



Vision

To become a leading value-oriented energy and infrastructure company in Asia Pacific.

Mission



To ensure shareholders' value creation by continuously generating superior financial returns



To achieve world-class operational excellence and enhance competitiveness



To be socially and environmentally responsible, conducting business in a fair and sustainable manner and complying with all related laws and regulations



To raise employees' awareness and motivation of self-development in preparation for future business competition.



To support long-term domestic energy security and infrastructure



To seek new opportunities and alternatives in related and other businesses to generate growth and expand business base for shareholders

Corporate Value

POWER of RATCH

BE ENTREPRENEURIAL
COMMIT TO INTEGRITY



BOOST AGILITY
ENCOURAGE INNOVATION



EXCEL SYNERGY &
COLLABORATION
STRENGTHEN PARTNERSHIP

Contents

05	Message from Chairman and CEO	59	Economic Performance
08	Business Profile	59	RATCH's economic values in 2020
08	Electricity generation	67	Shared Value Partnerships
11	Infrastructure	75	Customer Satisfaction
12	Energy-related businesses and others		
17	Value Chain of RATCH's Business	83	Environmental Performance
19	Key Sustainability Development Performance in 2020	83	Responsible production
23	Nourishing Relationship with Stakeholders and Cooperation	87	Air quality management
29	Sustainability Governing Structure	89	Wastewater management
31	Code of Conduct and Integrity	90	Waste management
34	Material Aspect in 2020	93	Noise management
37	Management Approach of 2020 Material Aspects	93	Biodiversity
40	Corporate Sustainability Development Strategy and Progress	96	Social Performance
40	Economic	96	Safety and Occupational Health Management
43	Community and society	110	Respect to Human Rights
45	GHG Management and Adaptation to Climate Change	112	Employee Stewardship and Capacity Building
58	Emerging Risks Management	119	Social Stewardship
		132	About this Report
		134	Performance Data
		141	GRI Content Index
		146	LR Independent Assurance Statement
		148	Feedback Form: 2020 Sustainability Report

Message from Chairman and CEO

Dear shareholders and stakeholders,

RATCH operates mainly in electricity generation, infrastructure and energy-related businesses in Thailand and throughout Asia Pacific and electricity generation remains our primary business, accounting for 80 percent of total investment. We have set the targets to raise the enterprise value to Baht 200,000 million in 2023 and increase generating capacity to 10,000 MW.



“ We will also step up the efforts to reduce greenhouse gas emissions. We have studied various approaches in Thailand and overseas and formed ESG Working Group, we expect to finalize new strategies and targets within 2021. ”

Amid rapid and abrupt changes in technology, climate change impacts, complex social and human rights issues as well as increasing competition, RATCH considers risk management an essential tool in sailing us through challenges and leading us to opportunities, continuous growth and target achievements. In 2020, RATCH reviewed risk management approaches and analysis tools and improved the process in response to today's challenges, and likely emerging risks. The purpose is to foresee a holistic picture of risks in economic, environmental and social dimensions as well as human rights-related risks in the project, organizational, national and international levels. That will assist the formulation of comprehensive enterprise risk management strategies and hence ensure more effectiveness in the strategic decision-making process. The review and improvement is scheduled for completion in 2021.

Commitment towards GHG reduction

RATCH is aware that electricity generation, though creating economic and social values, influences climate change which requires the global community's actions to keep temperature increase at no more than 1.5 degree Celsius above pre-industrial level. In response to this effort as a part of international community and GHG reduction-focused industry, RATCH is set to generate 25 percent of the 10,000 MW target from renewable energy, compared to the previous 20 percent target. Meanwhile, we encourage development of generating innovations that promise less energy consumption as succeeded at Berkprai Cogeneration Power Plant. The power plant is equipped with 3 generating systems gas turbine, steam turbine and gas engine. Commencing commercial operations in 2020, it consumes less fuels upon electricity unit about 300 BTU/ kilowatt-hour, representing by 4 percent reduction of fuel consumption compared to Small Power Producers (SPP) in Group of the company. Its generating efficiency is also above other SPP power plants', during peak and off-peak periods. While the efficiency stayed around 47 percent, the Equivalent Availability Factor was by 98 percent. The success allowed RATCH to be awarded the "Best Innovative Company Award" at the Stock Exchange of Thailand's SET Awards 2020.

We will also step up the efforts to reduce greenhouse gas emissions. We have studied various approaches in Thailand and overseas and formed ESG Working Group, we expect to finalize new strategies and targets within 2021. RATCH has launched some actions in the past years. As a participant of Thailand Greenhouse Gas Management Organization (Public Organization) or TGO's Thailand Voluntary Emission Reduction Program, RATCH developed 3 T-VER projects involving energy efficiency, renewable energy and forests. They had reduced greenhouse gases annually by 2,602 tons of carbon dioxide equivalent. Subsidiaries and companies under the Company's operational control have prepared greenhouse gas inventory. In 2020, RATCH Cogeneration Company Limited kicked off the organization carbon footprint assessment based on TGO's Carbon Footprint for Organization methodology. The data will be used in the formulation of the Group's greenhouse gas reduction guidelines and targets.

Safety and occupational health come first

RATCH maintains its zero accident target at all operating sites and all safety targets for 2020 were achieved. Amid the new coronavirus (COVID-19) outbreak, the Company put in place preventive measures in line with the government and the Ministry of Public Health's measures, to watch out and prevent infections among employees and the spread in office buildings and power plants. We worked with suppliers operating at office buildings and power plants, to formulate safety guidelines for their employees. None of the Group's employees or suppliers' has contracted the disease so far.

RATCH also supported the Company's power plants, to implement ISO 45001 Occupational Health and Safety Management System ensuring that occupational health and safety of employees, contractors and related stakeholders were treated at same standard.

In support of sustainable development goals

RATCH has also adhered on Thailand and international guidelines of governance, anti-corruption and respect to human rights, making them standard practices for the operations in both Thailand and abroad. Thanks to the best practices, RATCH has been listed in the Stock Exchange of Thailand's Thailand Sustainability Investment (THSI) since 2015 and SETTHSI. RATCH also supports the United Nations Sustainable Development Goals-Goal 12: Responsible Consumption and Production and Goal 13: Climate Action which can address the impacts from the Group's operations and foster organizational capacity and capabilities.

This Sustainability Report contains RATCH's concepts, approaches and 2020 performance on sustainable development. It reflects our commitment and adherence to sustainable development guidelines in growing business and simultaneously caring for society and the environment for sustainable coexistence. RATCH has a strong will to partner with all parties in creating the shared values for people and the environment and the globe.

Respectfully,



Mr. Boonyanit Wongrukmit
Chairman

Respectfully,



Mr. Kijja Sripatthangkura
Chief Executive Officer

Business Profile

RATCH Group Public Company Limited, formerly Ratchaburi Electricity Generating Holding PCL, was established on 7 March 2000 with the registered capital of 14,500 million baht. The public company is listed on the Stock Exchange of Thailand under the stock symbol of “RATCH”. Electricity Generating Authority of Thailand (EGAT) is the major shareholder with a 45 percent stake. The Company’s Head Office is located at 72 Ngam Wong Wan Rd, Bangkok, Nonthaburi, Nonthaburi Province.

Nature of Business

The Company operates as a holding company with interests in a number of entities involving mainly electricity generation, infrastructure, energy-related and other businesses in Thailand and abroad.

Business Structure

1. Electricity generation

Electricity generation is the Company’s core business. Its power plants, located in Thailand and overseas, generate electricity from fossil fuels and renewable energy. The equity installed capacity totals 8,174 MW.

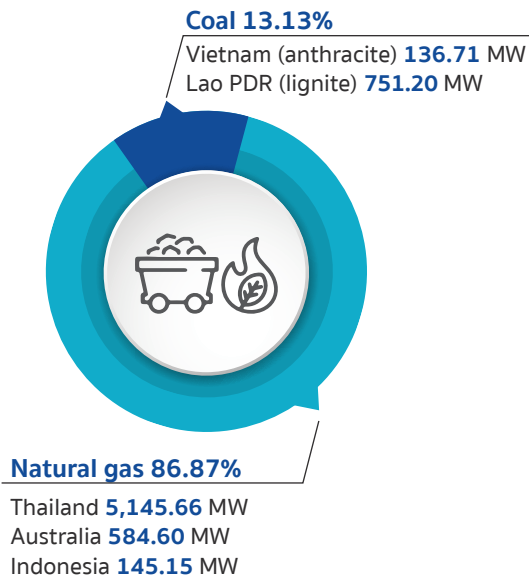
Capacity sorted by fuel



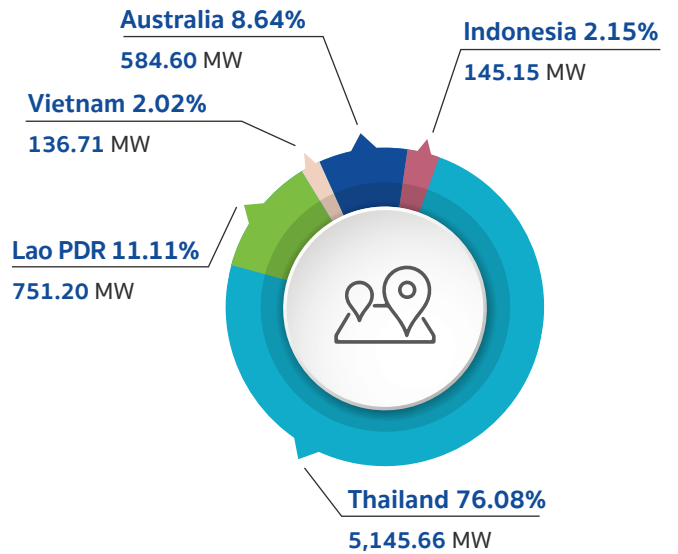
1.1 Fossil fuel power plants

RATCH has invested in power plants in this category in Thailand and abroad with combined capacity of 6,763.32 MW; 5,875.41 MW from natural gas and 887.91 MW from coal (136.71 MW from anthracite and 751.20 MW from lignite).

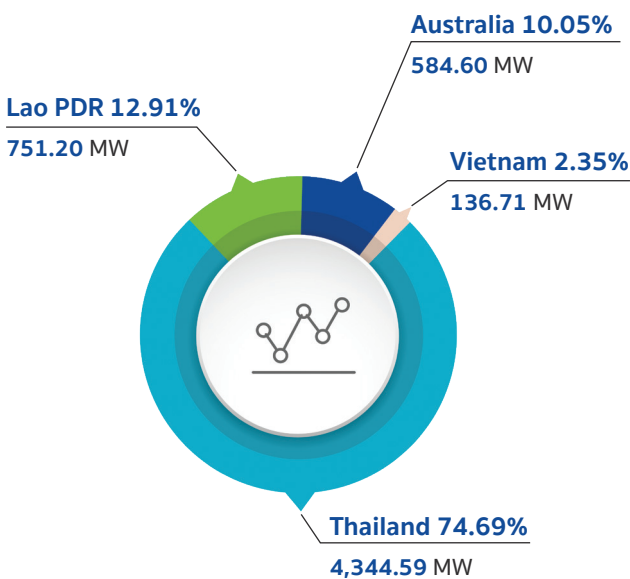
Classified sorted by fuel
Total 6,763.32 MW



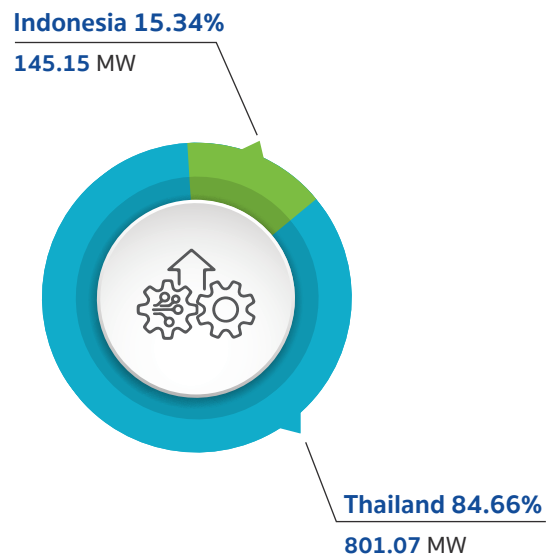
Capacity sorted by location



Commercial capacity
Total 5,817.10 MW



Under-construction capacity
Total 946.22 MW

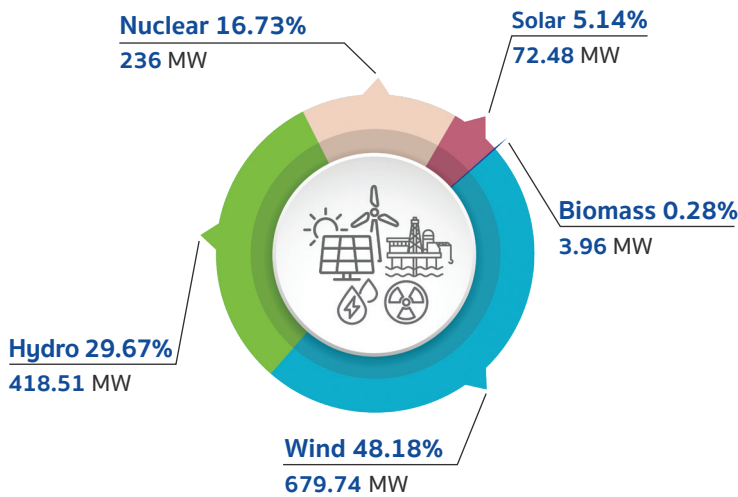


1.2 Renewable power plants

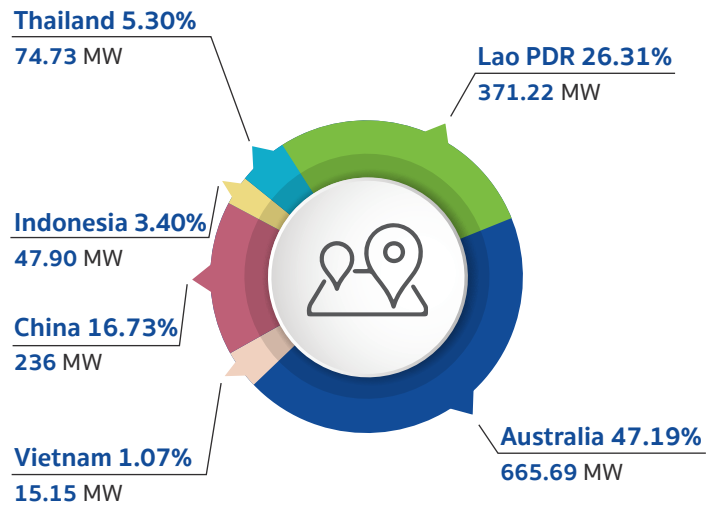
RATCH targets to raise renewable power generation from 20 percent of combined capacity to 25 percent in 2024, in support of the global effort in holding the increase in the global average temperature to well below 1.5 Celcius degree above pre-industrial levels.

The Company has explored investment opportunities in wind farms, solar farms, biomass power and hydropower. Currently, RATCH’s equity installed capacity of renewable energy generation stood at 1,174.68 MW, or 14.4 percent of the combined capacity of 8,174 MW. Inclusive of a nuclear power plant project, the renewable capacity will be 1,410.68 or 17.3 percent of total.

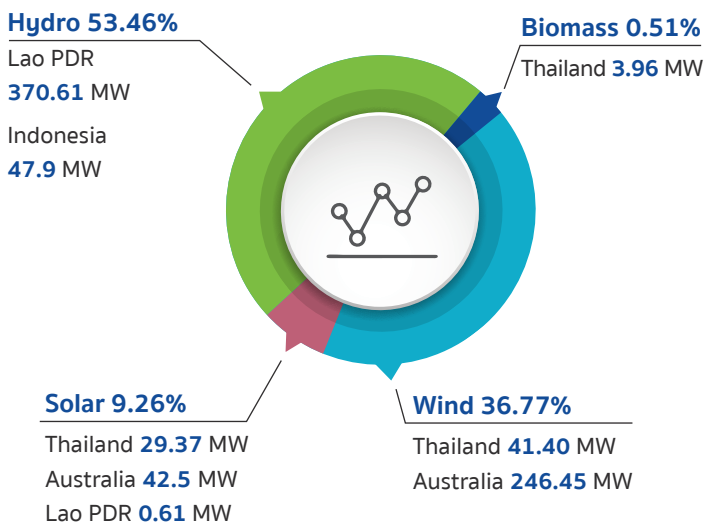
Capacity sorted by fuel
Total 1,410.68 MW



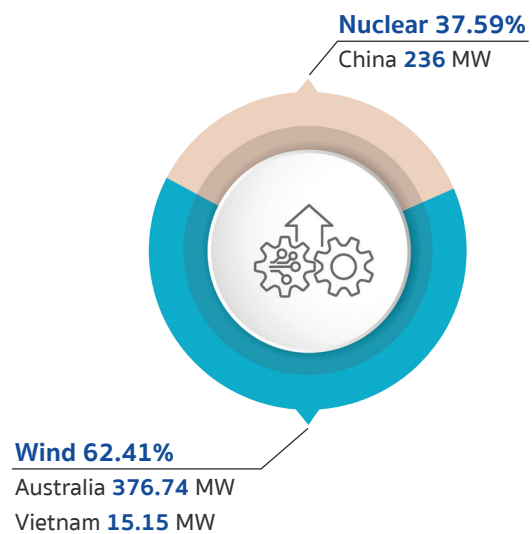
Capacity sorted by location
Total 1,410.68 MW



Commercial capacity
Total 782.80 MW



Under-construction capacity
Total 627.89 MW



The power plants of RATCH Group generate electricity and distribute it to buyers in particular countries under power purchase agreements that clearly specify the volume, quality and period of time. Some of the output is put on merchant markets. (More details appear in Section: Customers satisfaction on page 75.)

