labor laws and other related rules and regulations as guidelines for employee stewardship on the basis of equality, fairness, and respect to the individuality and dignity of all employees. RATCH has developed work rules, which concerned government agencies have reviewed and checked compliance with labor laws for use as guidelines for employee stewardship. RATCH will review and revise the rules regularly to ensure that they are up to date.

Hiring

RATCH defines that employees must be from 18 to 60 years old. They should possess educational background and knowledge that match their positions, regardless of gender, religion, language, culture and belief, and economic and social status.

Type of Hiring

Type	Definition	Total (persons)
Probationary employee	A person who RATCH will hire as an employee but place him or her as a probationary employee for no less than 90 days, commencing from the first day of service until his or her performance is proved to meet the criterion/standard	6
Employee	A person whom a company agrees to hire as a permanent employee, and may be required to be on probationary period as defined in the regulation	199
Temporary employee	A person whom RATCH agrees to hire for a specific period of time, with fixed terms and contract conditions	3

Normal working day: RATCH prescribes Monday through Friday as normal working days, with normal hours up to 48 hours per week and one hour per day of break.

Holidays comprises 1) weekly holidays (Saturday and Sunday), 2) public holidays of at least 13 days, 3) annual leave for an employee who has been working for a year, from the first day of his probationary service, for 10 days per year, with full pay.

Leave

Type of Leave	Rules and regulations	Entitlement		
		Probationary employee	Employee	Temporary employee
Sick leave	Rules and regulations An employee is entitled to sick leave of up to 30 working days per year with pay.	✓	✓	✓
	In case of sick or accident stemming from work, RATCH will consider the leave period upon verification, on a case-by-case basis, but no more than one year. RATCH will pay him or her salary in full through the leave period, but no more than 90 days.	✓	✓	✓
Personal Leave	An employee is entitled to a maximum of six days per calendar year of personal leave with pay.	✓	✓	✓
Maternity Leave	A female employee is entitled to take a maximum of 90 days of maternity leave before and after the confinement with full pay but no more than 45 days.	✓	✓	✓
	A female employee who is pregnant can request a temporary job change, before or after the confinement, by submitting a medical certificate of a first-class doctor advising that she cannot perform in the current job. RATCH will consider this matter as appropriate.	✓	✓	✓
Military Service Leave	An employee can take leave for military service for inspection, military drill, or readiness testing under the law concerning military service. An employee must report and show the military notice to his or her line supervisor immediately.	✓	✓	✓
	RATCH allows an employee who receives the military notice to take leave with full pay through the leave period of no more than 60 days.	✓	✓	✓
Ordination leave and Hajji leave	A Buddhist or Muslim employee who has been working with RATCH for no less than three consecutive years from the first day of the probationary period, and has never taken an ordination or Hajji leave, is entitled to take leave for once, with pay for up to 100 days.		✓	
Sterilization Leave	A male employee is entitled to leave for sterilization or ill because of sterilization for a period prescribed in a medical certificate issued by a first-class doctor.	✓	✓	✓
Study or Skill Development Leave	An employee is entitled to take study leave in accordance with the prescribed rule as follows: <ul style="list-style-type: none"> • Training or development of his or her knowledge and skills for the benefit of labor and social welfare, or the increase in skills and expertise in order to increase effectiveness. Such training and development must have a program or course with a definite and clear duration. • Educational examinations organized by the government, excluding their further study. 	✓	✓	✓

Employee Welfare

Welfare	Benefit Entitlement	Entitlement		
		Probationary employee	Employee	Temporary employee
Social Security Fund	An employee must be self-insured. RATCH and employees will each pay contribution to combine with the contribution that the government pays to the Social Security Fund at the rates prescribed by the law for the expense of welfare and benefit employees are entitled to.	✓	✓	✓
Compensation Fund	RATCH will contribute to the Compensation Fund as defined by the law to ensure that employees receive medical treatment, physical and mental, in case of injury or death.	✓	✓	✓
Life and Accident Insurance	RATCH provides employees with life and accident insurance in accordance with its prescribed rule.	✓	✓	✓
Health Insurance	RATCH provides health insurance as basic health care expenses in the hospital and other related expenses at the rate prescribed in its rules and regulations. The insurance covers an employee's spouse and children by law (but of them) no more than two from below the legal age to the last legal-age year.	✓	✓	✓
Annual Medical Checkup	RATCH pays an employee for an annual medical checkup for the amount as prescribed in its rules and regulations.	✓	✓	✓
Dental, Eye Disease Expenses and Vaccination	RATCH pays an employee as prescribed in the rules and regulations.	✓	✓	✓
Maternity Allowance	RATCH pays for the maternity expense of an employee or spouse as prescribed in the rules and regulations.	✓	✓	✓
Housing Interest Subsidy	An employee who has been working with RATCH for no less than two consecutive years from the first day of the probationary period is entitled to apply for monthly housing interest subsidy at the rate of 40% of the monthly interest collected by a bank or a financial institution. The loan must be no more than 40 times of his or her monthly salary and up to 4 million baht.		✓	
Emergency/Compassionate Loan	RATCH provides fund from its revenue to an employee who is in need of a loan for the activities as follows: <ul style="list-style-type: none"> • Children's education • Funeral expenses of spouse, father, mother, son or daughter, or those who are in the custody of the employee • Expenses arising from his or her natural disasters or public disasters 		✓	

Welfare	Benefit Entitlement	Entitlement		
		Probationary employee	Employee	Temporary employee
Public Disaster Loan	RATCH provides loan to an employee who is in need as prescribed in the rules and regulations.	✓	✓	✓
Funeral, Cremation and Welfare Allowance and Wreath Offering	RATCH provides cash assistance to an employee in case of his or her death or the death of a family member as prescribed in the rules and regulations.	✓	✓	✓
Provident Fund	RATCH has set a provident fund for employees under the provisions of EGAT's Provident Fund	✓	✓	

Termination of Employment

RATCH's work rules prescribed the termination of employment to 1) death, 2) resignation, 3) completion of contract, 4) retirement on reaching 60 years of age, and 5) termination by RATCH. The procedures and criteria for severance and special severance pay are clearly defined.

According to the company's regulations, those retiring at the age of 60 shall receive the compensation at the rate specified by law. The company annually calculates and allocates a budget for supporting the retirement.

When an employee reaches 60 years of age, RATCH may consider hiring him or her for a specific job under a fixed-term contract. In 2017, RATCH hired 2 persons (33.33%) out of 6 of retired employees for specific jobs.



Activity; Corporate Innovation through Design Thinking

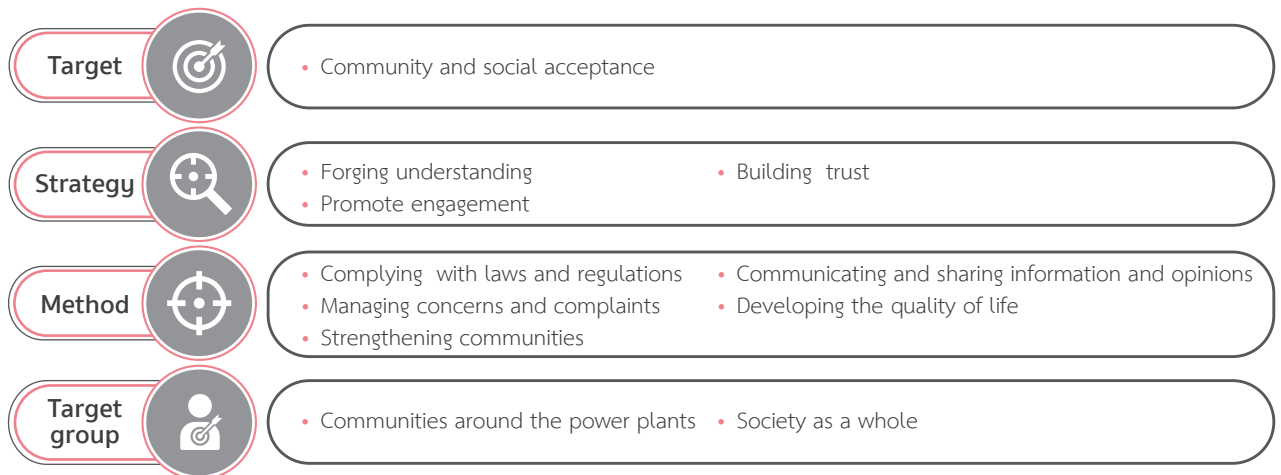
Community and Social Stewardship

For the power generation business, community and social acceptance is the key to success. This is because power plant development starts with an EIA required by law, with participation of surrounding communities that are the major stakeholders. The stakeholders must be well informed and able to share their concerns and make recommendation. The project managers must study their concerns and define measures, preventive and corrective, to efficiently lessen community impacts during construction and operation. All measures defined in the EIA must be followed seriously and respectfully throughout the concession period

With about 25 years of each power plant operation, good relationship with communities is vital for both sides. RATCH therefore strongly shows its intent to be a good neighbor by forging understanding, trust, and community participation by ways of compliance with the law and community development

Besides communities in the vicinity, society as a whole bears indirect impact from power generation, the basic infrastructure of economic and quality of life development.