2. Infrastructure

Since 2018, RATCH has diversified into infrastructure business, foreseeing continuous growth in basic infrastructure demand in alignment with economic and social development of Thailand and other ASEAN nations which are the Company's target investment destinations.

Type	Joint company	Location	Shareholding (%)	Invested capital (Million Baht)	Nature of Business	Customers
Mass transit system	Eastern Bangkok Monorail Company Limited	Thailand	10	1,400	Provide engineering design and construction, machinery and electrical systems, operation and maintenance services for MRT Monorail Yellow Line Project (Lat Phrao-Samrong), scheduled for operations in 2022.	General public (30-year concession)
Mass transit system	Northern Bangkok Monorail Company Limited	Thailand	10	1,400	Provide engineering design and construction, machinery and electrical systems, operation and maintenance for MRT Monorail Pink Line Project (Khae Rai-Min Buri), slated for operations in 2022.	General public (30-year concession)
Telecom	Smart Infranet Company Limited	Thailand	51	280	Provide rental fiber optic communications networks on major CBD roads and Bangkok's ringroads as well as on telegraph poles and railroads nationwide	Corporate customers
Telecom	Things on Net Company Limited	Thailand	35	180	Provide integrated IT services from consulting and strategic planning to data analytics as well as distribute sensor sets, IT platform and solutions for various purposes like asset tracking management, waste management, safety and environment, smart farming and smart city.	Corporate and retail customers

Type	Joint company	Location	Share-holding (%)	Invested capital (Million Baht)	Nature of Business	Customers
Tap water	Asia Water Company Limited	Lao PDR	40	194.59	Produce and distribute tap water with capacity of 24,000 cubic meters per day in Phase 1 since December 2018, before capacity increase in 2041 to 48,000 cubic meters per day.	Nam Papa Nakhone Luang of Lao, Vientiane Capital, under 50-year concession
Transport	BGSR Consortium	Thailand	10	185	<p>Involve in M6 (Bang Pa-in to Nakhon Ratchasima) and M81 (Bang Yai to Kanchanaburi) highway projects slated for operations in 2023, by providing the work on designing and installation of the fee collecting system, advanced control system, construction of other buildings and other elements.</p> <p>Provide O&M service for engineering works and systems like fee collection for Highways Department; traffic control; weighing station, rescue service; and road and system maintenance.</p>	General public/ Highways Department (30-year concession)

3. Energy-related businesses and others

RATCH explores investment opportunities in businesses related to energy and high-growth potential for added corporate value. Current investments are as follows:

Business	Company	Location	Share-holding (%)	Nature of Business	Customers
Operation and maintenance service	Chubu Ratchaburi Electric Service Company Limited	Thailand	51	Provide operation and maintenance service for 1,420 MW Ratchaburi Power Plant in Ratchaburi Province.	Ratchaburi Power Company Limited
Gas turbine maintenance	EGAT Diamond Service Company Limited	Thailand	10	Provide refurbishment service for power plants' gas turbine	Corporate customers
Recruitment service for power plants' technicians	RATCH-Lao Services Company Limited	Lao PDR	99.99	Provide technician recruitment service for power plants in Lao PDR	Corporate customers

Business	Company	Location	Share-holding (%)	Nature of Business	Customers
Coal mining	Phu Fai Mining Company Limited	Lao PDR	37.5	Supply lignite fuel to Hongsa Power Plant	Hongsa Power Company Limited
Biomass supply	Songkhla Biofuel Company Limited	Thailand	40	Provide biomass fuel to Songkhla Biomass Power Plant	Songkhla Biomass Company Limited
Wool pellet production	SIPHANDONE RATCH-LAO Company Limited	Lao PDR	25	Cultivate fast-growing trees in a 20,000-rai plot in Champasak Province, Lao PDR, with a plan to construct wood pellet manufacturing plant in 2021 for commercial operations in the first quarter of 2022.	Export to industrial users in Japan and South Korea, chiefly under long-term supply contracts
Securities holding	EDL-Generation Public Company	Lao PDR	10.10	Invest in EDL-GEN shares listed on Lao Securities Exchange via subsidiaries, RATCH-Lao Service Company Limited (5.64%) and RH International (Singapore) Corporation Pte. Ltd. (4.46%)	EDL-GEN operates electricity generation and distribution to Electricity Du Laos, as well as investment or joint venture in other hydroelectric projects.

• Shareholding structure

Electricity Generating Authority of Thailand is RATCH's major shareholder, holding 45 percent of 1,450 million shares. EGAT, a state enterprise, is tasked to generate, source and distribute bulk electric energy to Metropolitan Electricity Authority (MEA), Provincial Electricity Authority (PEA) and other users in Thailand and neighboring countries. It also operates other energy-related business under EGAT Act.

As of 8 September 2020, the number of RATCH shareholders reached 28,762; 28,603 Thai nationals holding a total of 1,337,850,401 shares or 92.27 percent of all issued shares, and 159 foreign nationals holding 112,149,599 shares or 7.73 percent. RATCH sets the foreign ownership limit at no more than 25 percent of issued shares. Minority shareholders (Free Float) as of 2 June 2020 were numbered 22,444, owning 54.99 percent of issued shares.

Find more information on www.ratch.co.th

Link- <https://investor.ratch.co.th/shareholdings.html>

• Number of employees

RATCH employs 468 workers to operate in Thailand, Lao PDR and Australia (excluding outsource company's operators), a 1.74 percent increase from 2019.

Base (Person)	Thai nationality	Lao nationality	Australian nationality	Others
Thailand	Male = 128 Female = 131	Male = 0 Female = 0	Male = 0 Female = 0	Male = 0 Female = 0
Lao PDR	Male = 4 Female = 1	Male = 158 Female = 20	Male = 0 Female = 0	Male = 0 Female = 0
Australia	Male = 2 Female = 0	Male = 0 Female = 0	Male = 15 Female = 5	Male = 0 Female = 0
Indonesia	Male = 3 Female = 0	Male = 0 Female = 0	Male = 0 Female = 0	Male = 0 Female = 0
Singapore	Male = 0 Female = 1	Male = 0 Female = 0	Male = 0 Female = 0	Male = 0 Female = 0

More information in Section: Performance Data

• Collaboration with external organizations

The Company has collaborated with external organizations in the public sector and the private sector as well as non-profit organizations, with an aim to establish a network that promotes sustainability in economic, social and environmental dimensions.

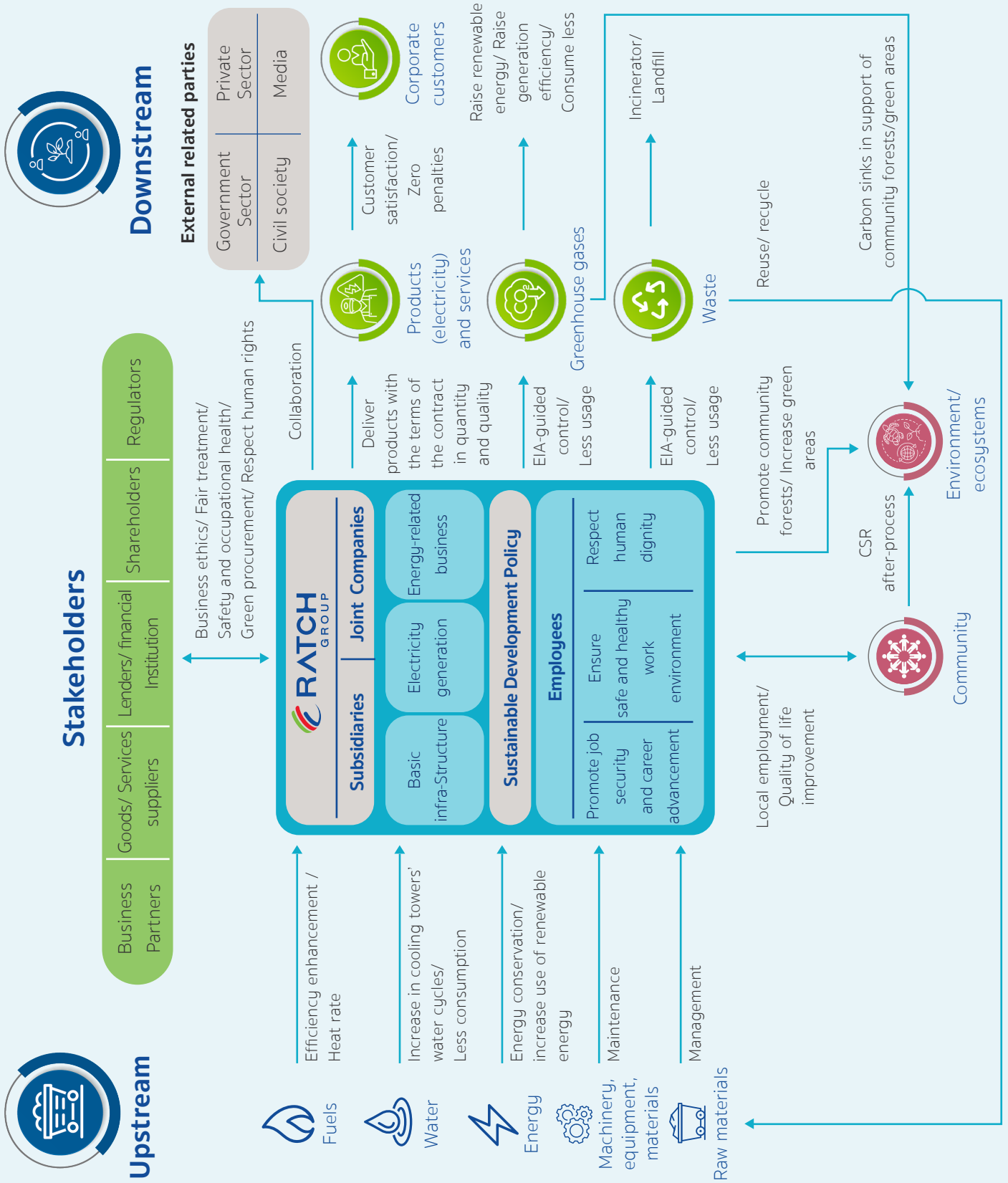
Organization	Country	Approach	Starting year	Project/ activity
Thai Institute of Directors Association (IOD)	Thailand	Voluntary	2015	Private Sector Collective Action Coalition Against Corruption (CAC)
Stock Exchange of Thailand	Thailand	Voluntary	2015	Listed companies' sustainability assessment
Thailand Greenhouse Gas Management Organization (Public Organization)	Thailand	Voluntary	2016	Carbon Footprint for Organization Project involving Ratchaburi Power Plant and Tri-Energy Power Plant
			2017	Low Emission Support Scheme (LESS)
			2018	Thailand Voluntary Emission Reduction Program (T-VER) and CFO applied in RATCH's Head Office

Organization	Country	Approach	Starting year	Project/ activity
Department of Industrial Works	Thailand	Voluntary	2012	Corporate Social Responsibility, Department of Industrial Works (CSR-DIW) Awards
Community Forest Management Office, Royal Forest Department	Thailand	Voluntary	2007	Love the Forest and the Community Project
Plant Genetic Conservation Project Under the Royal Initiative of HRH Princess Maha Chakri Sirindhorn	Thailand	Voluntary	2017	Supporting the initiative through special activities: training on school botanical gardens and local natural resources
Ratchaburi Provincial Energy Office	Thailand	Voluntary	2018	Community Energy Project
Ministry of Education and Sports	Lao PDR	Voluntary	2001	Education for Career Empowerment Project
Sirindhorn International Environmental Park Foundation Under HRH Princess Maha Chakri Sirindhorn's patronage/ Electricity Generating Authority of Thailand/ Electricity Generating Public Company Limited	Thailand	Voluntary	2015	United force to return nature to the environment in honor of HRH Princess Maha Chakri Sirindhorn

• Membership

Organization	Status	Sustainability Dimension	RATCH's role
Thailand Management Association (TMA)	Member	Economic	<ul style="list-style-type: none"> Attending meetings, seminars on business administration, networking activities
Thai Institute of Directors Association (IOD)	Member	Economic (Governance)	<ul style="list-style-type: none"> Attending training and seminars on corporate governance for directors, executives and employees Supporting academic activities
Thailand Listed Companies Association	Member	Economic (Governance)	<ul style="list-style-type: none"> Attending meetings and seminars on business management Joining sustainability awards
Thailand Private Sector Collective Action Coalition Against Corruption	Member	Economic (Governance)	<ul style="list-style-type: none"> Endorsing its manifesto, and being a certified member
Association of the Electricity Supply Industry of East Asia and Western Pacific (AESIEAP)	Member	Economic	<ul style="list-style-type: none"> Exchanging information on regional industry Attending meetings, seminars and study trips on technology in the region
<ul style="list-style-type: none"> ICC Thailand National Committee Board of Trade 	Member	Economic	<ul style="list-style-type: none"> Attending meetings, seminars, training and other activities Supporting activities
Electricity Supply Industry Association of Thailand	Executive Director	Economic	<ul style="list-style-type: none"> Promoting electricity-related technology and exchanging knowledge and experience on engineering technology Joining capacity enhancement activities for professional engineers
Thailand Business Council for Sustainable Development and Thailand Environment Institute	Member	Economic (Governance) Environmental Social	<ul style="list-style-type: none"> Being a Council member Associate member Being a partner of its environmental activities relating to PM2.5 and climate change
Association of Electrical and Electronic Engineers (IEEE)	Supporter	Economic	<ul style="list-style-type: none"> Supporting academic activities
Thailand Productivity Institute Member Social	Member	Social	<ul style="list-style-type: none"> Joining seminars and study trips

Value Chain of RATCH's Business



RATCH Group has adhered to sustainable development principles in operating business, being aware of its mission-bound responsibility in safeguarding the interests of stakeholders and commitments throughout the value chain. The Group honors moral and ethical practices that demand fairness and respect to human right. Concerning employees as they are deemed the organization's valuable resources, RATCH is committed to ensuring job security and fair career advancement, along with safety and occupational health in the workplace as well as respect to human dignity of all. On environment, RATCH strictly follows EIA measures, to reduce air and water pollution and waste. The 3Rs principles have been applied under the goal to achieve zero waste to landfill. Multiple actions have been exercised to reduce greenhouse gas emissions at source including a quest for environmental-friendly innovations and technology for power plants from the designing stage; efficiency enhancement for lower fuel consumption; an increase in renewable energy; and an increase in green areas for natural carbon sinks and carbon credits. Collaboration in economic, social and environment dimensions with external related parties have been sought.



EPC Contract signing of Hin Kong Power Plant



RATCH's Annual General Meeting 2020



Analyst Meeting



Site visit for Floating Solar project by Thai Investors Association and Investor Right Advocacy Volunteer Club at Ratchaburi Power Plant

Key Sustainability Development Performance in 2020

The performance and progress on sustainability development-related activities of RATCH-operating controlled businesses in 2020 is as follows:

Economic

Development of electricity generating innovation and replication



Combination of 3 generating systems: gas turbine generator, steam turbine generator and gas engine generator




Installed and operated at Berkprai Cogeneration Power Plant. Considered the first generating innovation of SPP in Thailand, the system maintains the power plant's maximum efficiency in both on-peak and off-peak periods, which results in economic and environmental benefits through lower investment cost, lower production cost, less fuel consumption and less combustion pollutants.




Replication at RATCH Cogeneration Power Plant (Extension phase), which has 30 MW in electricity generation capacity and 5.46 tons/ hour in steam capacity

Investment in renewable energy



3,941
million baht

Investment in innovation development and New S-Curve businesses



280
million baht

Social



Lost Time Injury Frequency Rate
RATCH's employees = 0
Suppliers' employees = 0



Investment on community
and social projects
186 million baht



No. of supported community
forests and coverage areas
145 forests with
93,023 rai in combined areas

Environmental



No. of suppliers conducted
environmental risk assessment

138



Saved energy

12,528
Megawatt-hours



Saved water

1.46
million cubic meters



Waste and hazardous
waste to landfill

37
ton



Environment-related
expenses and investment

17.2
million baht



Reduced greenhouse gas

1,171,044
tCO₂e

Awards and recognitions

- The Stock Exchange of Thailand assessed and listed RATCH in Thailand Sustainability Investment (THSI), the 6th consecutive year.
- RATCH won "The Best Innovative Company Awards" at SET Award 2020 following the combination of 3 generating systems: Gas Turbine Generator, Steam Turbine Generator and Gas Engine Generator. The combined system is installed at Berkprai Cogeneration Power Plant. Considered the first electricity generating innovation of SPP in Thailand, the system maintains the power plant's maximum efficiency in both on-peak and off-peak periods, which results in economic and environmental benefits through lower investment cost, lower production cost, less fuel consumption and less combustion pollutants.
- RATCH won the Sustainability Disclosure Awards 2020, the top of its kind, from Thaipat Institute (Public-Interest Organization)

- RATCH won Thailand Greenhouse Gas Management Organization (Public Organization)'s certificate and honorary plaque under Thailand Voluntary Emission Reduction Program (T-VER) for Ratchaburi Power Plant's Sustainable Forestation Project and participation in Low Emission Support Scheme (LESS); and under Carbon Footprint for Organization (CFO) for Head Office, Ratchaburi Power Plant and Tri Energy Power Plant.
- RATCH was bestowed ASEAN Building Fire Safety Awards 2020, organized by Engineering Institute of Thailand and ASEAN Federation of Engineering Organization (AFEQ), in recognition of Head Office's efficient fire safety design, full equipment as required by law, and regular equipment maintenance and test.
- RATCH received an honorary plaque from the Social Security Office, in recognition of its outstanding performance regarding employers' contribution to the Social Security Fund.



The Best Innovative Company Award at SET Awards 2020
organized by The Stock Exchange of Thailand



Thailand Sustainability Investment (THSI)
organized by The Stock Exchange of Thailand



Sustainability Disclosure Awards 2020
organized by Thaipat Institute
(Public-Interest Organization)

Nourishing Relationship with Stakeholders and Cooperation

RATCH considers it vital to nourish the relationship with stakeholders throughout the value chain, to ensure business achievements. The Company emphasizes building and nourishing long-term relationships and seeks continuous cooperation from stakeholders in the supply chain, from upstream to downstream. RATCH has stepped up its engagement and consultation with stakeholders, to understand, engage and appropriately respond to their expectations in economic, social and environmental aspects.



Identification of stakeholders in value chain

Stakeholders affected by RATCH's operations	Economic aspect		Social aspect		Environmental aspect		Stakeholders significant to RATCH's operations
1) Shareholders/ investors	✓	✓	✓	✓	✓	✓	1) Shareholders/ investors
2) Creditors/ financial institutions	✓	✓	✓	✓	-	-	2) Creditors/ financial institutions
3) Business partners	✓	✓	✓	✓	-	✓	3) Business partners
4) Regulators	-	✓	✓	✓	✓	✓	4) Regulators
5) Competitors	-	✓	-	-	-	-	5) Competitors
6) Suppliers	✓	✓	✓	✓	✓	✓	6) Suppliers
7) Customers	✓	✓	✓	✓	✓	-	7) Customers
8) Employees	✓	✓	✓	✓	✓	✓	8) Employees
9) Community/ society	✓	✓	✓	✓	✓	✓	9) Community/ society
10) Private organizations	-	✓	-	✓	-	✓	10) Private organizations
11) Media	-	✓	-	✓	-	✓	11) Media

Stakeholder prioritization

The stakeholder prioritization takes into account the following issues and impact levels:

- 1) Economic, social and environmental issues relating to RATCH's actions and their impacts on stakeholders.

- 2) Level of stakeholder-induced impacts on RATCH in legal, regulatory, financial and operational terms as well as corporate image.

Based on the assessment of issues relating to the Company's operations and level of their impact on stakeholders as well as stakeholders' impacts on the Company, 11 stakeholder groups have been identified and 8 groups are considered significant to the Company's operations. Consequently, the Company devises the approaches to nurture the relationship with the 8 groups and respond to their expectations as follows:

Guideline on stakeholder relationship nurturing and response to expectations

RATCH reviews stakeholders' expectations and determines the approaches to nurture the relationship and respond to their expectations through various engagement channels. Details are as follows:

Stakeholders	Expectations	Approach	Engagement channels	Topics
1) Employees	<ul style="list-style-type: none"> • Appropriate income and welfare • Healthy and safe work environment • Continual capacity building • Proper career advancement • Supportive work process in light of emerging disease outbreak 	<ul style="list-style-type: none"> • Review remuneration and welfare against peer companies' every 3 years • Provide safety standard, enjoyable and creative environment • Prepare level-based group and individual training • Establish succession plan and career development plans • Develop IT system to support new normal way of working • Welcome employees' opinions and suggestions • Promote activities that underline teamwork, creativity and innovation, to bolster corporate culture and engagement 	<ul style="list-style-type: none"> • Human Resource Management Committee • Performance Appraisal Committee • Level-based group training and knowledge sharing activities • Relationship building activities of each function and corporate volunteering projects • Employee meetings twice a year and Function's meeting to communicate strategy, targets and performance • Dissemination of corporate information via email, Intranet, and other media • Annual employee engagement survey • Welfare Committee • Safety, Occupational Health and Work Environment Committee <p><i>Whistleblower channel</i> https://www.ratch.co.th/en/cg/whistleblower</p>	<ul style="list-style-type: none"> • Employee Stewardship and capacity building
2) Shareholders/ Investors	<ul style="list-style-type: none"> • Ability to handle ESG (Environment, Social and Governance) risks and corporate sustainability strategies 	<ul style="list-style-type: none"> • Assessment on ESG-related risks and emerging risks for a review in business plans and strategies • Training on corporate governance for directors and executives 	<ul style="list-style-type: none"> • Annual General Meeting once a year • EGAT Group meeting • Analyst meeting every quarter • Company visits for shareholders 	<ul style="list-style-type: none"> • Management Approach of 2020 Material Aspects

Stakeholders	Expectations	Approach	Engagement channels	Topics
2) Share-holders/ Investors	<ul style="list-style-type: none"> Ability to deliver good returns Board of Directors' proper oversight Professionalism and operational excellence Adaptation of enterprise and business to technological change and emerging risks Short-, medium- and long-term growth strategies and targets Efficient examination and preventive measures against fraud and corruption 	<ul style="list-style-type: none"> Review and setting of strategies with clear goals as well as good corporate governance Diversification to other businesses for strengthening revenues Maintain power plants' efficiency in support of EGAT's goal to ensure national electricity security Establishing of business partnership to strengthen competitiveness in Thailand and abroad Certified membership of Thailand's Private Sector Collective Action Coalition Against Corruption (CAC) Participation in Stock Exchange of Thailand's sustainability assessment and SET Awards 	<ul style="list-style-type: none"> Roadshow Annual Report/ Sustainability Report ESG questionnaire Interview of major shareholders' opinions Maintain place in Thailand Sustainability Investment (THSI) Response to institutional investors' request for information and questionnaire on sustainability <p><i>Company Secretary Division</i> Tel: 0 2794 9510 Email: CS@ratch.co.th https://www.ratch.co.th/en/cg/secretary</p> <p><i>Investor Relations Department</i> Tel: 0 2794 9841-2 Email: IR@ratch.co.th https://investor.ratch.co.th/ir_contact.html</p>	<ul style="list-style-type: none"> Sustainability Development Strategy and progress Economic performance Social performance Environmental performance
3) Regulatory bodies	<ul style="list-style-type: none"> Compliance with relevant laws and regulations for operations in Thailand and abroad Good corporate governance Enterprise's knowledge and capacity in following and supporting government policies 	<ul style="list-style-type: none"> Track changes in relevant laws and regulations in Thailand and abroad and continually assess compliance Apply for licenses and follow license conditions Complete reporting as required by relevant laws and regulations Establish environmental management and safety system as well as other relevant systems Extend CAC's membership Cooperate to ensure enterprise sustainability 	<ul style="list-style-type: none"> Coordination Reporting Company inspection <p><i>Tel: 0 2794 9999</i> <i>Website: www.ratch.co.th</i></p>	<ul style="list-style-type: none"> Sustainability governing structure Economic performance Environmental performance Social performance

Stakeholders	Expectations	Approach	Engagement channels	Topics
4) Business partners	<ul style="list-style-type: none"> Financial stability and good corporate image Capability, track record and professionalism of team Managerial capability and governance Long-term partnership 	<ul style="list-style-type: none"> Lead organization towards good image, returns and credit ratings Recruit personnel with commitment and professionalism to work with partners and grow business Set clear guidelines on the disclosure of partners-related information Define partner-related strategies and selection criteria for joint projects, to keep project risks under control Assess partners' creditworthiness by monitoring/investigating from various sources as well as through due diligence Ensure mutual understanding in business approaches 	<ul style="list-style-type: none"> Meeting and exchange of opinion and solutions Agreements on issues including how to keep confidential information secure Study on prototype project Monitoring of project progress Establishment of joint working committee <p>Tel: 0 2794 9999 Website: www.ratch.co.th</p>	<ul style="list-style-type: none"> Shared value partnerships
5) Creditors	<ul style="list-style-type: none"> High credit ratings Efficiency and capability in generating revenue and profits Ability to debt repayment Investment and financing plans Ability to handle financial risks (interest rate and exchange rate) Uninterrupted relationship Trustworthiness, corporate image and governance 	<ul style="list-style-type: none"> Maintain company credit ratings at Investment Grade Strictly abide by repayment schedules Conduct revenue analysis and forecast and manage financial risks Seek low-cost funding sources suitable for investment projects such as Green Bonds and abide by loan conditions Strictly comply with corporate financial and tax policy 	<ul style="list-style-type: none"> Meetings Reporting/ disclosure of relevant information Site visits to monitor progress Agreements on issues including how to keep confidential information secure <p>Tel: 0 2794 9999 Website: www.ratch.co.th</p>	<ul style="list-style-type: none"> Sustainability Development Strategy and progress Economic values

Stakeholders	Expectations	Approach	Engagement channels	Topics
6) Suppliers	<ul style="list-style-type: none"> Trustworthiness, corporate image and governance Financial stability Transparency in operations and procurement process Abidance to contracts Supports to suppliers' operations and improvement 	<ul style="list-style-type: none"> Prepare standardized and transparent procurement process, to rid conflict of interest Assess suppliers' qualifications Give priority to suppliers with desirable qualifications and evaluate suppliers before start of contract and after work completion Prepare clear work plans, monitoring process and budget control accordingly to contracts Discuss with suppliers for mutual agreements on operational procedure Strengthen anti-corruption practices through CAC's certified membership 	<ul style="list-style-type: none"> Meetings and discussions for mutual problem solving Site visit, assessment of supplier's operations and feedback Interview on suppliers' view on corporate sustainability issues and their expectations <p>Tel: 0 2794 9999 Website: www.ratch.co.th</p>	<ul style="list-style-type: none"> Shared value partnerships
7) Customers	<ul style="list-style-type: none"> Response to customers' expectations and assistance to maintain national electricity security Electricity generation and delivery accordingly to contractual quantity and quality specifications Professionalism and transparency Cooperation in problem solving and good relationship 	<ul style="list-style-type: none"> Control operations accordingly to O&M plans, to maintain efficiency, availability payment and ability to promptly operate upon customers' request for national electricity security Mutually implement contractual clauses and solve disputes Arrange meetings and activities to nurture good relationship 	<ul style="list-style-type: none"> Meeting/ discussion Opinion-exchange seminars Interview on customers' view on corporate sustainability issues and their expectations <p>Tel: 0 2794 9999 Website: www.ratch.co.th</p>	<ul style="list-style-type: none"> Customer satisfaction

Stakeholders	Expectations	Approach	Engagement channels	Topics
8) Community/ society	<ul style="list-style-type: none"> • Operations with responsibility for society/ community • Transparent and timely information disclosure • Engagement in inspection of work process • Engagement in sustainable development of community quality of life and society • Recognition of their views and prompt problem solving 	<ul style="list-style-type: none"> • Ensure environmental and safety management in compliance with laws and relevant regulations and continually prevent possible risks to community • Communicate with community thoroughly and through various two-way channels like social network, announcements, meetings, visits and community development activities. • Appoint the Environmental Inspectors Committee, comprising representatives from all parties, to jointly inspect power plants' environmental management; and improve inspectors' relevant knowledge and capabilities • Prepare development plans to improve quality of life in terms of vocation, education, health and others upon community's requirements • Jointly prepare and exercise emergency response plan with community 	<ul style="list-style-type: none"> • Community visits to build relationship • Activities to improve quality of life • Site visit of community to observe the operations of neighboring power plants and/ or other projects • Community engagement in the power plant's construction/ operations/ environmental management through, for example, Environmental Inspectors Committee and tri-partite committee • Complaint channel and process to fix and prevent problems • Emergency drill <p>Tel: 0 2794 9510 Website: www.ratch.co.th/ https://www.ratch.co.th/en/contact</p>	<ul style="list-style-type: none"> • Social stewardship

Every year, RATCH reviews changes of the stakeholders involved in the company's businesses from electricity generation and energy-related to infrastructure businesses. The review is to ensure appropriate, transparent and fair responses to stakeholders affected by the Company's operations and those whose actions may send impacts on RATCH Group.

Sustainability Governing Structure



RATCH aligns with governance best practices in shaping the organizational management structure, which has the Board of Directors as the highest governing body. Best practices are also applied in defining economic, social and environmental strategies as well as short-term and long-term operational targets, for strong and sustainable growth.

Below the Board of Directors, sub-committees are in place to oversee key missions vital for the organization's sustainability. Details are as follows:

- **Audit Committee:** Oversee the efficiency and effectiveness of internal control system to rid fraud and corruption and maintain transparency.
- **Risk Management Committee:** Oversee enterprise risk management and project-level risks in economic, social and environmental dimensions; and evaluate issues likely to become emerging risks that may affect the enterprise's strategies and objectives, to ensure the achievements of business goals and investment projects.

- **Human Resources and Remuneration Committee:** Oversee human resource management that involves the Board of Directors, the Management and employees. It is involved in the selection, nomination, recruitment, capacity building, career advancement, performance evaluation, remuneration and welfare, with respect to individual rights and human dignity as guided by equal, equitable and fair principles and international labor standards.
- **Investment Committee:** Ensure the comprehensiveness and conciseness of risk assessment process and procedure of investment projects as well as the projects' impacts on the economy, the environment, society and community's rights, before making an investment decision; evaluate risks associated with projects' significant business partners and suppliers; and assess the appropriateness and worthiness of investment as well as compliance with legal requirements.
- **Corporate Governance and Social Responsibility Committee:** Define business ethics and guidelines on treatments of stakeholders, social responsibility and sustainable development.

The Board of Directors sets forth business strategies and targets, to be implemented by the Management led by Chief Executive Officer, the Management consists of the chiefs of the following 5 functions:

- **Business Development Function:** Be responsible for project risks, to achieve corporate investment goals.
- **Project Development Function:** Manage risks and impacts arising from project development, take care of community and prevent environmental impacts.
- **Asset Management Function:** Set short-term and long-term plans and manage enterprise risks, having Corporate Planning and Systems Development Division as the key task executer; control revenue-generating efficiency and capability; the management of environmental quality, safety and occupational health; and supervision of subsidiaries' and affiliated companies' neighboring community care.
- **Accounting and Finance Function:** Outline corporate financial plans, entailing revenue, investment fund, and the management of financial risks, taxes, liquidity and financial cost; consider as many financing options as possible; ensure appropriate funding cost for each project; and ensure financial disclosure's compliance with international standards.
- **Corporate Administration Function:** Map out the plan to support sustainable development and sustainable development reporting, having Sustainability Development Department under Corporate Relations Division as the main executer; ensure safety, occupational health and positive environment in work place; and oversee human resource management and information technology system which are fundamental to the organization's operations.