Community and Social Operation Framework



In 2017, RATCH's power plant operated its business in line with the above framework. Compliance with laws and following the measures set forth in the EIAs are its fundamental achievement. Other significant activities in 2017 can be summarized as follows:

Sharing Information and Opinions

Approaches and implementation consist of three major aspects:



Achievement of Ratchaburi Power Plant and Nava Nakorn Electricity Generating (NNEG) Power Plant

- 3,645-MW Ratchaburi power plant started to generate electricity in 2000, with 17,295 households its responsible communities, covering 84 villages, 9 tambon in Amphoe Mueang, Amphoe Photharam, Amphoe Damnoen Saduak, and Amphoe Bang Phae of Ratchaburi
- NNEG Cogeneration power plant, with an equity capacity of 55.65 MW (40% sharholding by RATCH) commenced its power generation in 2016, having 54,493 households in its responsible communities, covering 55 villages, 4 tambon in Amphoe Mueang, Pathum Thani.

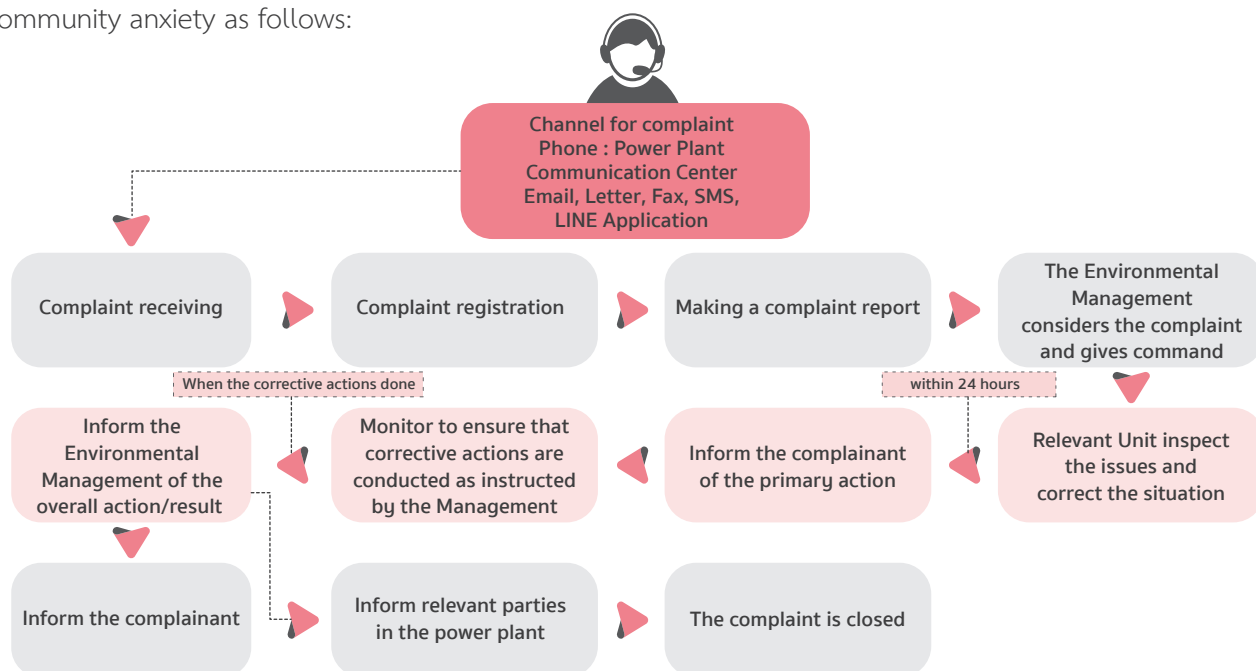
Method	Activity	Objectives	Outcomes
Ratchaburi power plant			
Community Visit	Field visit	To listen to their opinions and concerns, and build relationship	<ul style="list-style-type: none"> Field visits to 84 villages in 9 subdistricts, 4 districts
Knowledge and information sharing	Communication for Strengthening Relationship, Community Engagement, and Happy Society Project	To enable target communities in nine tambon to understand power plant operation	<ul style="list-style-type: none"> Nine activities organized, with 479 participants. 92.78% of the participants had better understanding of power generation processes, fostering a positive attitude
	Welcome to Our Home (Chuan Phuen Yuen Ban) Project	To forge understanding of power generation. Target groups were women and farmers in four districts of Ratchaburi	<ul style="list-style-type: none"> 390 participants, of whom 199 were from the women group and 191 from the farmer group 95.36% had better understanding of power plant operation
	Environmental Inspector Project	To enhance knowledge about monitoring, inspection, and environmental management of the power plant, and to be able to transfer knowledge to their communities	<ul style="list-style-type: none"> Organized training on “laws and water quality inspection” Organized a study visit for 20 environmental inspectors on environmental management of Mae Ku Waste power plant in Tak The environmental inspectors jointly observed the environmental quality monitoring of the power plant with external agencies.
Media and communication channels	<ul style="list-style-type: none"> Letter SMS LINE application 	To update people on operation related information of the power plant	<ul style="list-style-type: none"> Message receivers were village headman, Subdistrict headman, Chief Executive of Administrative Organization (SAO) and mayors of nine Subdistrict Municipality around the power plant Number of SMS messages: Six Number of letters to community: Five Some topics sent by letters were about: <ul style="list-style-type: none"> The transportation route of fuel oil tankers to the fuel oil storage station Ratchaburi power plant to switch to its reserved fuel oil for power generation Extension of period for gypsum ground transportation route
NNEG power plant			
Community visit	Friend to Friend visit Project	To exchange information and update people on operation information of the plant	Two-community visits to Wat Phuet Nimit and Chiang Rak Noi Moo 11, totaling 100 households.

Method	Activity	Objectives	Outcomes
Knowledge and information sharing	Power plant visit project	To educate and boost confidence in the process of power generation together with environmental management of the plant	<ul style="list-style-type: none"> 50 community participants from <ol style="list-style-type: none"> 1) Wat Phuet Nimit 2) East Thai Thani 3) West Thai Thani 4) Bor Dor Thor
Media and communication channels	<ul style="list-style-type: none"> Letter SMS LINE application 	Update on operation information of the plant	<ul style="list-style-type: none"> Number of receivers: <ul style="list-style-type: none"> - Four communities in Tha Khlong Municipality, namely East Thai Thani, West Thai Thani, Bor Dor Thor, and Wat Phuet Nimit - Two communities in Chiang Rak Noi, namely Chiang Rak Noi Moo 11 and Chiang Rak Noi Pattana Number of letters: Three Four news updates: <ol style="list-style-type: none"> 1) Report of the environmental quality monitoring for 2016-2017 2) The annual emergency drill schedule and plan 3) Fish releasing activity 4) Other supporting activities

Concerns Management and Complaint Handling

Every power plant has a channel for communities to voice their complaints and notify about incidents due to the operation of the power plant. Procedures and actions are well-defined to correct the problem/ incident promptly. The objectives are to maintain trust and confidence in a given power plant. In 2017 the plant recorded zero complaint on signification issues.

Ratchaburi power plant employs processes in line with ISO 14001 in the management and mitigation of community anxiety as follows:



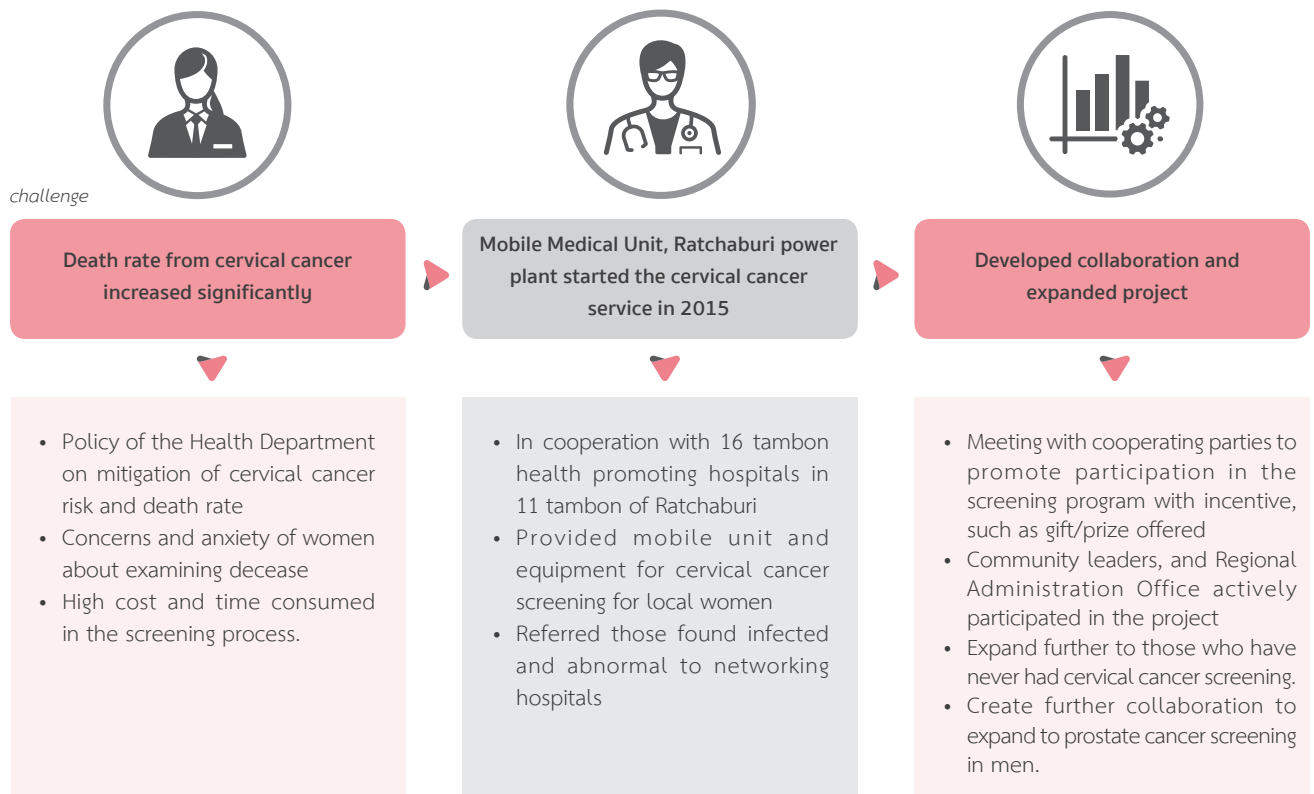
Better Quality-of-Life Promotion

In 2017 RATCH organized quality-of-life promotion programs for communities around power plants and Head Office as follows:

Operator	Activity	Objective	Target Group	Performance
Ratchaburi power plant	Mobile Medical Unit <u>In partnership with:</u> <ul style="list-style-type: none"> Photharam Hospital 	To provide wellbeing, and good health to communities through medical checkups, health care, Thai massage service, dental treatment (scaling and tooth extraction), and cervical cancer screening	Communities in 11 tambon of 4 amphoe around the power plant	<ul style="list-style-type: none"> 4,271 people from 11 tambon used the services 1,361 participants in cervical cancer screening program 10 persons had abnormal cervical cells and received proper medical treatment at Damnoen Saduak Hospital and Ratchaburi Hospital. Steady decrease in risk rates for cervical cancer
	Scholarship <u>In partnership with:</u> <ul style="list-style-type: none"> Tri Energy power plant Ratchaburi-Power power plant 31 schools around the three power plants 	To promote and support educational opportunities for youths in the area around the three power plants	Scholarships were granted to students from the kindergarten level to the secondary level	<ul style="list-style-type: none"> 1,011 scholarships valued at 1.33 million baht were granted to students from 27 schools around Ratchaburi power plant and Ratchaburi Power power plant. 240,000-baht scholarships were granted to students from four schools around Tri Energy power plant.
	Ratchaburi power plant Football Cup Project <u>In partnership with:</u> <ul style="list-style-type: none"> Local Administration Organization Provincial administration in 9 tambon around the Ratchaburi power plant 	To promote sports skills, exercise, and useful hobby, and keep people away from drugs. The project has begun since 2009	12 – 15-year-old youths in nine tambon around the plant	<ul style="list-style-type: none"> Nine youth teams, totaling 225, participated in the project Organized training and skill development in football Organized a tournament, with a winning cup sponsored by Ratchaburi power plant The winning team was Ban Rai Municipality.
Solarta Company Limited	Scholarships	To create educational opportunities for youths around the power plant	Children of those who live in communities around the plant	<ul style="list-style-type: none"> 120 scholarships valued at 1,000 baht each
RATCH	Happy Elderly, Healthy Thailand Project <u>In partnership with:</u> Nonthaburi Municipality	To enhance senior citizens' knowledge for a happy life, covering: 1. health, 2. social skills, and 3. finance security. The project was initiated in 2014.	Senior citizens in Nonthaburi (where RATCH's Head Office is located)	<ul style="list-style-type: none"> Training of caretakers and preventive method of cardiac disease and stroke patients Organized exercise training Organized medical check-ups and safe use of social network There were 170 participants. 85.96% of the participants learned about and better understood proper health care

Screening of Significant Issues under the Ratchaburi Power Plant Mobile Medical Unit Project

Screening of cervical cancer



An Interview with Ms. Somsri Phoprasit, Director of Tambon Don Sai Health Promoting Hospital, a co-organizer of Mobile Medical Unit Project, Ratchaburi power plant

“ Most women who participated in the cervical cancer screening were found abnormality, for example fungal infection, and tissue inflammation, of which 80-90% was curable. The continuing project helps lessen the number of infected women because once abnormality is found, the power plant will forward them to the hospital for a proper cure promptly.

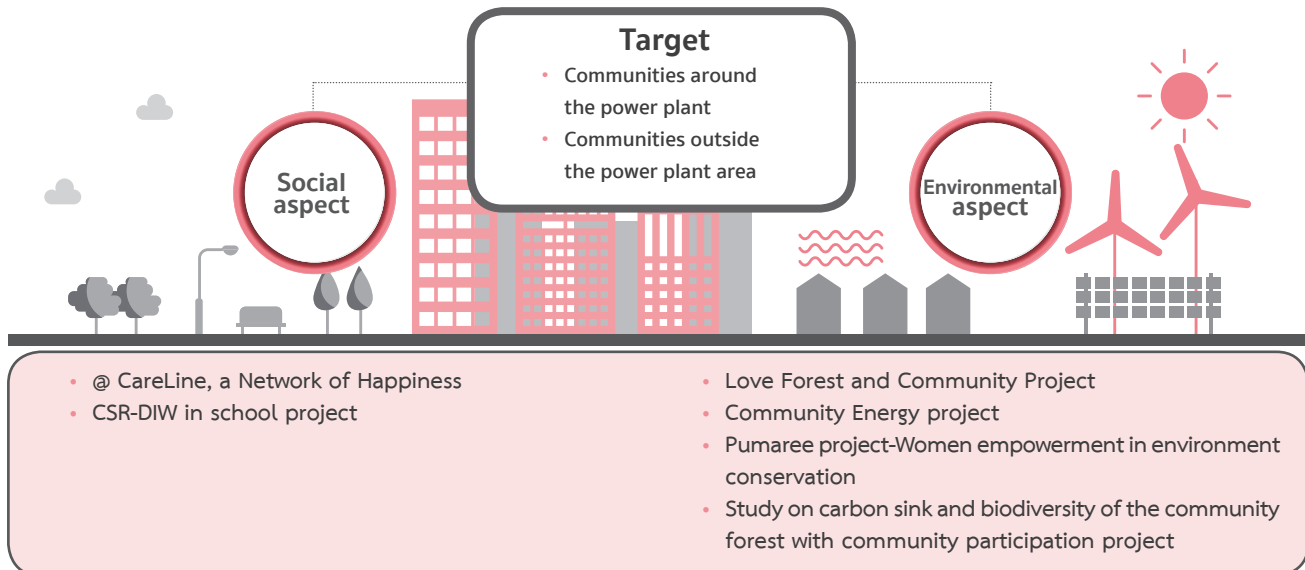


The Mobile Medical Unit Project of Ratchaburi power plant is very efficient. It provides support in medical equipment, public relations, and creates inspiration for women. The tambon health promoting hospital alone may have insufficient capacity to persuade women to participate in cervical cancer screening and enable them to take a screening test. Several positive impacts have arisen from this project, for example, the opportunity to undergo screening, cost reduction, and time-saving because they do not have to go to the hospital. The sooner an abnormality is found and properly cured, the less the death rate. Furthermore, this project creates collaboration among community leaders, local administration, the government sector, and the power plant.”

Community Empowerment

This operation involves target groups in and outside the power plant’s area. The expectation is to strengthen the capability of the communities so that they can efficiently develop their communities in social and environmental aspects.

The 2017 performance of RATCH and Ratchaburi power plant is as follows:



Social Dimension

“CSR in School” Project Ratchaburi Power Plant

Ratchaburi power plant has been conducting the “CSR in School” project since 2015 after participating in Corporate Social Responsibility, Department of Industrial Works: CSR-DIW. It triggered decision to expand the approach to schools around the power plant. The objective is to raise awareness and foster the value of social and environmental responsibility and governance among personnel and students in each school.

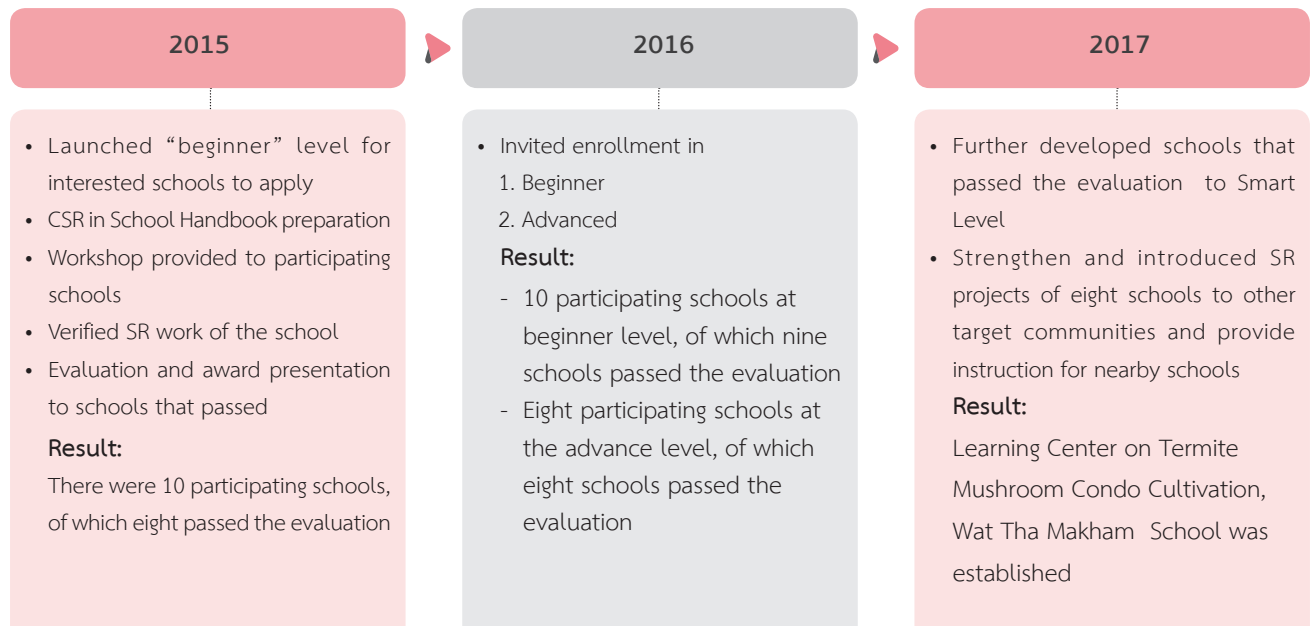
The target groups are 27 schools around the power plant area, with a focus on