Under the management structure, specific working groups have been set up to drive special missions towards success.



More details on corporate governance and management structure appeared in the 2020 Annual Report.

Code of Conduct and Integrity

RATCH's Code of Conduct is applied with all employees who must strictly follow it in undertaking tasks or activities to preserve the much-valued integrity. (<https://www.ratch.co.th/en/cg/the-code-of-conduct>) In addition, the Company enforces the Anti-Fraud Corruption Policy. (<https://www.ratch.co.th/en/cg/corporate-policy/anti-fraud-corruption-policy>)

In 2015, RATCH declared its intention to support Thailand's Private Sector Collective Action Against Corruption (CAC) and secured the first-round certified membership (2016-2018) and the second-round certified membership (2019-2021).

Anti-Fraud Corruption Principles

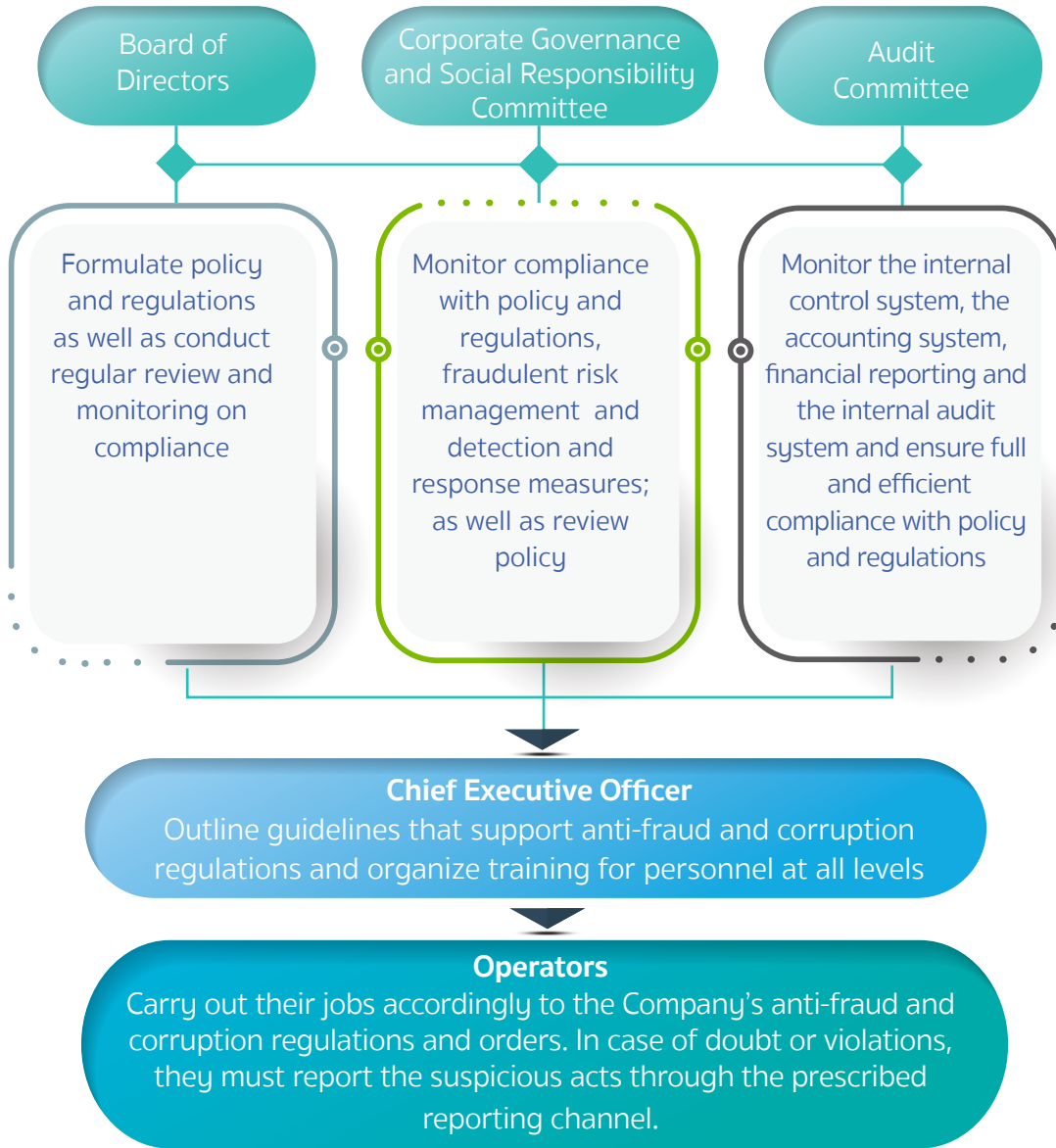
RATCH emphasizes the monitoring on the operations and activities, to ensure that all activities under the Company's control do not violate the following principles:

- Don't give or take all kinds of bribes for any transactions with public or private organizations.
- Don't offer inappropriate payments to influence other organizations' officers for faster services.
- Don't make payments to government officers or the third-party, to speed up services.
- All personnel must maintain integrity and transparency and must not ignore any possible fraudulent or corrupt practices. All personnel reporting such suspicious acts, complainants and cooperators are fully protected against retaliation as required by law.
- Don't support political parties or get involved in political activities.
- Donations are limited only to charitable causes as prescribed by the Company's policy, not to influence others to return inappropriate benefits.
- Giving/taking gifts must conform to acceptable social customs as prescribed by the Company's policy and the value must not be exorbitant or high enough to significant influence others' decisions.
- Receptions must be transparently organized as prescribed by the Company's policy without intention to win any benefits that may be perceived as fraud or corruption or may significantly influence a decision.



Promoting Anti-Fraud and Corruption Activity

Structure of anti-fraud and corruption oversight

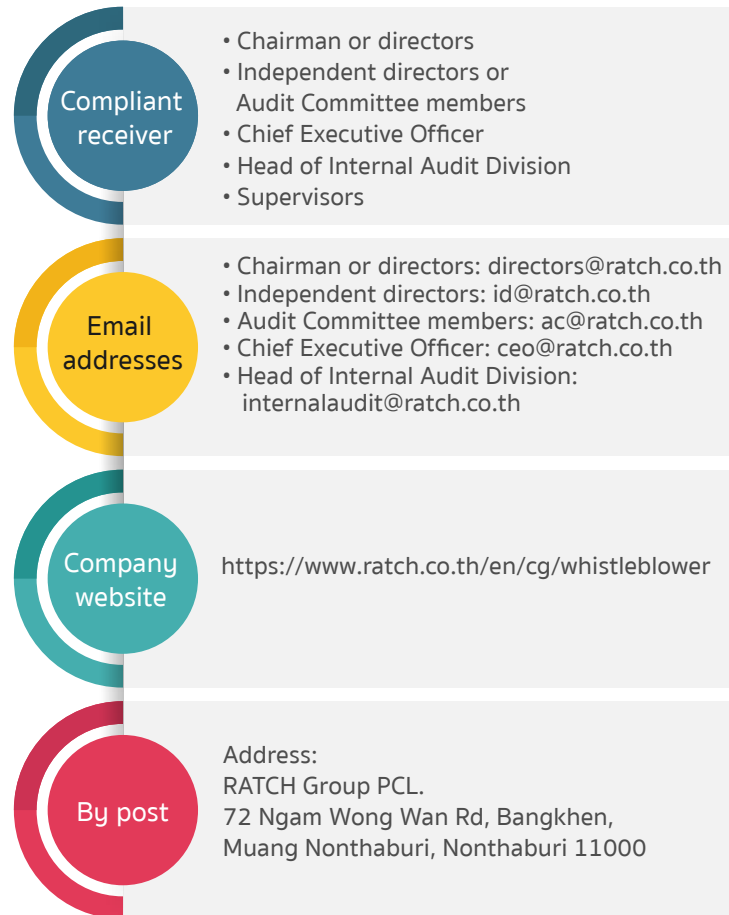


Promoting Anti-Fraud and Corruption Activity in 2020

Whistleblowing channel

RATCH has established a Whistleblower Channel that makes it possible for stakeholders to report concerns about breaches of the Code of Conduct and possible fraudulent and illegal actions that may cause harm to the Company.

Complainants are protected under the Company's measures against retaliation and damage mitigation for complainants or those who cooperate in the reporting.

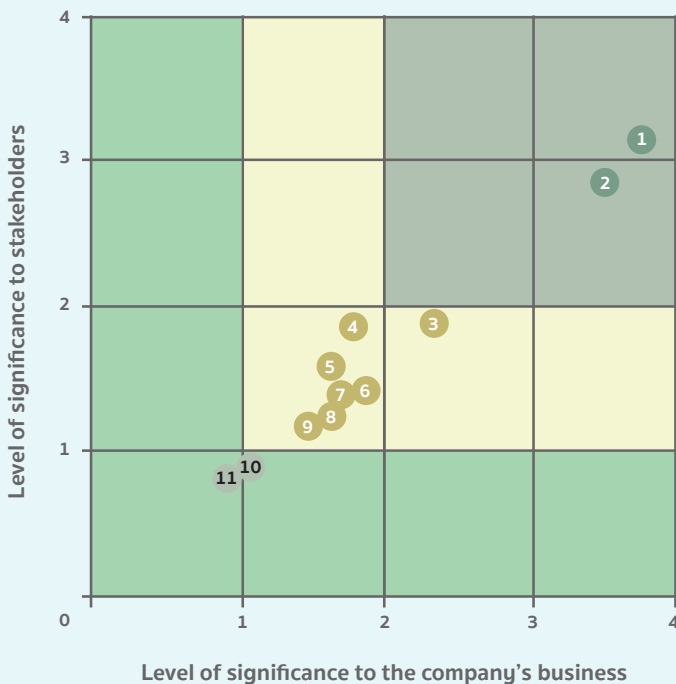
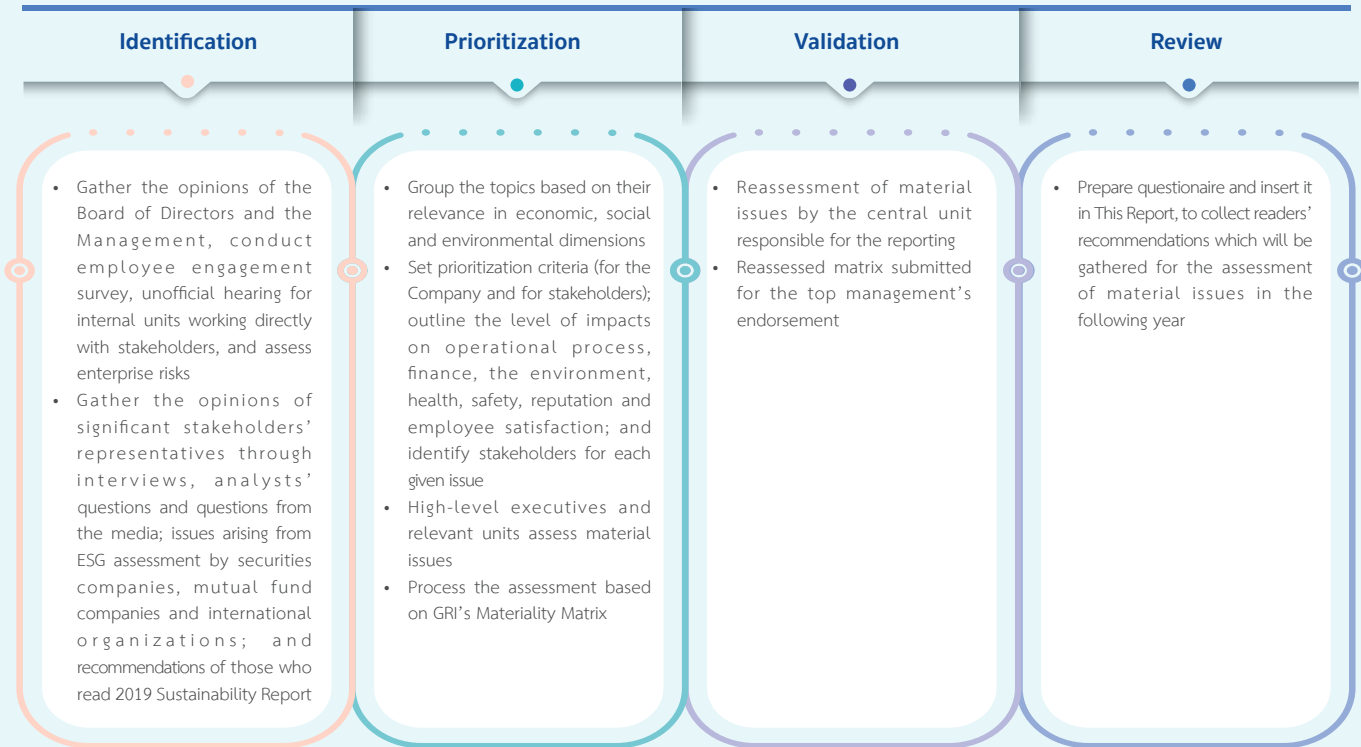


Significant progress in 2020

- Review and assess fraudulent risks that cover all activities, to improve Risk Register, Fraudulent Risk Map, risk prevention measures and the internal audit system in accordance with conditions, for more effective risk management.
- Review Code of Conduct and orders and update them to fit changing situations, to prevent possible risks. A non-disclosure agreement is in place with written penalties on violators. Executives and employees must sign to acknowledge the agreement and follow the code to protect confidential information and must not reveal such information to outsiders.
- Test and evaluate the awareness, understanding and implementation of anti-fraud and corruption policy of employees at all levels via an e-learning channel. The evaluated must score at least 80% and they must pass the test before an annual performance assessment. In 2020, the average score was 88 percent.
- Organize an orientation on the Company's anti-fraud and corruption guidelines for the newly-recruited.
- Educate and raise awareness on corrupted acts and consequences through short plays, newsletters and VDO clips, communicated via the Company's communications system and internal TV network.
- Express the Company's standpoint against corruption to stakeholders and demand their compliance, through the announcements and official letters on the Company's Anti-Fraud Corruption Policy and guidelines.
- In 2020, the Company witnessed zero violations on the Anti-Fraud Corruption Policy or the Code of Conduct. No director or executive resigned due to governance-related issues.