The participating schools are classified into three levels, according to the defined evaluation criteria

Level	Qualification	Evaluation Criteria
Beginner	First-time participating schools	<ul style="list-style-type: none"> • Social Responsibility (SR) Policy announced • An SR working committee set up • Training for personnel and students in their schools • SR project undertaken
Advanced	Schools that passed the “beginner” level	<ul style="list-style-type: none"> • Able to develop SR projects with active community participation
Smart	Schools that passed the “advanced” level	<ul style="list-style-type: none"> • Able to extend the value of the SR project to community outside schools. • Focus on active participation of all stakeholders around the schools • Able to be project instructor of schools in the vicinity

Achievement



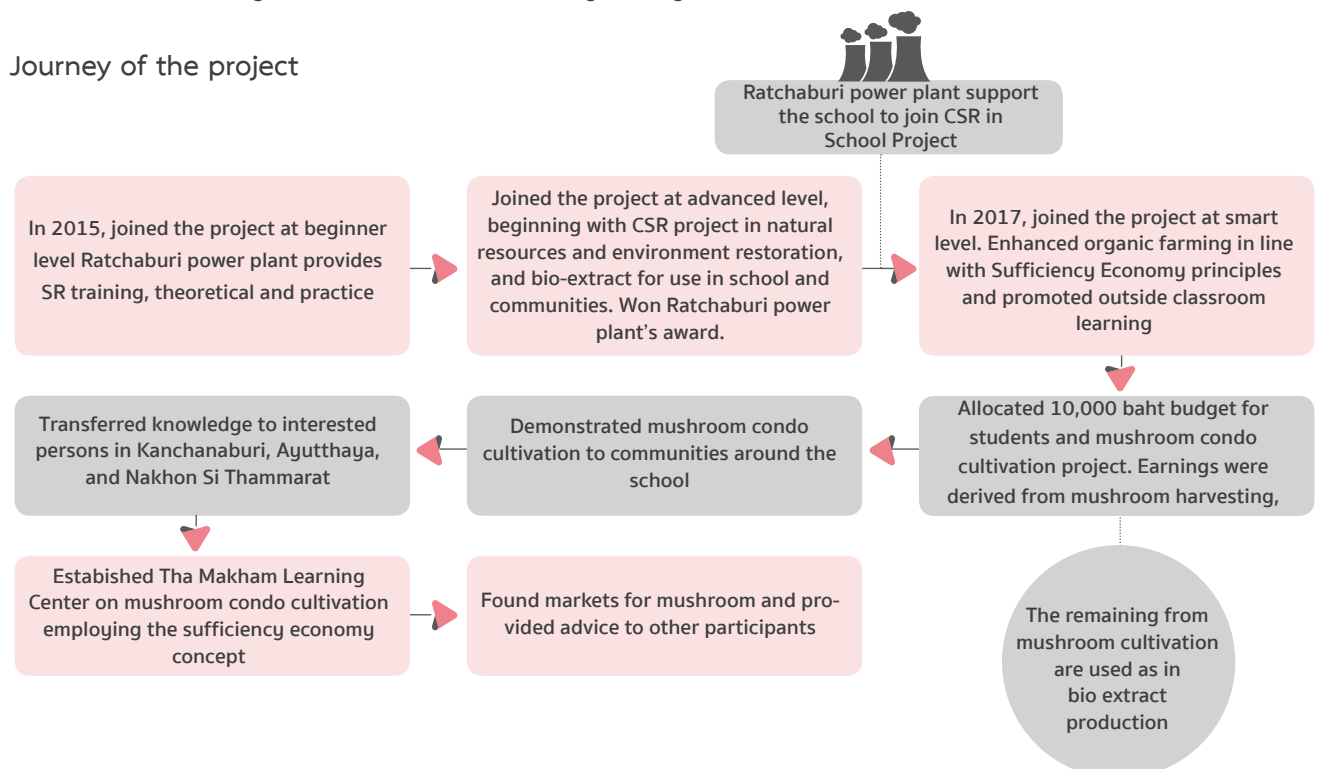
Case Study

Learning Center of Termite Mushroom Condo Cultivation, Tha Makham School (Tha Makham Pracha Uthit)

The Tha Makham School (Tha Makham Prachauthit) has joined the CSR in School Project since 2015, with “beginner” level classification. It progressed successfully to the advanced level and currently passed smart CSR when it can add its CSR project value to the community by establishing bio-extract and mushroom condo projects, following the policy “Moderate Class, More Knowledge” of the public sector.

Termite Mushroom Condo Project of Tha Makham School entails cooperation among teachers, students, and those who live in the community under the concept of “Moderate Class, More Knowledge, and more career opportunities” and adopt the late King Bhumibol Adulyadej’s Sufficiency Economy principles. The project has established a learning center to transfer knowledge and generate income for communities around the school.

Journey of the project



Project Achievement

- 206 students of elementary level (grade 4-6) attended training and practicing termite mushroom condo cultivation. The project generated a monthly income of 10,000–15,000 baht. The earnings were transformed into scholarships for needy students, and some will be put on savings of the students who worked on termite mushroom condo project. Another portion will be used as working capital, and therefore no additional investment is required.
- 11 households of Tambon Don Sai engaged in pilot mushroom condo cultivation with an initial investment of 500–1,000 baht. The return is 10–14 kilograms of mushroom, which can be harvested weekly, creating income of 15,000–30,000 baht per household.
- Established a training center in the school to provide training and advice on the termite mushroom cultivation process for interested people. From August to September 2017, there were 250 participants. At least, one training program was monthly arranged.
- Established another learning center “ Ban Suan Rak Poh” to provide training on termite mushroom condo cultivation in Ayutthaya.

2018 Project Expansion Plan

Tha Makham School (Tha Makham Pracha Uthit) plans to promote termite mushroom condo cultivation to other communities and provinces in vicinity to establish a community enterprise which will help create job opportunities, higher income, and a better quality of life of the community. Moreover, it plans to study further on mushroom processing to add more value to the products. The students in grade 4 of elementary level were trained to take lead in carrying out this project.

Leaders of student carrying out “termite mushroom condo” project, Wat Tha Makham School

We began with planting effective microorganism (EM) when the school firstly took part in “CSR in school” project. After the school was upgraded to “smart” level, we cultivated termite mushroom condo which required strews as a material. The said strews were also used in making EM. In addition, the income from selling mushroom was allocated for scholarship and savings. Currently, we establish the learning center where interested villagers are invited to cultivating mushroom. I am responsible for training them and also other visitors. This became an occupation for villagers, allowing them to earn a living.



@CareLine, a Network of Happiness

Starting in 2015, @CareLine, a Network of Happiness, aims at creating shared value, as well as sharing knowledge and benefit to community and society based on RATCH’s commitment to becoming a good corporate citizen of Nonthaburi province, its headquarters located. In 2017, the Brain Based Learning (BBL) approach has been promoted among targeted school under Nonthaburi Primary Education Service Area Office 1 in order to adopt it into learning process of students in kindergarten to primary education levels. The BBL was driven by 5 factors: (1) playgrounds, (2) classrooms,

(3) learning process, (4) textbooks and worksheets and (5) innovative learning media. RATCH in collaboration with focused schools enhances, develops and improves those drivers to properly facilitate children’s learning effectiveness and readiness based on their physical, brain, social and mental development.

The program outcome in 2017

- The “Teachers Training on BBL approach” was organized for second consecutive year for 82 teachers from 33 schools under Nonthaburi Primary Education Service Area Office 1. It helps

them to apply BBL in designing lesson plan and evaluation method for ascertaining the student's performance.

- Workshop on “Media and Innovation Development for Learning Promotion Year 2” was organized, for teacher in targeted schools. It allows participants to practice on creating learning media and tools before applying in their departments. Moreover, desk, chair and equipment were colorfully repainted based on BBL concept to attract and stipulate student's attention and their brain's ability. This was implemented in form of the volunteer-minded employee activity by joining hands with executives and teachers of six networking schools: Wat Songploo school, Wat Tamnak Tai school, Bang Kulad school, Chomchon Wat Bangkrainai school, Bang Kruai Kindergarten and Wat Chalermprakiat school.

Environmental Dimension

Community Energy Project

The project has carried out by the company for three project locations (each lasts for three years).

Firstly in 2011 – 2013,

the company joined hands with Ratchaburi Energy Office to encourage the communities in Tambon Tharap and Tha Singha to develop the community energy plan and provide energy efficiency technology suited for community or households.

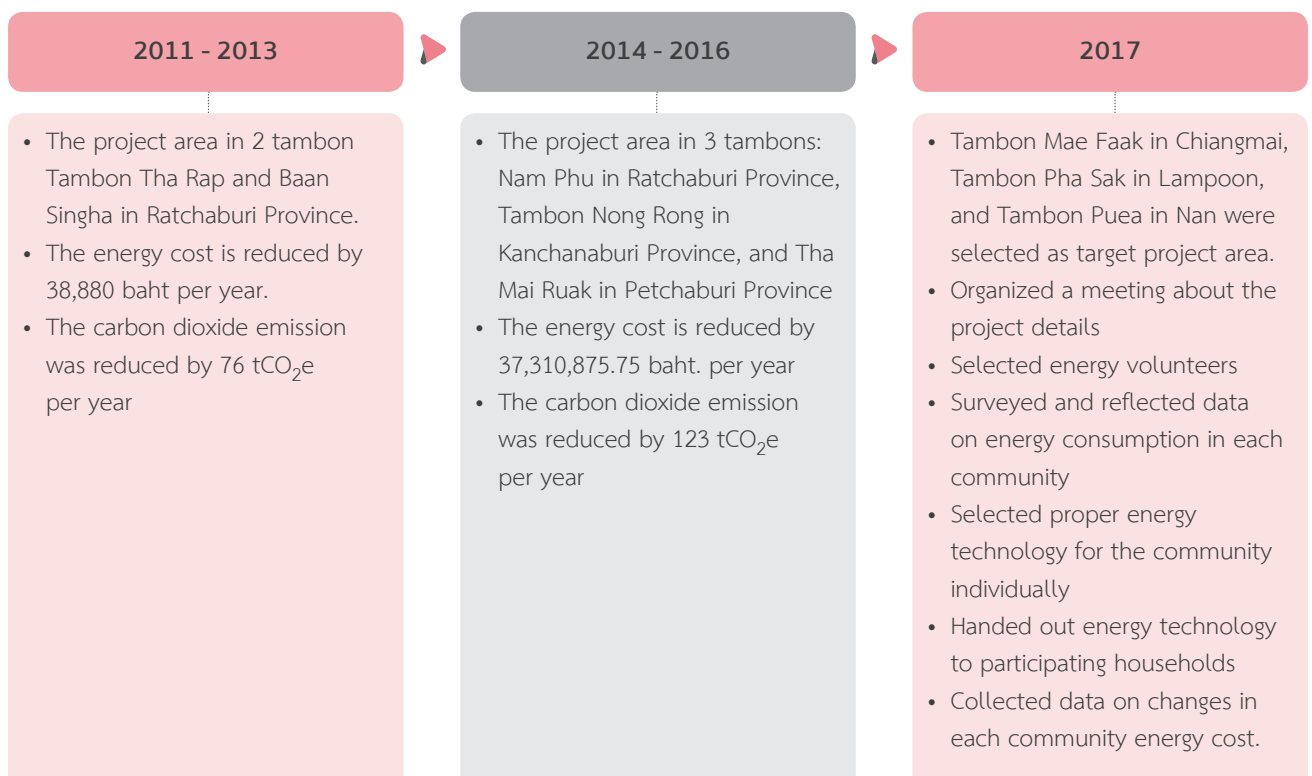
In 2014-2016,

the project was continued in collaboration with the provincial energy office in three provinces, including Ratchaburi, Kanchanaburi and Phetchaburi to promote efficient use of energy in household by using appropriate renewable energy technology for reducing energy cost and GHG emission. Also, the community learning center was set up to encourage people with the efficient use of energy.

In 2017-2019,

the project has been implemented in Chiang Mai, Lamphun and Nan provinces partnering with the provincial energy offices. It basically aims to forge good understanding in the first year.

Performance







Performance of Environmental Projects

Project	Achievement	Partnership
<p>Love Forest and Community Project</p> <p>Objective: to join forces in forest preservation, to create carbon sink, and mitigate climate change</p>	<p>Community Forest Contest</p> <ul style="list-style-type: none"> • 139 community forests won the award, having a carbon sink capacity of 267,597.96 tCO₂ per year • Ban Thung Yi Peng community forest from Krabi won the national community forest award. • During 2008-2017, a total of 1,392 community forests won the award, with a total area of 1,252,053.42 rai, and carbon sink capacity of 2,504,106.84 tCO₂ per year. • The winning community forests demonstrated effective forest management, with the concept of sustainable community forest benefiting communities and a healthy ecosystem preserves water resources. <p>Kla Yim Youth Club</p> <ul style="list-style-type: none"> • In 2017, two activities were arranged under the concept of “Kla Yim youths follow the HM the late King’s initiatives by planting trees in the heart of people” • There were 126 youth participants in the activities • 81% of youths participating in the project had knowledge about HM the late King’s philosophy on natural resources and environmental restoration as well as electricity generation for sustainable development. In addition, they could participate in natural resources conservation through the young conservator network. • During 2008–2017, there were 21 activities, with 1,679 youth participants <p>Community Forest Network Seminar</p> <ul style="list-style-type: none"> • In 2017, two seminars, with 165 participants were organized as a forum for exchanging ideas in community forest development and building strong community forest connection • 86% of the participants acquired knowledge on community forest management in line with the HM the late King’s philosophy and on energy production which led to sustainable development 	<p>Royal Forest Department</p> <p>Royal Forest Department</p> <p>Royal Forest Department</p>
<p>Study on carbon sink and biodiversity of the community forest with local participation</p> <p>Objective: to study the change in carbon dioxide sink and diversity of each type of forest for use in the calculation of carbon dioxide sink capacity of the forest</p>	<ul style="list-style-type: none"> • The project has run for 5 consecutive years (2013-2017). It selected 61 community forests of different types across the country to be an example of each type. • A fixed area plot was set up, and recorded carbon dioxide sink in 61 community forests. • Carbon dioxide sink volume: 1,967,939.47 tCO₂ • Baan Sai Nam Sung community forest, Tambon Khao Mai Kaew, Amphoe Sikao, Trang, has highest diversity, with 159 types of plant and diversity index of 5.995. 	<p>Royal Forestry Department</p>

Project	Achievement	Partnership
<p>Phumaree project- women empowerment in environment conservation</p> <p>Objective: to encourage and enhance the capability of women in natural resources and environment management within their community, and to promote gender equality</p>	<ul style="list-style-type: none"> • Implemented in Amphoe Chiang Klang and Tung Chang, Nan, the project focused on three issues based on the community's needs and potentiality: Natural resource conservation, eco-tourism and waste management. • 75.33% of female participants played an active role in community forest restoration. Eleven community forests were registered, totaling 11,582 rai. • 51.93% of the women participated in tourist attraction promotion, with on-the-job training in eco-tourism. An eco-tourism Community Enterprises was established by Baan Manee Phruet Community, Tambon Ngob, Amphoe Tung Chang, Nan. • 79.94% of women participated in community waste management, forming "La-on Recycle" Group. The group coached youths to manage community waste. They are able to reduce 30% of waste from that of last year. 	<p>Thailand Environmental Institute (TEI)</p>

In 2017, RATCH received "The Low Emission Support Scheme LESS" certificate from Thailand Greenhouse Gas Management Organization (Public Organization, TGO) for carbon dioxide reduction from RATCH's environmental projects

 <p>Watershed Reforestation to create carbon sink in Nan</p>	 <p>Community Energy Project in Ratchaburi, Kanchanaburi, and Phetchaburi</p>	 <p>Solar Energy Promotion at Yom Ban Hua Ha community, Mae Hong Son</p>	 <p>voluntary bulb replacement to mitigate global warming around the King Rama IV Memorial Park in Phetchaburi</p>
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These four projects could reduce the carbon dioxide emission totaling 72.44 tCO₂e



Raising Awareness of Employees on Social Responsibility



“Check Dam construction” volunteers’ activity at the community forest at Ban Phu Ron, Suphan Buri

RATCH is committed to cultivating social contribution spirit among its employees, in the belief that good and great employees can drive the corporation to sustainability. Since 2010, RATCH has continued to organize voluntary programs on the quality-of-life development, educational promotion for children and youth, religion support, and natural resources and environmental conservation.

In 2017 there were 719 person-days participating in 16 voluntary activities, or 5,752 voluntary-spirit hours, and estimated social return of about 2,228,900 baht.

Community Satisfaction Survey

Community Perception survey toward the power plants is the indicator of satisfaction and acceptance of community.

Ratchaburi Power Plant

The plant conducted a survey on surrounding communities’ opinions towards its operation, with 500 samplings in 9 tambon around the plant. The survey was continuously conducted biennially as scheduled. During 2017, Ratchaburi power plant continued communication, listening community’s feedback and implementing its community relation activities to enhance satisfaction and trust of local people. The findings are summarized below:

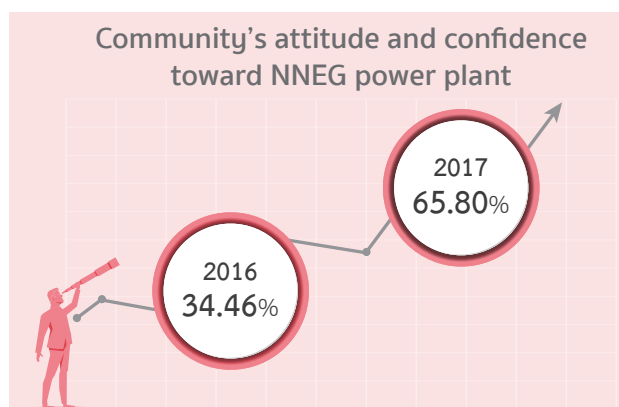
Result	2014	2016	2017
Overall attitude toward the power plant was very good.	93.76%	95.41%	Planning for 2018 survey
Confidence and trust toward the power plant was very good.	89.75%	95.15%	
Satisfaction level toward CSR activities of the power plant	95.75%	96.38%	

Plan for 2018

- Conducting a survey on the communities’ satisfaction and perception toward brand image as well as community and social activities of the power plant.
- Adding communication channels for updating the power plant’s information, with more CSR activities organized
- Timely hearing the communities’ feedback and problem solving, and developing method of issue communication or clarification to communities (if any)
- Carrying out CSR projects that focus on local participation in life quality development, along with conducting an opinion survey and project performance evaluation

NNEG Power Plant

In 2017, NNEG power plant conducted several social projects in 55 communities. Communication via various media and forging of understanding were undertaken to gain confidence and mitigate communities’ anxiety. In addition, the plant arranged regular community visits, power plant study visits, and a yearly community’s attitude and confidence survey, of which 2017 was conducted for the second consecutive year.