Material Aspects in 2020

Materiality Assessment Process



Material issues to the Company in 2020:

- 1 Risk management
- 2 Operational control/operational excellence
- 3 Business strategy for sustainable growth
- 4 Corporate governance
- 5 Greenhouse gas emission reduction/long-term adaptation to climate change
- 6 Employee stewardship
- 7 Resource utilization management and environmental quality control
- 8 Compliance to Code of Conduct and anti-corruption policy
- 9 Safety management for employees, community and society
- 10 Community stewardship
- 11 Human rights

Materiality reporting GRI102-47

Material Issues	GRI Indicators	Topic in the report	Page	Reporting scope				
				Internal		External		
				Power Generation	Infrastructure	Energy-related business	Community/customers/suppliers/partners/Shareholders/creditors/regulators	
Economic								
1	Risk management	<ul style="list-style-type: none"> • GRI 102-15 Key impacts, risks, and opportunities • GRI 102-30 Effectiveness of risk management processes 	<ul style="list-style-type: none"> • Sustainability Governing Structure • Management Approach of 2020 Material Aspects • Corporate Sustainability Development Strategy and Progress 	29-30 37-39 40-58	✓	✓	✓	-
2	Operational control/operational excellence	<ul style="list-style-type: none"> • GRI 102-31 Review of economic, environmental, and social topics • GRI 201-1 Direct economic value generated and distributed • GRI 419-1 Non-compliance with laws and regulations in the social and economic area 	<ul style="list-style-type: none"> • Management Approach of 2020 Material Aspects • Corporate Sustainability Development Strategy and Progress • Economic Performance 	37-39 40-58 59-82	✓	✓	✓	-
3	Business strategy for sustainable growth	<ul style="list-style-type: none"> • GRI 102-26 Role of highest governance body in setting purpose, values, and strategy • GRI 102-31 Review of economic, environmental, and social topics • GRI 201-1 Direct economic value generated and distributed 	<ul style="list-style-type: none"> • Sustainability Governing Structure • Management Approach of 2020 Material Aspects • Corporate Sustainability Development Strategy and Progress • Economic Performance 	29-30 37-39 40-58 59-82	✓	✓	✓	-
4	Corporate governance	<ul style="list-style-type: none"> • GRI 102-18 Governance structure • GRI 102-26 Role of highest governance body in setting purpose, values, and strategy • GRI 102-31 Review of economic, environmental, and social topics 	<ul style="list-style-type: none"> • Sustainability Governing Structure • Management Approach of 2020 Material Aspects • Corporate Sustainability Development Strategy and Progress 	29-30 37-39 40-58	✓	✓	✓	-
8	Compliance to Code of Conduct and anti-corruption policy	<ul style="list-style-type: none"> • GRI 102-16 Values, principles, standards, and norms of behavior • GRI 102-17 Mechanisms for advice and concerns about ethics 	<ul style="list-style-type: none"> • Code of Conduct and integrity • Respect to Human Rights 	31-33 110-111	✓	✓	✓	-

Material Issues	GRI Indicators	Topic in the report	Page	Reporting scope				
				Internal		External		
				Power Generation	Infrastructure	Energy-related business	Community/ customers/ suppliers/partners/ Shareholders/ creditors/ regulators	
Environment								
5	Greenhouse gas emission reduction/ long-term adaptation to climate change	<ul style="list-style-type: none"> • GRI 305-1 Direct (Scope 1) GHG emissions • GRI 305-2 Energy indirect (Scope 2) GHG emissions • GRI 305-4 GHG emissions intensity • GRI 305-5 Reduction of GHG emissions 	• GHG management and adaptation to climate change	45-57	✓	-	✓	-
7	Resource utilization management and environmental quality control	<ul style="list-style-type: none"> • GRI 301-1 Materials used by weight or volume • GRI 302-4 Reduction of energy consumption • GRI 303 : Water and Effluents 2018 • GRI 305-7 Nitrogen oxides (NO_x), sulfur oxides (SO_x), and other significant air emissions • GRI 306 : Waste 2020 • GRI 307-1 Non-compliance with environmental laws and regulations 	• Environmental Performance	83-95	✓	✓	✓	-
Social								
6	Employee stewardship	<ul style="list-style-type: none"> • GRI 404-1 Average hours of training per year per employee • GRI 404-3 Percentage of employees receiving regular performance and career development reviews 	• Employee Stewardship and capacity building	112-118	✓	✓	✓	-
9	Safety management for employees, community and society	• GRI 403 : Occupational Health and Safety 2018	• Safety and Occupational Health Management	96-109	✓	✓	✓	✓
10	Community stewardship	• GRI 413-1 Operations with local community engagement, impact assessments, and development programs	• Social Stewardship	119-131	✓	-	-	✓
11	Human rights	<ul style="list-style-type: none"> • GRI 406-1 Incidents of discrimination and corrective actions taken • GRI 404-3 Percentage of employees receiving regular performance and career development reviews 	<ul style="list-style-type: none"> • Respect to Human Rights • Employee Stewardship and capacity building 	110-111 112-118	✓	✓	✓	✓

Management Approach of 2020 Material Aspects



Generate governance-based economic growth and maintain national energy and infrastructure security



Build trust and confidence among stakeholders and community through equality and engagement



Efficiently preserve environmental quality, balance of ecosystem and greenhouse gas efficiency

RATCH and stakeholders' material aspects in 2020

Dimension	Materiality	Risk	Opportunity
Economic	Risk management	Abrupt technological change, transition to digital society, and climate change lead businesses towards new dimensions and varieties of risks.	Review the method and process of enterprise risk assessment by exploring newly-developed risk assessment tools that give the comprehensive multi-dimensional picture of environmental, social and human rights risks. Such picture will help shape a comprehensive enterprise risk management strategy and increase the efficiency of strategic decision-making process. The review is slated for completion in 2021.
	Operational oversight/ Operational excellence	Intensifying competition in the electricity generation business due to newcomers; huge investment; requirement of partners in most projects; requirement of skilled and experienced teams for projects under development and construction and those commercially-operated; and an internal work process that allows successful project management.	Apply High Performance Organization concept in the assessment and improvement of work process, for greater efficiency and better responses to organizational objectives. Gap assessment took place in 2018, followed by a work plan for material aspect improvement under the goal to lift organizational performance on par with companies in the same industry. The post-assessment is scheduled for 2022.
	Business strategy for Sustainable growth	Sustainability development framework that highlights economic, social and environmental balance being a key criterion exercised by institutional investors in Thailand and abroad in evaluating corporate determination and capabilities in economic, social and environmental management.	Integrate sustainability development into business strategies to ensure the coverage in economic, social and environment dimensions. Set environmental objectives, particularly those involving greenhouse gas management which is a material aspect to stakeholders and a social issue. The process is expected to complete in 2021.

Dimension	Materiality	Risk	Opportunity
Economic	Corporate governance	Part of ESG underlined by the Stock Exchange of Thailand, the SEC, relevant regulatory bodies, shareholders, foreign partners and suppliers, civil society, domestic and foreign institutional investors; an indicator of corporate sustainability; and a factor that influences public trust and corporate creditworthiness which are the Company's objectives.	Strengthen governance policy based on the SEC's CG Code and raise the Company's governance and sustainability standard to the Top Quartile of listed companies participated in the Stock Exchange of Thailand's Sustainability Assessment of Listed companies; SET Awards in Sustainability Excellence; Thai Institute of Directors Association 'Corporate Governance Report of Thai Listed Companies (CGR) assessment; and Thai Investors Association's Annual General Meeting (AGM) Quality Evaluation Program.
	Compliance to Code of Conduct and Anti-corruption standards	Compliance to Code of Conduct and Anti-Fraud Corruption Policy being the point of concern of the Stock Exchange of Thailand, business partners, suppliers, local and foreign institutional investors and being a gauge of transparency and business ethics.	Raise governance practices to meet international standards by having the Corporate Governance Working Group monitor the governance best practices and sustainable development guidelines of the SEC, the SET and international organizations and adjust the Company's Code of Conduct accordingly; improving and outlining the guidelines for issues material to the Company and stakeholders in timely manner; monitor employees' compliance to Code of Conduct; assessing the internal audit system's efficiency and effectiveness; and supporting Thailand's Private Sector Collective Action Coalition Against Corruption (CAC) under Thai Institute of Directors as a certified member.
Environmental	Greenhouse gas reduction/ Adaptation to long-term climate change	Global warming and climate change prompt the international community to control greenhouse gas emissions to limit global warming to 1.5 degrees Celsius from pre-industrial levels, with emphasis on the emissions from the electricity generation and energy sectors.	<ul style="list-style-type: none"> Review business plans and target to generate 25 percent of electricity from renewable energy in 2025. Action plans to achieve the target start in 2021. Outline short and long-term strategies to reduce greenhouse gas emissions and set clear targets. Explore investment opportunities in businesses specialized in energy-related innovation and energy management.
	Resource utilization management and environmental quality control	Community concern over air, water and waste impacts; increasing attention from civil society, media and investors on environmental issues particularly water-related ones and waste management; and stringent laws in Thailand and across the globe.	<ul style="list-style-type: none"> Develop renewable energy for power plants' use, such as floating solar panels in reservoirs; and improve water quality to maximize reuse cycles. Develop a water footprint assessment as a tool for efficient water management.

Dimension	Materiality	Risk	Opportunity
Environmental	Resource utilization management and environmental quality control		<ul style="list-style-type: none"> Engage with community by setting up the Environmental Inspectors Committee or a tri-partite working team comprising community's representative, to monitor power plants' environmental management; put in place a community relations unit to establish a communications channel with communities; set up a complaint channel; and design a standard practice to address complaints.
Social	Employee stewardship	Intensifying competition and transition to Digital Society influence a change in necessary skills, which cause concerns about career advancement among employees.	<ul style="list-style-type: none"> Create capacity building tools to enhance employees' career advancement and equip them with new functional skills and digital skill which will facilitate adjustments to transitions and new assignment for their own benefits in the long run.
	Safety management for employees, community and society	The long-standing outbreak of COVID-19 across the globe and possibilities of Lost Time Accidents and Lost Time Injury leading to deaths of the Company's employees and suppliers' at power plants older than 10 years and at domestic and foreign projects under construction may derail the Company's zero accident target.	<ul style="list-style-type: none"> Raise old power plants' safety and occupational health standards to ISO 45001, for more efficient management on safety and occupational health which will protect the Company's employees and other relevant workers from accidents, injuries and illness. Adjust Business Continuity Plan, to include operational guides in case of contagious diseases.
	Community stewardship	Community's expectations rise due to more stringent laws on large-scale projects including power plants and petroleum exploration and production projects that promote civil society and community's role in setting the boundary of project areas; and strengthened environmental impact assessment process particularly for large projects involved with infrastructure, mining and energy businesses.	<ul style="list-style-type: none"> Improve community stewardship via a quality of life improvement plan for community, designed to continually develop its capacity, knowledge and skills through engagement by all parties; and support local wisdom and career networks. RATCH and affiliates have continually provided necessary resources for the process.
	Human rights	National Action Plan on Business and Human Rights Phase 1 (2019-2022) was implemented, to tackle human rights violations in the business sector. The plan highlights 4 priority areas: 1) Labor; 2) Community, Land, Natural Resource and Environment; 3) Human Rights Defenders; 4) Cross Border Investment and Multinational Enterprises. The plan requires reporting on human rights performance assessment. In this regards, the SEC acknowledged the requirement and included the reporting in listed companies' disclosure rules, starting in 2022. It also encourages commercial.	<ul style="list-style-type: none"> Put in place Human Rights Policy in alignment with the National Action Plan on Business and Human Rights, as guidelines for the Company and suppliers: and support the assessment of risks in the 4 priority areas in project feasibility studies.

Corporate Sustainability Development Strategy and Progress

RATCH sets forth the Corporate Sustainability Development Policy (<https://www.ratch.co.th/en/cg/corporate-policy/corporate-sustainability-policy>) as the strategy for economic, environmental and social development of the Group's operations in Thailand and overseas. The Environment, Social, Governance (ESG) Working Group was formed to set ESG's goals and actions ensuring progress and tangible results. The policy covers the following areas:

Economic	Environmental and adaptation to climate change	Social and community
<ul style="list-style-type: none"> • Explore approaches to continually improve all fronts of operational efficiency. • Develop and promote corporate innovations and new technology as business strategies for the organization's added value and long-term growth as well as mutual benefits for society and the environment. • Encourage and support adaptation of business partners, suppliers and stakeholders throughout the value chain with the sustainable development principle. 	<ul style="list-style-type: none"> • Ensure environmental and biodiversity management meet relevant laws and regulations; invest in, develop and improve the environmental management system; and seek new measures and approaches to lift the management efficiency and better control the environmental quality. • Invent and seek ways to reduce resource and energy consumption as well as the emissions of pollutants and greenhouse gas, so as to prevent, control and minimize impacts. • Set targets for GHG generated by electricity generation and other business operations; define the assessment approaches for climate risks and impacts; and seek measures to reduce GHG emissions and adapt to climate change. 	<ul style="list-style-type: none"> • Invest in employee capability development through training and necessary resources and create workplace environment that is safe and supports creativity and their full potential. • Respond to customers' demands and comprehensively satisfy customers in terms of contractual product quantity and quality. • Promote community and stakeholder engagement by embracing their opinions, holding transparent and creative discussions, adopting equal treatment with respect to individual differences, and improving community quality of life and strengths. • Collaborate with the public sector, business associations, partners, civic groups and stakeholders in developing and/or applying sustainability-related measures and best practices.
Goals <ul style="list-style-type: none"> • Increase renewable energy capacity • Development of green business, technology and innovations 	Goal <ul style="list-style-type: none"> • GHG emission reduction target 	Goal <ul style="list-style-type: none"> • No complaint or petition for remedy or compensation

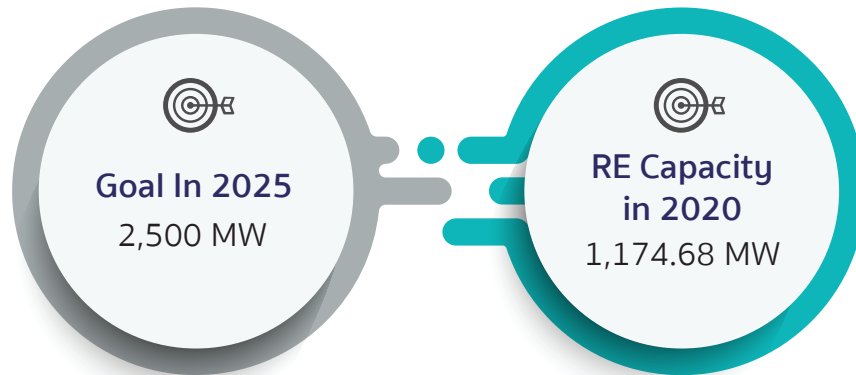
Significant progress on sustainable development in economic, environmental and social aspects in 2020

Sustainable development's economic progress

In 2020, RATCH was more active in exploring investment opportunities in renewable energy, green businesses, technology and innovations. Key activities are as follows:

1. Raising renewable energy capacity

RATCH aimed to increase renewable energy capacity to 20 percent of 10,000 MW target in 2023. In 2021, the target was raised to 25 percent, to be achieved in 2025, with focus chiefly on wind power, solar power and hydroelectric power. The progress of key activities is as follows:



- 9 wind farms = 679.74 MW
- 4 hydroelectric power plants = 418.51 MW
- 12 solar farms = 72.48 MW
- 1 biomass power plant = 3.96 MW

Investment in 2 new wind farms	
Ecowin Wind Farm in Vietnam - 51 percent owned by RATCH - 29.70 MW installed capacity - Under construction with commercial operations slated for October 2021 - 20-year power purchase agreement from Vietnam Electricity	Nexif Energy Ben Tre Wind Farm in Vietnam - 50 percent owned by RATCH - 80 MW installed capacity - Phase 1 with 30 MW capacity and Phase 2 with 50 MW capacity - Electric power supply to Vietnam Electricity - Scheduled for commercial operations around 2022

Construction projects under grid compliance test before commencing commercial operation

Yandin Wind Farm in Australia	Collector Wind Farm in Australia
<ul style="list-style-type: none"> • Commercial operations starting in first quarter of 2021 • Equity installed capacity = 149.94 MW • 70% owned by RATCH • Commencing first generation in July 2020 • 15-year power purchase agreement with Alinta Sales Pty. Ltd. 	<ul style="list-style-type: none"> • Commercial operations starting in first quarter of 2021 • Equity installed capacity = 226.8 MW • Entirely owned by RATCH • 60% of output sold to Infigen Energy for 10 years • 19.4% of output sold to ALDI Foods Pty. Ltd. for 10 years • The remainings of output sold to Austr National Electricity Market.

2. Development of green businesses, technology and innovation

Industrial wood pellet business	
<p>Location: Champasak Province, Lao PDR</p> <ul style="list-style-type: none"> Capacity: 80,000 tons per year from the plantation of fast-growing trees on 20,000-rai area for distribution to industrial customers in Japan and South Korea Plant construction starting in 2021 for manufacturing and distribution in 2022 Wood and wood products to be certified by Forest Stewardship Council (FSC) to guarantee that the forest is being managed with internationally acceptable forest management standard concerning social, economic and environmental benefits. 	<p>Location: Ta Oy City, Samouey City, Salavan Province, Lao PDR</p> <ul style="list-style-type: none"> Feasibility study on the plantation of industrial, fast-growing trees like acacia for wood pellet manufacturing

Technology and innovation		
<p>Fiber optic project</p> <ul style="list-style-type: none"> Establish a joint venture, Smart infranet Company Limited, in which RATCH owns a 51% stake Offer fiber optic rental service, with 5,062-km network along railroads and highways across country and network along MEA underground cable system covering Sukhumvit, Phaholyothin-Pradipat and Phayathai roads Negotiate on a joint venture with PEA ENCOM, to expand fiber optic networks on PEA's transmission lines Sign a cooperation pact with EGAT, to expand networks via EGAT's high-voltage transmission lines across the country 	<p>District 9 Project: Digital industrial zones and smart communities</p> <ul style="list-style-type: none"> To build smart industrial city in Thammasat University and Nava Nakorn Industrial Promotion Zone, Pathum Thani Province, with emphasis on 7 aspects; Smart Environment, Smart Governance, Smart Mobility, Smart Energy, Smart Economy, Smart Living, Smart People Collaborated effort of RATCH, Nava Nakorn Company Limited (NNCL), ALT Telecom Public Company Limited (ALT) and Thammasat University together with Harvard University's Graduate School of Design Consideration investment in Smart Energy and Smart Living to complement RATCH's electricity generation and telecom network businesses 	<p>Nouveau energy innovations</p> <ul style="list-style-type: none"> A 30:40:30 joint venture of RATCH, EGAT and Electricity Generating Public Company Limited Emphasize innovations concerning electric cars, charging stations, artificial intelligence (AI) technology for checking energy loss in transmission grid, smart grid and electric power trading platforms Under process to win approval for joint venture establishment

3. Fund mobilizing for environmental conservation projects

To drive renewable energy development towards targets, RATCH puts in place the Sustainable Financing Approach and the Green Financing Framework. In 2020, RATCH launched its first green bond issue worth Baht 8,000 million, to finance renewable energy and clean transport systems. The bonds, with average maturity of 11 years and 2.45 percent average coupon rate, were offered to institutional and high-networth investors. TRIS Rating assigned "AAA" rating for the bond issue, with "Stable" outlook.

The proceeds were allocated to projects under the following 2 categories:

Baht 6,700 million or 84% to 4 wind farms	Baht 1,300 million or 16% to 2 clean transport projects
<ul style="list-style-type: none"> Collector Wind Farm (226.8 MW) in Australia, entirely owned by RATCH Yandin Wind Farm (214.2 MW) in Australia, 70% owned by RATCH Ecowin Wind Farm (29.7 MW) in Vietnam, 51% owned by RATCH Nexif Ben Tre Wind Farm (80 MW) in Vietnam, 50% owned by RATCH 	<ul style="list-style-type: none"> MRT Pink Line (Khae Rai-Min Buri) in Thailand, 10% owned by RATCH MRT Yellow Line (Lad Phrao-Samrong) in Thailand, 10% owned by RATCH

The Green Bond issuance gained domestic and international recognition. “Deal of the Year” in 2020 Best Bond Award was bestowed by Thai Bond Market Association as a distinctive and most popular private bond in 2020, together with the Environmental, Social and Governance Bond (ESG Bond) Award, which issued based on Green, Social, Sustainable Financing Framework and well suited need of investors.

Additionally, “Best Local Currency Green Bond” was awarded by the Asset Triple A Capital Markets Regional Awards 2020: Deals of the Year in Renewable Energy/ Transition Energy category. Setting a new practice for green bond issuance in Thailand, it is the country’s first green bond issue that was supported by an Assurance Report, prepared by an external verifier, that replaced the popular form of a second party opinion report.

Sustainable development’s progress on community and society

RATCH-controlled power plants have carried out activities to improve community quality of life; encourage community engagement in operational and environmental management; strengthen community in economic, safety, health and environmental dimensions; listen to community complaints through open and accessible channels to deal with community concerns; and adopt an equitable and thorough communication approach. The activities are aimed at attaining community trust and confidence in the Company and its power plants’ operations. In 2020, RATCH received no complaint from the communities near the power plants.

Assistance to community affected by the failure of Xe-Pian Xe-Namnoy Hydroelectric Power Plant’s Saddle Dam D

Since the Xe-Pian Xe-Namnoy Hydroelectric Power Plant’s Saddle Dam D washed-out in mid-2018, RATCH has provided various forms of assistance through the Government of Lao and closely monitored Xe-Pian Xe-Namnoy Power Co., Ltd., the joint venture’s actions in economic, social and environmental rehabilitation programs. The programs which are managed, supervised and scrutinized by the Lao government have shown gradual progress. The rehabilitation and compensation programs to ease the impacts on community and society are summarized below:

Action	Key issue	Progress
Remedy to fatalities	<ul style="list-style-type: none"> The Dead and the Missing Children who lost parents 	Xe-Pian Xe-Namnoy Power Co., Ltd., a joint company fully compensated to fatalities via the Lao government.

Action	Key issue	Progress
Damage compensation	<ul style="list-style-type: none"> Affected household properties Affected local businesses Infrastructure Environment including water source, agricultural land, forest land, reforestation and removal of mud from agricultural fields 	<ul style="list-style-type: none"> Xe-Pian Xe-Namnoy Power Co., Ltd., a joint company coordinated the insurance companies and the contractor to pay full compensations, endorsed by the Lao government. Forest rehabilitation and reforestation plan, covering 2,297 hectares, endorsed by the Lao government is prepared for implementation during 2021-2023.
Temporary fix on infrastructure to ease difficulty situation	<ul style="list-style-type: none"> Irrigation system Land clearing for permanent settlement construction Electrical system and power lines to connect temporary shelters School building and fixing Expansion of hospital area 	Completed
Temporary assistance and rehabilitation of community livelihood	<ul style="list-style-type: none"> Tools for agricultural and livestock activities and rehabilitation of livelihood Rehabilitation of agricultural land and reservoir 	Completed
Construction of permanent settlements and preparation of agricultural land for the affected households	<ul style="list-style-type: none"> The Lao government takes charge of the scheme. Construction of 4 new villages, equipped with infrastructure, a school and a hospital. The Lao government set aside new land plots for the resettlement of 812 households. Setting aside new agricultural land for the villagers of 4 villages 	<ul style="list-style-type: none"> Survey on the resettlement and agricultural land is completed. land clearing completed Accommodation construction for 812 families in 4 villages is 33% completed. It is scheduled for completion in 2021. Fixed roads and constructed new 11 bridges along the main roads Basic infrastructure of the new villages is under construction. Some villagers have been transferred from shelters to newly-built houses in the 4 new villages. Provided assistance to ensure smooth resettlement

Sustainable development's environmental progress

RATCH places an emphasis on greenhouse gas management, which is a critical issue for the Company's electricity generation which contributes the biggest part of corporate revenues. In 2020, resources were geared towards the preparation of GHG inventory, covering RATCH-operated power plants. The GHG strategy and targets are being revised to fit current circumstances and future trends under responsibility of ESG Working Group. The revision is slated for completion in 2021.

GHG Management and Adaptation to Climate Change



Target

- 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters
- 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning



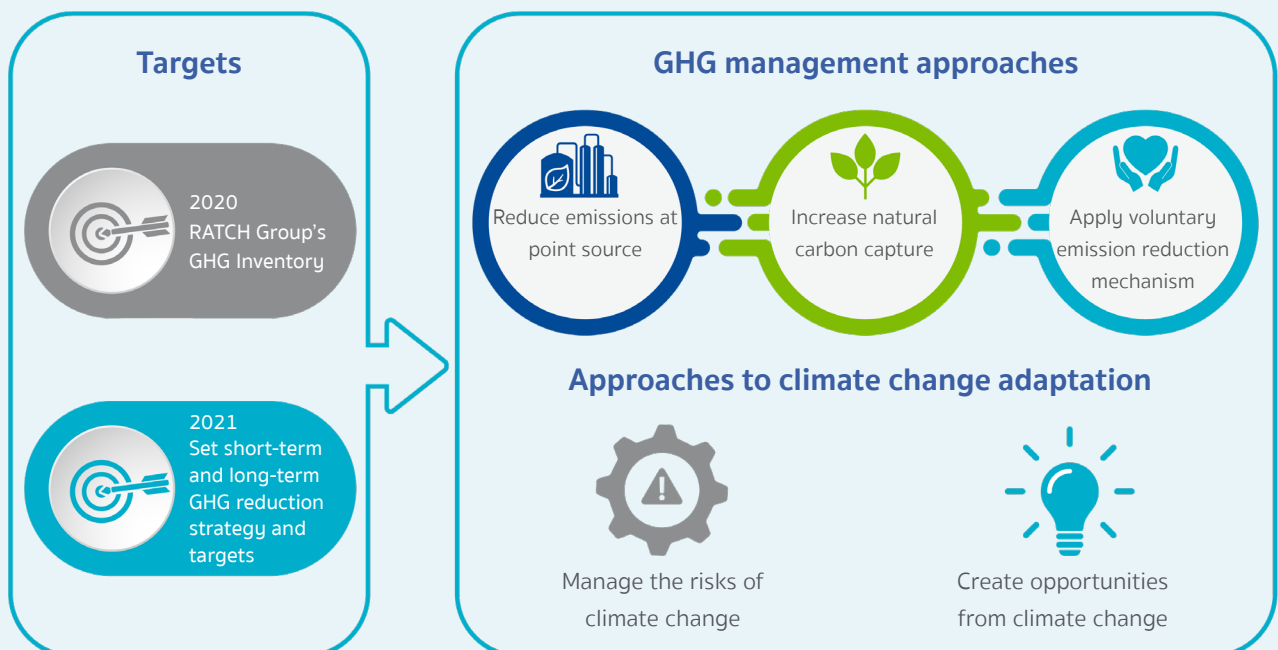
Target

- 12.2 By 2030, achieve the sustainable management and efficient use of natural resources
- 12.8 By 2030 ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

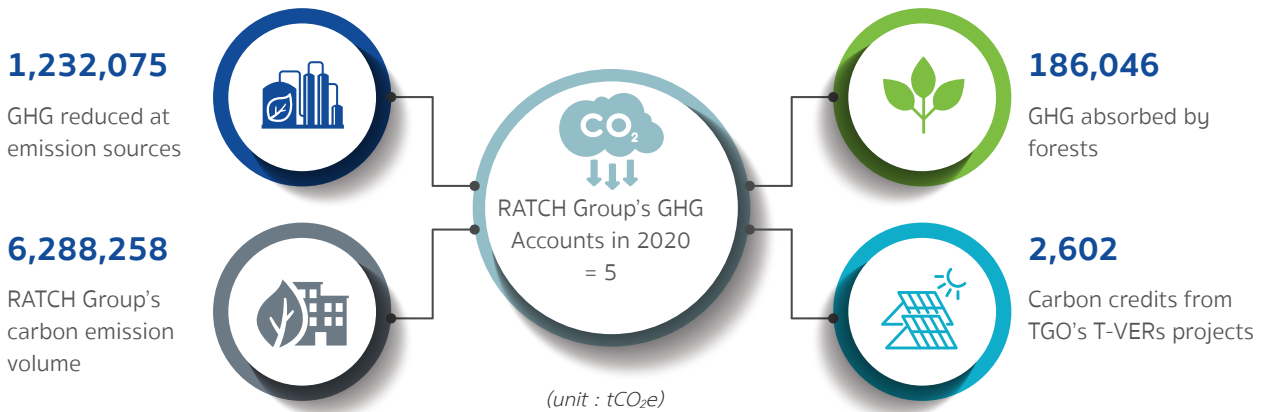


RATCH is aware that energy, though being an essential factor of all countries’ economic and social development, causes environmental impacts that lead to climate change. RATCH is determined to join national and international endeavors in reducing greenhouse gas emissions (GHG), to slow an increase in global temperature and mitigate the intensity of natural disasters caused by climate change.

GHG management framework



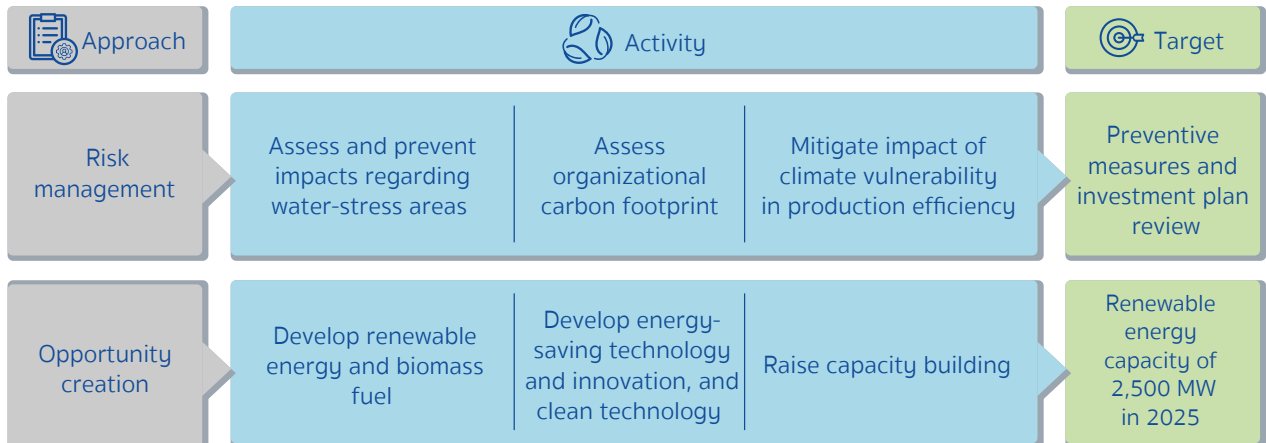
2020 Performance



Group's implementation of GHG management plan

GHG reduction approach	Activity			Result
Reduce emissions at point source	Wind farms	Hydroelectric power plants	Solar farms/biomass power plants	Volume of GHG reduced
	Energy Efficiency	Energy Saving	On-grid and off-grid renewable energy use (Solar/ Wind/ Biomass)	<ul style="list-style-type: none"> Less consumption of energy and resources Lower production cost Higher production efficiency Lower GHG emissions Awareness among suppliers and community
	Electric trains	Carbon footprint assessment under Carbon Footprint for Organization methodology	Green Office Project	
	3Rs principles (Reduce/ Reuse/ Recycle)	Green Procurement	Community Energy Project	
Increase carbon sinks	Love the Forest and the Community Project (Community Forest promotion)	Increase green areas	Reforestation projects	<ul style="list-style-type: none"> Increase carbon sequestration capacity Community awareness
Apply voluntary emission reduction mechanism	T-VERs applied in energy efficiency projects	T-VERs applied in forests and green-area project	T-VERs applied in renewable energy project	Mutual understanding and awareness with employees/community
	TGO's Low Emission Support Scheme			

Adaptation to Climate Change

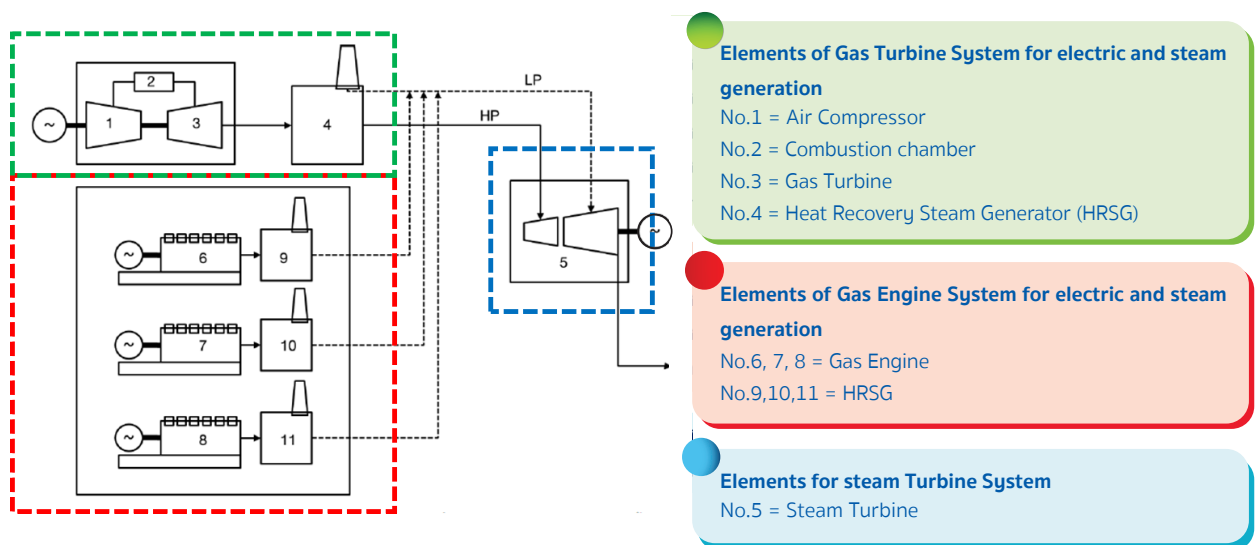


Commitment to reduce GHG at point source

Novel fuel-saving innovation for small power producers (SPPs)

Berkprai Cogeneration Power Plant is a small power producer (SPP) with capacity of 99.23 MW. Located in Tambon Berkprai, Ban Pong District, Ratchaburi Province, the power plant secures a 25-year Power Purchase Agreement. Holding a 35 percent stake in the power plant, RATCH invented a nouveau “Electricity and steam generation combined with 3 systems” that offers higher generation efficiency and lower heat rate or less fuel consumption compared to typical SPP power plants. With the technology, heat rate is efficiently maintained for both on-peak and off-peak periods, resulting in lower production cost and a significant decrease in GHG emissions.

The invention makes use of gas turbine, steam turbine and gas engine. Compared to the generally-used model for cogeneration power plants, the combined system replaces a gas turbine with 3 gas engines which allow greater flexibility and efficient support to Daily Start/Stop (DSS) as ordered by the customer (Electricity Generating Authority of Thailand).