Investment in Community and Social Development

In 2017 RATCH supported the development of communities in the local and countrywide, directly and indirectly. The investment comprises the fund for the continuing social development project, the fund for community activities, and philanthropy for public benefits, and taxes.

Investment in Community and Social Development	Budget (million baht)
Community and Social Development Project	
<ul style="list-style-type: none"> • Long-term Project (5 years and upper) 	22.52
<ul style="list-style-type: none"> • Medium-term Project (3 years and upper) 	2.19
<ul style="list-style-type: none"> • Short-term Project (within one year) 	5.16
Community Activities Support	0.46
Philanthropy for Public Benefits	19.74
Indirect support	
<ul style="list-style-type: none"> • Income tax 	589.59
<ul style="list-style-type: none"> • Local tax 	19.58

Performance Data



Abbreviation

RATCH = Ratchaburi Electricity Generating Holding PCL.

RATCHGEN = Ratchaburi Power Plant

TECO = Tri Energy Power Plant

RAC = RATCH-Australia Corporation Limited

NNEG = Nava Nakorn Electricity Generating Company Limited

RL = RATCH-Lao Services Company Limited

Economic

Data	Unit	2017	2016	2015
Revenues	Million THB	46,438.33	51,279.88	59,326.30
Operating costs	Million THB	36,847.37	41,623.27	50,616.66
Employee wages and benefits	Million THB	679.69	639.39	624.26
Dividend to all shareholders	Million THB	3,480.00	3,407.50	3,291.50
Payments to government	Million THB	1,365.94	1,054.91	1,829.75
Community investments	Million THB	238.88	68.67	101.01
Spent on local suppliers				
Company in Thailand ^[1] (RATCH/RATCHGEN/TECO/NNEG)	Million THB	42,134.08	59,920.22	82,670.44
Company in Australia(RAC)	Million AUD	29.97	24.27	26.23
Spent on foreign suppliers				
Company in Thailand ^[1] (RATCH/RATCHGEN/TECO/NNEG)	Million THB	834.75	1,119.29	710.99
Company in Australia (RAC)	Million AUD	0.19	0.07	0.32

Remark : [1] Operations in Thailand include RATCH, RATCHGEN, TECO and NNEG

Spent on Local and foreign suppliers of NNEG only presented in 2017

Health and Safety^[2]

Data	Unit	2017	2016	2015
Total workforce represented in formal joint management—worker health and safety committees				
RATCH	persons (%)	15 (5.76%)	13 (5.00%)	11 (4.37%)
RATCHGEN	persons (%)	15 (3.33%)	15 (2.79%)	15 (2.74%)
TECO	persons (%)	13 (26.00%)	13 (25.49%)	9 (17.60%)
NNEG	persons (%)	5 (6.33%)	5 (7.46%)	-
RAC	persons (%)	6 (28.57%)	6 (31.58%)	6 (30.00%)

Data		Unit	2017	2016	2015
Number of Fatalities by Gender					
Employees		person (Male : Female)	0 : 0	0 : 0	0 : 0
Workers		person (Male : Female)	0 : 0	0 : 0	0 : 0
Number of Fatalities by Region					
Thai		person	0	0	0
Australian		person	0	0	0
Number of injuries by Gender					
RATCH	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0
RATCHGEN	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	person (Male : Female)	0 : 1	5 : 0	3 : 0
TECO	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	person (Male : Female)	0 : 0	1 : 0	0 : 0
NNEG	Employees	person (Male : Female)	0 : 0	0 : 0	-
	Workers	person (Male : Female)	0 : 0	0 : 0	-
RAC	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0
Number of injuries by Region					
Thai		person	1	6	3
Australian		person	0	0	0
Injury rate (IR)					
RATCH	Employees	No/200,000 Hours worked	0.00	0.00	0.00
	Workers	No/200,000 Hours worked	0.00	0.00	0.00
RATCHGEN	Employees	No/200,000 Hours worked	0.00	0.00	0.00
	Workers	No/200,000 Hours worked	0.11	0.76	0.31
TECO	Employees	No/200,000 Hours worked	0.00	0.00	0.00
	Workers	No/200,000 Hours worked	0.00	0.62	0.00
NNEG	Employees	No/200,000 Hours worked	0.00	0.00	-
	Workers	No/200,000 Hours worked	0.00	0.00	-
RAC	Employees	No/200,000 Hours worked	0.00	0.00	0.00
	Workers	No/200,000 Hours worked	0.00	0.00	0.00
Total number of occupational diseases					
Employees		person (Male : Female)	0 : 0	0 : 0	0 : 0
Workers		person (Male : Female)	0 : 0	0 : 0	0 : 0
Occupational Diseases Rate (ODR)					
Employees		No/200,000 Hours worked	0	0	0
Workers		No/200,000 Hours worked	0	0	0

Data		Unit	2017	2016	2015
Total number of lost day					
RATCH	Employees	day (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	day (Male : Female)	0 : 0	0 : 0	0 : 0
RATCHGEN	Employees	day (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	day (Male : Female)	0 : 0	32 : 0	13 : 0
TECO	Employees	day (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	day (Male : Female)	0 : 0	1 : 0	0 : 0
NNEG	Employees	day (Male : Female)	0 : 0	0 : 0	-
	Workers	day (Male : Female)	0 : 0	0 : 0	-
RAC	Employees	day (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	day (Male : Female)	0 : 0	0 : 0	0 : 0
Lost day rate (LDR)					
RATCH	Employees	No/200,000 Hours worked	0	0	0
	Workers	No/200,000 Hours worked	0	0	0
RATCHGEN	Employees	No/200,000 Hours worked	0	0.00	0
	Workers	No/200,000 Hours worked	0	1.98	3.27
TECO	Employees	No/200,000 Hours worked	0	0	0
	Workers	No/200,000 Hours worked	0	0.62	0
NNEG	Employees	No/200,000 Hours worked	0	0	-
	Workers	No/200,000 Hours worked	0	0	-
RAC	Employees	No/200,000 Hours worked	0	0	0
	Workers	No/200,000 Hours worked	0	0	0
Absentee days					
RATCH	Employees	day (Male : Female)	186 : 408.5	180.5 : 481.5	121 : 399.5
RATCHGEN	Employees	day (Male : Female)	110.5 : 179.5	81.5 : 122.5	109.5 : 113.0
TECO	Employees	day (Male : Female)	16 : 20	10 : 13	12 : 15
NNEG	Employees	day (Male : Female)	21 : 42	12 : 16	-
RAC	Employees	day (Male : Female)	32.5 : 23	27 : 3.5	21 : 14
Absentee rate (AR)					
RATCH	Employees	% (Male : Female)	0.74 : 1.71	0.74 : 2.00	0.48 : 1.72
RATCHGEN	Employees	% (Male : Female)	1.40 : 3.00	1.02 : 2.17	1.40 : 1.70
TECO	Employees	% (Male : Female)	0.04 : 0.05	0.03 : 0.04	0.05 : 0.07
NNEG	Employees	% (Male : Female)	0.64 : 1.39	0.43 : 0.57	-
RAC	Employees	% (Male : Female)	8.2 : 1.65	0.89 : 0.25	0.64 : 1.50

Remark : [2] Presented information covers safety data of RATCH, RATCHGEN, TECO, NNEG (commercial operation in 2016) and RAC.
All Employees of RATCH, RATCHGEN, TECO, NNEG are Thai, and RAC's employees are Australian and Thai.

People^[3]

Data	Unit	2017		2016		2015	
		Male	Female	Male	Female	Male	Female
Total Employees	Persons	445		439		479	
	Persons	297	148	294	145	322	157
Employee by employment contract							
Permanent	Persons	293	148	290	145	299	140
Temporary	Persons	4	0	4	0	23	17
Employee by age group							
<30 years	Persons	153	27	154	21	165	33
30-50 years	Persons	102	109	96	111	106	111
>50 years	Persons	42	12	44	13	51	13
Employee by category							
Top Management	Persons	13	3	13	3	15	3
	%	2.92	0.67	2.96	0.68	3.13	0.63
Middle Management	Persons	47	13	38	12	34	9
	%	10.56	2.92	8.66	2.73	7.10	1.88
Junior Management	Persons	42	37	44	35	39	35
	%	9.44	8.31	10.02	7.97	8.14	7.31
Officer	Persons	192	95	197	95	227	102
	%	43.15	21.35	44.87	21.64	47.39	21.29
Worker	Persons	3	0	2	0	7	8
	%	0.67	0.00	0.46	0.00	1.46	1.67
Employee by Nationality							
Thai	%	62.02		61.73		56.16	
Lao	%	33.71		34.17		40.29	
Australian	%	4.27		4.10		3.55	
Other	%	0.00		0.00		0.00	
New Hires by Age Group							
<30 years	Persons	44	3	26	9	94	13
	%	9.9	0.7	5.9	2.1	19.6	2.7
30-50 years	Persons	7	9	6	5	6	7
	%	1.6	2.0	1.4	1.1	1.3	1.5
>50 years	Persons	2	0	2	0	2	0
	%	0.4	0.0	0.5	0.0	0.4	0.0
Total	Persons	53	12	34	14	102	20
	%	11.9	2.7	7.7	3.2	21.3	4.2

Data	Unit	2017		2016		2015	
		Male	Female	Male	Female	Male	Female
Turnover by Age Group							
<30 years	Persons	44	0	15	4	3	3
	%	9.9	0.0	3.4	0.9	0.6	0.6
30-50 years	Persons	3	8	6	3	8	2
	%	0.7	1.8	1.4	0.7	1.7	0.4
>50 years	Persons	6	1	5	1	5	1
	%	1.3	0.2	1.1	0.2	1.0	0.2
Total	Persons	53	9	26	8	16	6
	%	11.9	2.0	5.9	1.8	3.3	1.3
Parental leave							
Parental leave	Persons	-	1	-	3	-	4
Returning to work after parental leave ended	Persons	-	1	-	3	-	4
Returning to work after parental leave ended (12 month after return to work)	Persons	-	1	-	3	-	4
Training and Development							
Top Management	hour/ person/year	31.85	163.33	53.69	36.67	21.87	182.00
Middle Management	hour/ person/year	51.36	56.23	72.95	70.25	57.41	65.00
Junior Management	hour/ person/year	67.36	91.86	24.39	33.97	32.36	48.51
Officer	hour/ person/year	28.40	35.78	9.37	24.09	10.41	29.04
Worker	hour/ person/year	0.00	0.00	0.00	0.00	9.43	10.50
Employee receiving career development review							
Top Management	%	100	100	100	100	100	100
Middle Management	%	100	100	100	100	100	100
Junior Management	%	100	100	100	100	100	100
Officer	%	100	100	100	100	100	100
Worker	%	100	100	100	100	100	100
Employee receiving regular performance review							
Top Management	%	100	100	100	100	100	100
Middle Management	%	100	100	100	100	100	100
Junior Management	%	100	100	100	100	100	100
Officer	%	100	100	100	100	100	100
Worker	%	100	100	100	100	100	100

Data	Unit	2017		2016		2015	
		Male	Female	Male	Female	Male	Female
Grievance							
Total number of grievance about labor practices through formal grievance process	Case	0	0	0	0	0	0
- Total number of grievance addressed	Case	0	0	0	0	0	0
- Total number of grievance resolved	Case	0	0	0	0	0	0
Total number of grievance about human rights through formal grievance process	Case	0	0	0	0	0	0
- Total number of grievance addressed	Case	0	0	0	0	0	0
- Total number of grievance resolved	Case	0	0	0	0	0	0

Remark : [3] Presented employee data are of RATCH, RATCHGEN, RAC and RL in 2015-2017

Environment [4]

Data	Unit	2017	2016	2015
Energy^[5]				
Total energy consumption	TJ	101,369	121,754	113,926
Total direct energy consumption	TJ	172,578	198,374	183,945
- Natural Gas	TJ	171,474	193,963	179,847
- Bunker Oil	TJ	1,062	4,175	3,635
- Diesel Oil	TJ	43	236	463
Total Indirect Energy Consumption	TJ	223	216	206
- Electricity purchased	TJ	223	216	206
- Heating purchased	TJ	0	0	0
- Steam purchased	TJ	0	0	0
Total energy sold	TJ	71,432	76,836	70,225
- Electricity sold	TJ	71,161	76,836	70,225
- Heating sold	TJ	0	0	0
- Steam sold	TJ	271	0	0

Data	Unit	2017	2016	2015
Net Generation	MWh	19,766,905	21,343,271	19,506,984
Total energy intensity (within organization)	GJ/MWh	8.73	9.29	9.43
Total Energy Reduction	GJ	151,373	132,611	53,386
- Fuel saving	GJ	93	31,796	0
- Electricity saving	GJ	151,279	100,815	53,386
- Steam saving	GJ	0	0	0
GHG Emission^[6]				
Direct GHG emissions (Scope 1)	tCO ₂ e	8,093,088	9,310,427	8,659,373
Indirect GHG emissions (Scope 2)	tCO ₂ e	37,395	36,388	34,819
Total GHG emissions (Scope 1 + 2)	tCO ₂ e	8,130,482	9,346,816	8,694,192
GHG emission intensity (Scope 1 + 2)	tCO ₂ e/MWh	0.411	0.438	0.446
Total GHG emissions reductions	tCO ₂ e	24,461	16,301	8,632
Emission^[7]				
NO _x emissions	Tons	3,576	9,732	9,529
	kg/MWh	0.18	0.46	0.49
SO _x emissions	Tons	95.1	119.2	117.6
	kg/MWh	0.0048	0.0056	0.0060
Opacity	%	2.65	1.29	3.41
TSP	Tons	629.7	21.4	N/A
Water^[8]				
Total water withdrawal	Million m ³	28.86	31.37	30.59
- Surface water	Million m ³	25.36	28.40	28.62
- Sea water	Million m ³	0	0	0
- Ground water	Million m ³	0	0	0
- Rain water	Million m ³	0	0	0
- Municipal water	Million m ³	1.81	1.12	0.05
- Waste water from another organization	Million m ³	1.69	1.84	1.92
Recycled and reused water	m ³	2,028,390	837,094	3,243,181
	% of total water withdrawal	7.03	2.67	10.60

Data	Unit	2017	2016	2015
Water Discharge^[8]				
Total water discharge to surface water	Million m ³	3.96	4.52	3.81
- COD loading	Tons	201	210	207
- BOD loading	Tons	32	35	21
Waste^[9]				
Total waste disposal	Tons	6,839	7,430	10,469
Total hazardous waste disposal	Tons	1,021	1,092	302
- Reuse	Tons	11	631	83
- Recycling	Tons	18	0	1
- Recovery (including energy recovery)	Tons	967	444	136
- Secured Landfill	Tons	25	18	82
- Onsite storage	Tons	0	0	0
Total non-hazardous waste disposal	Tons	5,818	6,338	10,167
- Reuse	Tons	0	0	0
- Recycling	Tons	5,301	5,768	574
- Recovery (including energy recovery)	Tons	440	529	0
- Landfill	Tons	76	41	29
- Onsite storage	Tons	0	0	9,564
- Waste from non-routine operation	Tons	0	0	0

Remark : [4] Presented environmental data are of RATCHGEN, TECO, NNEG (commercial operation in 2016) and RAC.

[5] Energy consumption are calculated based on conversion factors for stationary combustion in the energy industries from Thai Energy Statistics 2010.

[6] GHG Emission of RATCHGEN and TECO are calculated based on the assessment Methodology of Carbon Footprint for Organization developed by TGO (2nd edition, April 2015) that are calculated from CO₂ / CH₄ / N₂O / R-134a / R-407c / R-410a and SF₆. Base year of GHG calculation is 2015.

GHG Emission of NNEG are calculated based on CO₂ emission factors from IPCC Volume 2 Energy.

- For Natural Gas, CO₂ emission factor = 56,100 kgCO₂/TJ on Net Calorific Basis.

- For Diesel oil, CO₂ emission factor = 74,100 kgCO₂/TJ on Net Calorific Basis.

GHG Emission of RAC follow National Greenhouse and Energy Reporting Act.

[7] Emission of RATCHGEN, TECO, NNEG are calculated from the Continuous Emission Monitoring Systems (CEMs) and RAC used calculation method of the Queensland Department of Environment – Environmental Protection Agency (EPA)

[8] The data are measured from metering.

[9] The data are measured from Manifest System and weight scale.

GRI Content Index



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GRI 103 :	Management Approach	21-25, 49-50			
GRI 301-1	Materials used by weight or volume	50-51, Performance Data			✓
GRI 301-2	Recycled input materials used	58-59			
GRI 302: Energy					
GRI 103 :	Management Approach	21-22, 64-65			
GRI 302-1	Energy consumption within the organization	Performance Data			✓
GRI 302-3	Energy intensity	Performance Data			✓
GRI 302-4	Reduction of energy consumption	64-68, Performance Data			
GRI 303 : Water					
GRI 103 :	Management Approach	21-22, 50-52			
GRI 303-1	Water withdrawal by source	51, Performance Data		The company will start to collect data and arrange rain report in 2018.	✓
GRI 303-2	Water sources significantly affected by withdrawal of water	50-51			
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GRI 304 : Biodiversity					
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GRI 305-1	Direct (Scope 1) GHG emissions	Performance Data			✓