Electricity and steam generation combined with 3 systems at Berkprai Cogeneration Power Plant

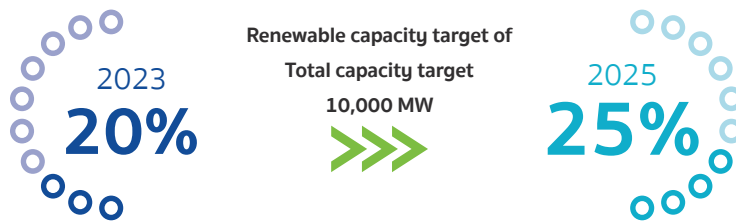
The innovation reduces fossil fuel consumption per a unit of electricity about 300 BTU/kilowatt-hour, or 4 percent of fuel saving compared to other SPPs. Meanwhile, the peak and off-peak plant efficiency stays at 47.05 percent, above the average rate of SPPs at 42.92 percent. The Equivalent Availability Factor is at 98.75 percent, against the 89.97 percent average EAF of SPPs. RATCH is registering the innovation with the Department of Intellectual Property and plans to install the technology at RATCH Cogeneration Power Plant’s extension phase to minimize heat rate and GHG emissions per kilowatt-hour.



RATCH wins Best Innovative Company Award at the Stock Exchange of Thailand’s SET Awards 2020, through the 3-combined generation system at Berkprai Cogeneration Power Plant that includes gas turbine, steam turbine and gas engine. It is the first innovation of Thailand’s SPP industry.





Raise electricity generation from renewable energy



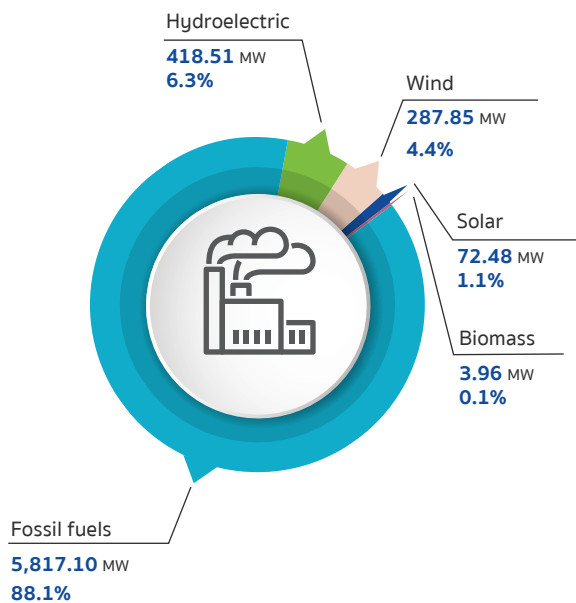
In 2020, RATCH’s equity installed capacity successfully invested 1,174.68 MW increasing portion of equity capacity from renewable accounted to 14.4 percent (of 8,174 MW equity capacity) against the new 25 percent target set for 2025. The electric power generated by renewable energy in 2020 totaled 4.94 million megawatt-hour, 10 percent from domestic power plants and 90 percent from the overseas power plants including Lao PDR, Indonesia and Australia (48 percent, 25 percent and 17 percent, respectively). The renewable energy reduced GHG by 1,225,787 tons of carbon dioxide equivalent.

Electric power generated from renewable sources in 2020

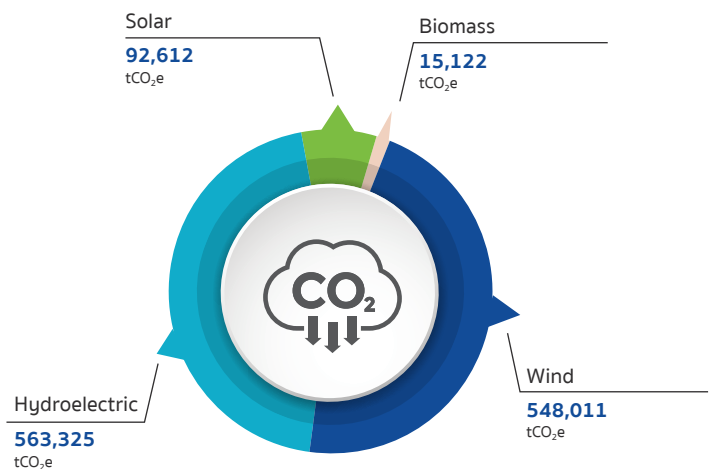
In 2020, the two renewable power plants below with 376.74-MW combined equity capacity which currently conducts grid compliance test are able to generate 1.18 million megawatt-hour per year. It is estimated that the two projects will reduce GHG by 874,455 tons of carbon dioxide equivalent.

Project	Status	Shareholding (%)	Equity installed capacity (MW)	Projected GHG emission reduction/year (tCO ₂ e)
 <p>Yandin Wind Farm Location: Australia Type: IPP Operator: RATCH-Australia Corporation Pty Ltd</p>	Under grid compliance test process	70	149.94	446,775
 <p>Collector Wind Farm Location: Australia Type: IPP Operator: RATCH-Australia Corporation Pty Ltd</p>		100	226.8	427,680

Equity operating capacity in 2020



GHG emissions reduced by renewable energy projects in 2020



Emissions reduction VS. Emission targets

RATCH sets GHG emissions reduction target for the Company’s gas-fired IPP at 0.4945 tons of carbon dioxide equivalent per megawatt-hour, the base case agreed upon in 2019 by Thailand Greenhouse Gas Management Organization (Public Organization), the Office of Natural Resources and Environmental Policy and Planning, the Energy Policy and Planning Office and Electricity Generating Authority of Thailand. The electricity generation business is operated accordingly to the power purchase agreements with the primary customer, EGAT, and each power plant’s output and type of fuels are determined by the customer, which commands the power plants through the National Control Center. In 2020, the GHG emissions per megawatt-hour by RATCH Group’s IPPs were higher than the target.

Assessing reduction of GHG from power generation under TGO guidelines

RATCH assesses the reduction of GHG emitted by its power generation based on the energy-efficiency calculation methodology developed in 2019 by Thailand Greenhouse Gas Management Organization (TGO). Thailand has adopted two base years to measure the reduction in GHG emissions.

- 2010 base year is applicable for measures to achieve NAMA targets within 2020.
- 2015 base year is applicable for measures to achieve NDC targets within 2030.

**NAMA = Nationally Appropriated Mitigation Action, referring to national actions to reduce global emissions.*

NDC = Nationally Determined Contribution, referring to efforts by each country to reduce national emissions.

The CO₂ Intensity (CI) in 2010 (base year) is calculated from each type of fossil-fuel power plants of EGAT and IPPs, which 2010 baseline CI of natural gas is at 0.4945 tCO₂e. Based on the natural gas baseline CI, CO₂ Intensity of Ratchaburi Power Plant in 2020 is as follows:

Power Plant	Type of fuel	Fuel consumption (million cubic feet)	Net generation (MWh)	2010 baseline CI (tCO ₂ e/MWh)	2020 CI (tCO ₂ e/MWh)
Ratchaburi Power Plant	Natural gas	110,449	12,677,121	0.4945	0.4985

Note : 1) Calculation is based on the power plants' 2020 data on natural gas consumption.

2) Tri Energy Power Plant was reserved shutdown until PPA's expiration on 30 June 2020.

Ratchaburi Power Plant's set target of GHG emissions per net megawatt-hour based on EGAT's 2010 CI baseline of natural gas at 0.4945 tCO₂e. In 2020, the power plant uncompleted the target; its GHG emission per electric power unit was higher than base year of 2010.

Energy-saving and efficiency enhancement projects and activities in 2020

All individual power plants were dedicated in finding ways to continually enhance production efficiency and reduce energy consumption, as efficient fuel and energy consumption would help reduce GHG emitted by their operations.

Project/Activity	Energy saved (megawatt-hour)	Expenses saved (baht)	Emissions reduction (tCO ₂ e)
Ratchaburi Power Plant			
Suspending operation of auxiliary cooling water pump during gas turbine shutdown	94.30	284,795	47
Operating 1 station air compressor instead of Control Air Compressor during reserved shutdown	787.02	2,376,797	393
Tri-Energy Power Plant			
Replacement of main air compressor with screw compressor, to provide air to N ₂ Generator during the plant's full block reserved shutdown	175.03	612,605	87
Installation of service water booster pump, to enable water recycling during the plant reserved shutdown	41.44	145,035	21
Installation of On/Off Timer to control Generation Building's air-conditioning compressor, which lessened the use of compressor during the night	16.30	57,034	8
Reducing energy consumption in plant cooldown after Full Speed No Load Operating (FSNL) Test, through shortened ECB and HRC pump operations during plant full block reserved shutdown	36.35	127,218	18
Reducing energy consumption in equipment cooldown after FSNL Test, by performing CT101 and CT201 FSNL Test on the same day	165.45	579,063	83
Nava Nakorn Electricity Power Plant			
Stopping FG Compressor during holidays' peak periods, to reduce electricity demand from Station Service and sell the saved electric power to industrial customers	1,595.14	3,943,928	797
Reusing RO Pass II Sampling Water at RO Permeate Tank, to reduce power supply from Station Service	8.99	125,406	4
Applying VFD and UF Feed Water Pump in speeding up the pump, which reduces the pump's energy consumption	27.58	76,370	14

Project/Activity	Energy saved (megawatt-hour)	Expenses saved (baht)	Emissions reduction (tCO ₂ e)
RATCH Cogeneration Power Plant			
Installing variable speed drive (VSD) for cooling fan and GT air pump	1,384.04	5,536,180	692
Maintaining the electric chiller's compressor	528.16	2,112,620	264
Reducing the pressure of gas compressor, to fit gas turbine generator's operations	3,986.28	15,945,127	1,993
Installing 376 replacement LED light bulbs	26.95	107,806	13
Adjusting the electric chiller's operations, by keeping it on only during peak period	838.58	3,354,338	419
Conducting offline cleaning for gas turbine's blade compressor every 4 months to reduce energy consumption	2,742.07	10,968,271	1,371
RATCH Group Head Office			
Campaigning energy saving measures, "Turn-off, Adjust, Replace, Change"	87.00	391,779	43.49
Total	12,540.68	46,744,372	6,269

Though Ratchaburi Power Plant has been operational for more than 20 years and achieved the output target under the 5-year energy conservation project (2018-2022) of 1,142 megawatts-hour in 2019. The power plant launched a number of 2 projects which saved additional 881 megawatts-hour with its operations in 2020. In addition, Ratchaburi Power Plant set accumulative energy saving target of the new 5-year energy conservation plan (2021-2025) at least 79.4988 million mega joules, representing power saving of 228,400 kilowatts-hour per year.

Carbon Footprint for Organization (CFO)

RATCH Group assessed GHG emissions in the electricity generation business in 2020, focusing on primary assets – Ratchaburi Power Plant, Tri Energy Power Plant and Head Office. The assessment was based on emission scopes 1-2 under Thailand Greenhouse Gas Management Organization (Public Organization)'s Carbon Footprint for Organization methodology. The process was also extended to cover RATCH Cogeneration Power Plant, making it the first SPP of the Company to conduct a carbon footprint assessment.

Carbon Footprint for Organization (CFO)	Direct GHG emissions (Scope 1)						Indirect GHG emissions (Scope 2)					
	<ul style="list-style-type: none"> Consumption of fuels like natural gas, bunker oil and diesel in production process Consumption of fuels for transportation Applying limestone in desulfurization Leakage of sulfur hexafluoride (SF₆) and coolants 						<ul style="list-style-type: none"> Power supply from Electricity Generating Authority of Thailand Power supply from Provincial Electricity Authority Power supply from Metropolitan Electricity Authority 					
Year	GHG emissions (tCO ₂ e)											
	2015 (base year)	2016	2017	2018	2019	2020	2015 (base year)	2016	2017	2018	2019	2020
Ratchaburi Power Plant	7,128,375	7,555,982	5,650,003	5,606,992	5,201,346	4,997,704	27,702	28,028	29,597	25,167	24,090	18,837
Tri Energy Power Plant	1,456,665	1,288,633	1,805,180	779,508	95,489	140	2,183	2,186	1,864	2,419	3,117	1,182
RATCH Group's Head Office	-	-	-	73 (base year)	69	664	-	-	-	1,110 (base year)	1,084	888

Note : Tri Energy Power Plant's carbon footprint assessment was conducted during the operations from January to June 2020.

Emission reduction under T-VER program

Ratchaburi Power Plant continually proceeded with its 3 T-VER programs in reducing GHG emissions. The MRV framework (Monitoring, Reporting and Verification) was applied to achieve emissions-control standards and support the future implementation of Thailand's Emission Trading Scheme (ETS).

Progress of T-VER Program

Item	Project	Type of project	Status		Crediting period	Reduced GHG		Evaluation Plan for carbon credit verification
			Registered	Carbon Credit Certified		tCO ₂ e / year	tCO ₂ e / project	
1	Energy Efficiency Project through LED Lighting Replacement by Ratchaburi Electricity Generating Company Limited	Energy efficiency (EE)	✓	✓	7 years (1 Jul 2017- 30 Jun 2024)	771	5,397	2021
2	Solar Floating Project at Ratchaburi Electricity Generating Company Limited	Renewable energy (RE)	✓	-	7 years (2021-2027)	1,774	12,418	2021
3	Sustainable Forestation Project of Ratchaburi Power Plant by Ratchaburi Electricity Generating Company Limited	Forest and Green area (FOR)	✓	-	20 years (1 Sep 2019-31 Aug 2039)	57	1,140	2022

GHG reduction by means of energy and resource savings

RATCH Group has campaigned for and implemented energy and resource-saving programs at Head Office and after-process activities at power plants. They are Green Office Project, Waste Bank Project and 3R (Activity Reduce/ Reuse/ Recycle)

Activity/Project	Reduced GHG (tCO ₂ e)
Green Office Project Less energy consumption at Head Office Less water consumption at Head Office	45.17
3R Activity at Head Office (Use less paper/reuse and recycling)	7.84
Recycle Waste Bank at Ratchaburi Power Plant	8.97

Community energy-saving campaign

RATCH builds community engagement by giving them knowledge and understanding in support of projects and activities that will help reduce energy and resource consumption as well as save household expenses. In a way, the move helps reduce GHG emissions.



- Implement Community Energy Project Phase III in Tambon Yang Hak, Pak Tho District, Ratchaburi Province
- Promote community energy technology that reduces fossil fuel consumption and cuts GHG emissions
- Support use of solar panels instead of diesel-powered generators for 23 households since 2014
- Enhance energy stability, equip community with management knowledge, help reduce expenses and help reduce GHG emissions

Increase carbon sinks

Aside from schemes that tackle internal emissions, RATCH has continually promoted the capture of GHG through the conservation of community forests which are key carbon sinks.



- Launch the community forest conservation initiative under “Love the Forest and the Community Project”, which involves community forest contest, Community Forest Leaders’ Network Seminar and Kla Yim Youth Club.
- Promote understanding in community forest conservation and management since 2008
- Since 2008-2020, the company supported 1,828 community forests, total areas of 1,605,871.44 rai enabling to absorb 3,211,742.88 tCO₂e

RATCH has encouraged community engagement in preserving community forests which are indirect carbon sinks since 2008 under “Love the Forest and the Community Project” or “Kla Yim”. Together with the Royal Forest Department, the community forest contest has been organized. In 2020, RATCH extended supports to 145 community forests that encompass 93,023 rai which in effect helped the Company capture 186,046 tons of carbon dioxide (based on the Royal Forest Department’s estimate that forests can capture 2 tons of carbon dioxide per rai per annum on average).

Projects applied Low Emission Support Scheme

The Company submitted Head Office’s 1 energy-saving project and 2 community energy-saving projects to GHG evaluation under LESS Scheme (in energy-efficiency category). The projects reduced GHG emissions by 16.72 tCO₂e per year.

Project	Certification period under LESS Scheme	Reduced GHG (tCO ₂ e/y)
Solar-power promotion at Ban Hua Ha, Mae Hong Son Province (Off-grid solar power generation)	1 July 2019 – 30 June 2020	3.68
Community Energy Project at Tambon Pua, Chiang Klang District, Nan Province (Replace lighting bulbs for greater energy efficiency)	1 July 2019 – 30 June 2020	7.48
Light bulb replacement project at Head Office in Nonthaburi Province	9 July 2019 – 20 August 2020	5.56
Total		16.72

Adaptation to Climate Change

Risk assessment and managing the impacts of climate change

The Risk Management Committee and the Risk Management Working Group conducted the assessment on organization-level and project-level risks relating to climate change, to ensure RATCH Group's appropriate preparedness and preventive measures. They also ensured the Group's Business Continuity Plan is sufficient for abrupt emergencies, to avoid business disruption.