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GRI 305-2	Energy indirect (Scope 2) GHG emissions	Performance Data			✓
GRI 305-4	GHG emissions intensity	Performance Data			✓
GRI 305-5	Reduction of GHG emissions	64-72			
GRI 305-7	Nitrogen oxides (NOX), sulfur oxides (SOX), and other significant air emissions	53-54, Performance Data			✓
GRI 306 : Effluents and Waste					
GRI 103 :	Management Approach	49, 58-60			
GRI 306-1	Water discharge by quality and destination	55, Performance Data			
GRI 306-2	Waste by type and disposal method	58-60, Performance Data		According to the operation and maintenance contract, RAC has totally mandated the contractors for managing all types of waste in compliance with relevant laws and regulations. Therefore, the record of waste data or information is unavailable at RAC.	
GRI 306-5	Water bodies affected by water discharges and/or runoff	50-52, Performance Data			
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GRI 401 : Employment					
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GRI 401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	117-120			
GRI 403 : Occupational Health and Safety					
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Disclosure	Description	Page number and /or URL		Omission	External Assurance
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GRI 403-2	Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities	Performance Data			✓
GRI 403-3	Workers with high incidence or high risk of diseases related to their occupation	108-109			
GRI 404 : Training and Education					
GRI 103 :	Management Approach	110, 116-117			
GRI 404-1	Average hours of training per year per employee	116-117, Performance Data			
GRI 404-2	Programs for upgrading employee skills and transition assistance programs	111-112, 116, 120			
GRI 404-3	Percentage of employees receiving regular performance and career development reviews	Performance Data			
GRI 406 : Non-discrimination					
GRI 103 :	Management Approach	48			
GRI 406-1	Incidents of discrimination and corrective actions taken	48			
GRI 414 : Supplier Social Assessment					
GRI 103 :	Management Approach	18, 82-83			
GRI 414-1	New suppliers that were screened using social criteria	83-84			
GRI 419 : Socioeconomic Compliance					
GRI 103 :	Management Approach	93			
GRI 419-1	Non-compliance with laws and regulations in the social and economic area	78, 97-98			
GRI-G4 Electric Utilities Sector Disclosures					
N/A	(EU1) Installed capacity, broken down by primary energy source and by regulatory regime	13-14, 76			
N/A	(EU2) Net energy output broken down by primary energy source and by regulatory regime	50, 94, Performance Data			

Disclosure	Description	Page number and /or URL		Omission	External Assurance
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N/A	(EU5) Allocation of CO2e emissions allowances or equivalent, broken down by carbon trading framework	69, 72			
N/A	(EU10) Planned capacity against projected electricity demand over the long term, broken down by energy source and regulatory regime	76, 93-94			
N/A	(EU11) Average generation efficiency of thermal plants by energy source and by regulatory regime	96			
N/A	(EU30) Average plant availability factor by energy source and by regulatory regime	96			

LRQA Assurance Statement

Relating to Ratchaburi Electricity Generating Holding Plc's Corporate Sustainability Report for the calendar year 2017

This Assurance Statement has been prepared for Ratchaburi Electricity Generating Holding Plc. in accordance with our contract but is intended for the readers of this Report.

Terms of engagement

Lloyd's Register Quality Assurance Ltd. (LRQA) was commissioned by Ratchaburi Electricity Generating Holding Plc. (RATCH) to provide independent assurance on its 2017 Sustainability Report ("the report") against the assurance criteria below to a limited level of assurance and at the materiality of the professional judgement of the verifier using LRQA's verification approach. LRQA's verification approach is based on current best practise and uses the principles of AA1000AS (2008) - inclusivity, materiality, responsiveness and reliability of performance data and processes defined in ISAE3000.

Our assurance engagement covered RATCH's subsidiaries in Thailand and Australia under its direct operational control, and specifically the following requirements:

- Confirming that the report is in accordance with:
 - GRI Standard and core option
 - GRI G4's Electricity & Utilities sector disclosures
- Evaluating the reliability of data and information for nine selected indicators as listed below:
 1. GRI 301-1 Materials used by weight or volume
 2. GRI 302-1 Energy consumption within the organization
 3. GRI 302-3 Energy intensity
 4. GRI 303-1 Water withdrawal by sources
 5. GRI 305-1 Direct (Scope 1) GHG emission
 6. GRI 305-2 Energy indirect (Scope 2) GHG emission
 7. GRI 305-4 GHG emission intensity
 8. GRI 305-7 Nitrogen Oxide (NOx) Sulphur Oxide (SOx) and other significant air emissions
 9. GRI 403-2 Type of injury and rates of injury occupational diseases, lost days and absenteeism and number of work related fatalities

Our assurance engagement excluded the data and information of RATCH's subsidiaries where it has no operational control and all of its operations and activities outside of Thailand and Australia. Our assurance engagement also excluded the data and information of its suppliers and any third-parties mentioned in the report

LRQA's responsibility is only to RATCH. LRQA disclaims any liability or responsibility to others as explained in the end footnote. RATCH's responsibility is for collecting, aggregating, analysing and presenting all the data and information within the report and for maintaining effective internal controls over the systems from which the report is derived. Ultimately, the report has been approved by, and remains the responsibility of RATCH.

LRQA's opinion

Based on LRQA's approach nothing has come to our attention that would cause us to believe that RATCH has not:

- Met the requirements above
- Disclosed reliable data and information for the nine selected indicators as no errors or omissions were detected
- Covered all the issues that are important to the stakeholders and readers of this report.

The opinion expressed is formed on the basis of a limited level of assurance and at the materiality of the professional judgement of the verifier.

Note: The extent of evidence-gathering for a limited assurance engagement is less than for a reasonable assurance engagement. Limited assurance engagements focus on aggregated data rather than physically checking source data at sites.

LRQA's approach

LRQA's assurance engagements are carried out in accordance with our verification approach. The following tasks though were undertaken as part of the evidence gathering process for this assurance engagement:

- Assessing RATCH's approach to stakeholder engagement to confirm that issues raised by stakeholders were captured correctly. We did this by interviewing RATCH's Management who engage directly with stakeholder groups as well as reviewing documents and associated records.

- Reviewing RATCH's process for identifying and determining material issues to confirm that the right issues were included in their report. We did this by benchmarking reports written by RATCH and its peers to ensure that sector specific issues were included for comparability. We also tested the filters used in determining material issues to evaluate whether RATCH makes informed business decisions that may create opportunities which contribute towards sustainable development
- Auditing RATCH's data management systems to confirm that there were no significant errors, omissions or mis-statements in the report. We did this by reviewing the effectiveness of data handling process, and systems, including those for internal verification. We also spoke with key people in various departments responsible for compiling the data and drafting the report.
- Visiting RATCH's major electricity generating unit (Ratchaburi Power Plant) to sample performance data and information for the nine selected indicators to confirm its reliability.

Observations

Further observations and findings, made during the assurance engagement, are:

- **Stakeholder inclusivity and responsiveness:**
We are not aware of any key stakeholder groups that have been excluded from RATCH's stakeholder engagement process. However, it was observed that some of the communication channels did not adequately respond to the topics of interest, for example Management team (Project management for construction activities). We believe that more direct stakeholder involvement, such as RATCH asking in their communication media about stakeholder's expectations for material issues / topics / performance, will ensure that future reports are more informative for end-users.
- **Materiality:**
We are not aware of any material issues concerning RATCH's sustainability performance that have been excluded from the report. However, RATCH should review their process for determining materiality so that future reports better define the relevant material issues which essentially influence the decisions of stakeholders and LRQA's assurance engagement.
- **Reliability**
Although RATCH has a data collection system, we believe that RATCH should consider implementing internal verification checks to identify any errors or problems in their own datasets which will further improve the robustness of the system and reliability of the reported indicators.

LRQA's competence and independence

LRQA ensures the selection of appropriately qualified individuals based on their qualifications, training and experience. The outcome of all verification and certification assessments is then internally reviewed by senior management to ensure that the approach applied is rigorous and transparent.

This verification is the only work undertaken by LRQA for RATCH and as such does not compromise our independence or impartiality.

Dated: 22 February 2018



Pornphan Sirisomrithikul
LRQA Lead Verifier

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Feedback Form

2017 Sustainability Report

Ratchaburi Electricity Generating Holding PCL.

1. Reader Profile

- Gender Female Male
 Age Below 30 years old 30 – 50 years old More than 50 years old

2. Please identity your stakeholder type

- Shareholder Investor Alliance and Trade Partner
 Community Employee Scholar/ Independent Organization
 Customer Mass Media Other (Please specify.....)

3. Where do you receive this sustainability report?

- AGM Company’s website Company’s employee
 Other (Please specify.....)

4. For support investment decision on RATCH’s securities

- For support investment decision on RATCH’s securities
 For learning more about RATCH’s business
 Research and educational purposes
 Other (Please specify.....)

5. Satisfactory level towards the sustainability report

- Information adequacy High Medium Low
 Attractive topics High Medium Low
 Readability High Medium Low
 Design High Medium Low
 Overall satisfaction High Medium Low

6. In your opinion, are you confident that RATCH potentially achieves the sustainable growth?

- Yes, because.....
 No, because.....
 No idea because.....

7. In your opinion, which is the most significant aspect toward the company’s sustainable growth?

- Economy (Please specify.....)
 Environment (Please specify.....)
 Society (Please specify.....)

8. In your opinion, what should the report be improved?

- Design Readability
 More content Other (Please specify.....)

Thank you for your information and valuable opinion
 which advantages us for improvement of next issue of the report.

RATCH



RATCHABURI
ELECTRICITY GENERATING
HOLDING PCL.



Sustainability Development Department
Ratchaburi Electricity Generating Holding PCL.
8/8 Moo 2, Ngam Wong Wan Road,
Bangkhen, Muang, Nonthaburi,
11000 Thailand

Channels to return the feedback form:



1. E-mail

Send the photo of the completed
feedback form to sustainability@ratch.co.th



2. Fax

0 2794 9888 ext. 9951-9955



3. Postal

Send the completed feedback form to the
specified address above



4. Mobile

Send the photo of the completed
feedback form to 08 1899 6908



5. Website

Download the feedback form at www.ratch.co.th
and send back via e-mail at sustainability@ratch.co.th

RATCH



RATCHABURI
ELECTRICITY GENERATING
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RATCH



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