Risk factor and impact	Risk level	Activity	Result
<p>Increase in average temperature</p> <ul style="list-style-type: none"> Impact on generation efficiency and Availability Penalties incurring from failure to meet contractual production specifications 	Medium	<ol style="list-style-type: none"> Ratchaburi Combined Cycle Power Plant studied and implemented actions to reduce the temperature of air feeding the Air Inlet Filter, to increase gas turbine efficiency. Tri Energy Power Plant used water spray to reduce the temperature of air feeding gas turbines' combustion system 	<ol style="list-style-type: none"> Ratchaburi Combined Cycle Power Plant ably increases gas turbine's capacity as specified in the power purchase agreement if temperature goes up by 1-5 degrees Celcius which will minimize heat rate, reduce fuel consumption and hence cut production cost. GHG emissions will be reduced as fuel consumption per production unit drops, which will ease climate impacts and slow down an increase in global temperature.
<p>Drought</p> <ul style="list-style-type: none"> Shortage of raw material Inability to meet contractual capacity Conflicts with community over water 	Medium	<ol style="list-style-type: none"> Analyze and assess water stress of potential project locations as the basis for investment consideration: and regularly monitor the intensity at commercially-operated projects. Power plants in Ratchaburi Province conduct a monthly check on water use in Mae Klong River Basin and work with EGAT in assessing the situation and getting prepared for the impacts on production and conflicts with community over water. Sea high tide is monitored as it is a cause of salty water, to assess water cycles in the cooling system and the generation process. Improve the cooling towers' water quality control system for more cycles. Berkprai Cogeneration Power Plant built an underground water reservoir, to accommodate a risk incurring from insufficient water supply from the river. 	<ol style="list-style-type: none"> Study the Water Footprint assessment concept, to calculate the volume of water consumed throughout the full production cycle. The data shall ensure efficient management of water consumption and the capability of relevant water sources. Ratchaburi, Tri Energy and Berkprai Power Plants consumed average 0.73 percent of water released from the upper dam to the Mae Klong River, which sufficiently support generation activities without causing conflicts over water with the community. The Mae Klong River's raw water quality is monitored to plot a quality improvement plan so that water can be recycled 4-6 rounds as targeted.

Risk factor and impact	Risk level	Activity	Result
<p>Flood</p> <ul style="list-style-type: none"> • Production disruption • Discontinuity in electricity generation • Damage to equipment/building 	Low	<ol style="list-style-type: none"> 1) Ratchaburi Power Plant set up 3 flood warning stations to monitor water levels and rainfall - inside the power plant and the canal in front of the plant, and a system to alert relevant parties and Group's power plants in the same area. 2) New projects are surrounded with water drainage system and the power plants are located on the ground higher than the previously-flooded level. 3) Prepare flood emergency manual and contingency plan for prompt responses and hold flood drill annually. 	<ol style="list-style-type: none"> 1) All power plants must prepare emergency response plans and conduct regular drills. 2) RATCH Group's power plants reported no flooding incident in 2020.

Opportunities induced by climate change

Opportunity	Action	Result
Raise investment in renewable energy	<ul style="list-style-type: none"> • Review renewable energy investment strategy and targets for alignment with national power development plans and GHG reduction plans 	<ul style="list-style-type: none"> • In 2020, the renewable energy target is raised to 25% of total capacity (10,000 MW) within 2025.
Apply energy-saving technology/innovation and develop green businesses	<ul style="list-style-type: none"> • Extend the new cogeneration innovation (that combines gas turbine, steam turbine and gas engine) • Select high-efficiency and environmental-friendly technology of internationally-recognized companies for new power plants. • Invest in the manufacturing and distribution of wood pellets which involves the plantation of fast-growing trees. 	<ul style="list-style-type: none"> • Apply the innovation with RATCH Cogeneration Power Plant's extension project. • Select a world-class company's high-efficiency and environmental-friendly gas turbine for Nexif Rayong Cogeneration Power Plant. • Jointly invest in a wood pellet manufacturing plant in Lao PDR for the overseas distribution of products certified by Forest Stewardship Council (FSC)
Raise capacity building	<ul style="list-style-type: none"> • Join EGAT's Thailand Clean Energy Network 2020 which kicks start the country's Renewable Energy Certificate (REC) trading. REC is a mechanism that represents power users' rights to renewable energy, by supporting renewable energy producers and investors' endeavor in raising revenue through REC. 1 megawatt-hour (MWh) of electricity is equal 1 REC. 	<ul style="list-style-type: none"> • Organize an internal knowledge sharing activity, where an EGAT speaker shared knowledge, understanding and exchange opinions on the objectives, targets, principles and creation of RECs; the certification process and trading mechanism; its relevance to Climate Change Act; and the potential benefits for RATCH. The event shed light on a new opportunity and possible application of REC mechanism with potential projects.

Emerging Risks Management

RATCH envisages that worsening climate change will induce uncertainties that may turn to emerging risks and affect the Company's future operations. Risks relevant to climate change or climate change impacts that may have significantly adverse or positive impacts on the Company's operations are as follows:

Emerging risks	Possible impacts	Management approach/opportunity
Laws and regulations on GHG reduction	<ul style="list-style-type: none"> It may be mandatory for the private sector to reduce carbon dioxide or greenhouse gas emissions through a Cap & Trade scheme (limit on GHG emission allowances through buy/sell activities) and/or target setting and/or carbon taxes. Such laws may affect the Company's long-term business strategies and objectives and operating cost. 	<ul style="list-style-type: none"> Continually monitor and study GHG reduction targets of target investment countries, as well as relevant policies, laws and regulations, to assess possible changes and impacts that may affect the Company. Monitor and follow up on national-level and international-level GHG reduction mechanism, the development and mechanism of carbon markets, carbon credit pricing and enforced carbon taxes, to analyze the economic impacts on the Company. Review and adjust the electricity generation investment strategy to balance the investment ratio of fossil fuel and renewable power plants.; and prepare GHG management strategy and reduction target in line with investment countries' strategic plans and targets.
Advanced and rapid technology development in support of GHG reduction	<ul style="list-style-type: none"> Technology to generate electric power from renewable energy like solar and wind power has been continually stepped up in line with increasing demands. R&D on Carbon Capture and Storage (CCS) to reduce fossil fuel power plants' GHG, particularly those powered by coal. 	<ul style="list-style-type: none"> Monitor the advancement of electricity generation technology for cost analysis. Explore opportunities to invest in the renewable energy value chain and alternative energy technology; and seek collaboration with technology developers or experts. Follow up on the improvement in CCS technology and its commercialization trend.

Economic Performance

RATCH's economic values in 2020

Item	Value (Million Baht)
Economic value added	
Sales and service revenue	31,652.54
Profit sharing from investment in jointly-controlled businesses	4,600.34
Interest income	159.41
Received dividend	61.18
Economic value distributed to stakeholders	
Fuel cost	24,475.39
Operations and maintenance expenses	1,665.29
Cost of maintenance and parts	1,270.92
Power plant insurance premium	377.82
Administrative expenses and payments	1,601.09
Financial cost	1,551.35
Taxes*	569.66
Local taxes**	2.78
Dividend paid to shareholders	3,480.00
Community and social investment	185.75
Economic value received by RATCH	
RATCH's profits	6,286.68

Note:

* Inclusive of corporate taxes, withholding tax, and special business tax of RATCH and subsidiaries in Thailand

** Local taxes are the taxes collected by local administrative offices to finance local development projects. Local taxes are subjected to local administrative offices' consideration and are not remitted to the government. They are house and building tax, local development tax, and signboard tax.

Revenue Structure

RATCH's revenue is classified into 4 main categories:

1. Revenue from sales of electricity generated by subsidiaries



- ▶ Ratchaburi Electricity Generating Company Limited, an IPP which operates Ratchaburi Power Plant and Tri Energy Power Plant that boasted 4,365 MW in combined installed capacity

- Availability payment and energy payment as specified in the power purchase agreements (PPAs) with Electricity Generating Authority of Thailand. However, on 30 June 2020, Tri Energy Power Plant's PPA was expired and the power plant decommissioned.



- ▶ RATCH Cogeneration Company Limited, a subsidiary that operates a SPP power plant with 119.15 MW in installed capacity

- Revenue per power purchase agreements (PPA) with Electricity Generating Authority of Thailand, consisting of: Capacity Payment (CP), Energy Payment (EP), and Fuel Saving (FS)



- ▶ RATCH-Australia Corporation Pty Ltd

- Revenue from long-term PPAs for the electricity generated by combined cycle power plants, wind farms and solar farms
- Revenue from electricity sales to the Merchant Market



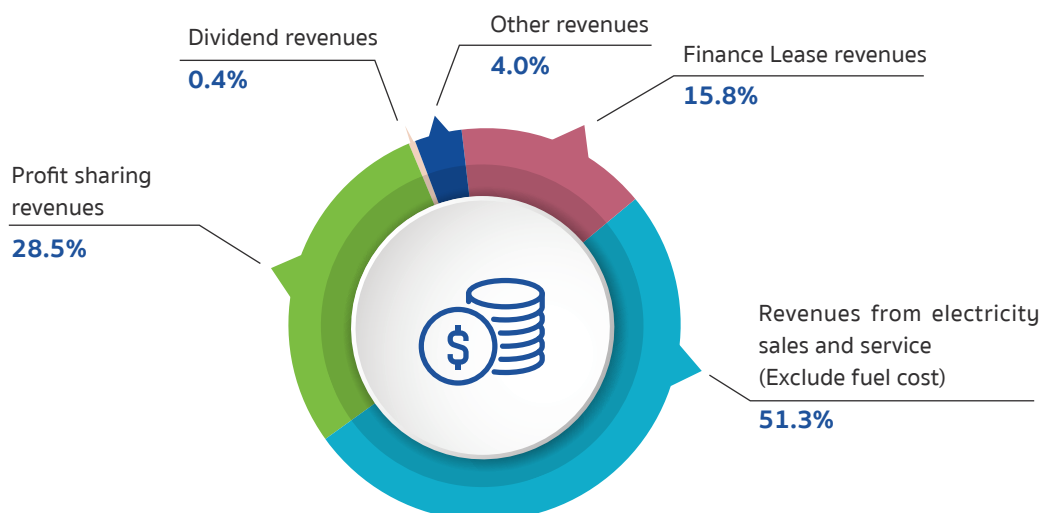
- 2. Revenue from finance lease, or the availability payment in the forms of loans and shareholders' returns, booked at effective interest rates method accordingly to Thai Financial Reporting Interpretation Committee standard No. 4 (TFRIC 4).



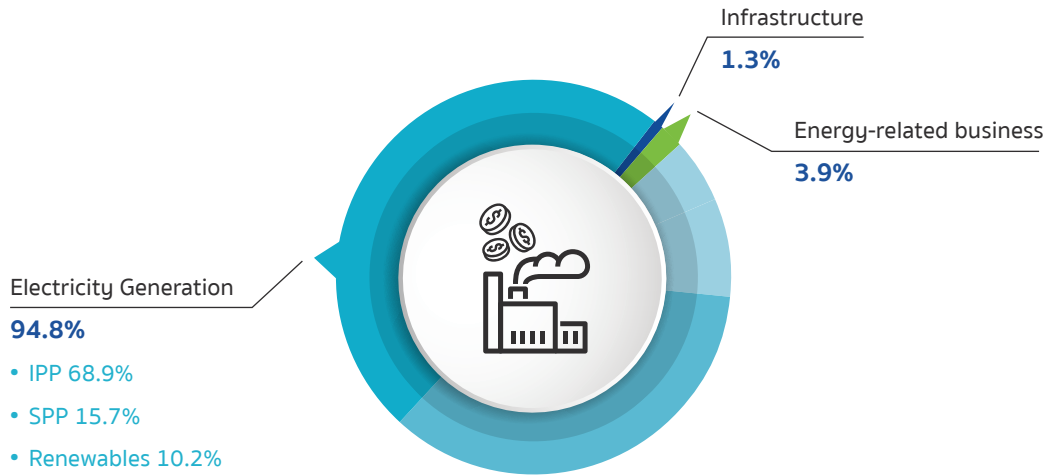
- 3. Revenue from profit sharing in joint ventures in electricity generation, energy-related and infrastructure businesses



- 4. Other revenues comprising interest income and dividend from EDL-Generation Public Company



Ratio of revenues from electricity generation, infrastructure and related businesses



Ratio of revenues from fossil fuel and renewable power plants



Investment in 2020

Total investment = Baht 10,982 million



Total investment in electricity generation business

Baht **10,517** million

- Fossil fuel power plants
Baht **6,576** million
- Renewable power plants
Baht **3,941** million



Total investment infrastructure business

Baht **465** million

Performance in 2020

Electricity Generation Business



Fossil fuel power plants

Nava Nakorn Cogeneration Power Plant (Extension phase), with generating capacity of 60 MW and steam capacity of 10 tons per hour. Powered by natural gas, it is located at Navanakorn Industrial Zone in Pathum Thani Province.

- Commencing commercial operations on 31 October 2020 and selling electricity and steam to industrial customers in the industrial zone.
- Being a 40:30:30 joint venture project of Ratchaburi Electricity Generating Company Limited, a subsidiary; Nava Nakorn Public Company Limited; and Global Power Synergy Public Company Limited.

Hin Kong Power Plant, with 1,400-MW capacity. Powered by natural gas, it is located in Tambon Hin Kong, Muang District, Ratchaburi Province.

- RATCH sold a 49 percent stake in Hin Kong Power Holding Company Limited to Gulf Energy Development Public Company Limited, to jointly develop the power plant. Hin Kong Power Holding is the sole owner of Hin Kong Power Company Limited which develops and operates the power plant.
- Hin Kong Power Company Limited signed the engineering, procurement and construction contract with MHI Power Project (Thailand) Company Limited, Sino-Thai Engineering and Construction Public Company Limited and Mitsubishi Power Company Limited; and signed a long-term maintenance and parts supply service agreement with MHI Power (Thailand) Company Limited. The construction works are expected to start in June 2021 for completion in 43 months. Under a 25-year power purchase agreement with Electricity Generating Authority of Thailand (EGAT), the first generator is scheduled to commence operations in March 2024 and the second in January 2025.
- Hin Kong Power Company Limited signed up EGAT as the Post Notice to Proceed owner's engineer, in accordance with the owner's engineer services contract. EGAT will supervise and ensure the construction meets relevant terms and conditions.

Nexif RATCH Energy Rayong Power Plant, with 92 MW generating capacity. Powered by natural gas, it is located at SSP Industrial Park in Baan Khai District, Rayong Province.

- RATCH acquired a 49 percent stake in NER Singapore Pte. Ltd., which owns Nexif Energy Rayong Company Limited, the developer of Nexif Energy Rayong Power Plant. The SPP co-generation power plant secures a 25-year power purchase agreement from Electricity Generating Authority of Thailand.

- NER Singapore Pte. Ltd. was renamed to NEXIF RATCH ENERGY SINGAPORE Pte. Ltd., and Nexif Energy Rayong Company Limited was renamed to Nexif RATCH Energy Rayong Company Limited.
- The financial package was secured and the construction has started and advanced as planned. The power plant is slated for commercial operations in April 2022.

RATCH Cogeneration Power Plant (Extension phase), with 30 MW generating capacity and 5.46 tons per hour of steam capacity. Powered by natural gas, it is located in Tambon Khlong Nueng, Khlong Luang District, Pathum Thani Province. It is an SPP cogeneration power plant.

- Electricity Generating Authority of Thailand (EGAT) approved the extension project.
- Environmental Impact Assessment report was completed and submitted to the Office of Natural Resources and Environmental Policy and Planning for consideration.
- Output from the extension project will be sold to industrial customers in Navanakorn Industrial Zone and Chumnumsap Industrial Park as well as government agencies and hospital located in the nearby vicinity.

Cogeneration Independent Power Supply Power Plant, with 40 MW capacity. Powered by natural gas, it is located at Nava Nakorn Nakhon Ratchasima Industrial Zone, Nakhon Ratchasima Province.

- The shareholders' agreement was signed with Nava Nakorn Public Company Limited and PEA Encom International Company Limited, to set up R E N Korat Energy Company Limited for the development and operation of the cogeneration independent power supply project. The plant will be connected with Provincial Electricity Authority's grid. The joint venture's shareholding ratio is 40:35:25.

Tri Energy Power Plant, with 720-MW capacity. Powered by natural gas, it is located in Ratchaburi Province.

- Operations were ceased on 30 June 2020 on the expiration of power purchase agreement with Electricity Generating Authority of Thailand.
- Asset liquidation and decommission is underway, slated for completion in mid-2021. Some machinery and parts will be kept as RATCH Group's parts. Some of the 250-rai area will locate 1,400 MW Hin Kong Power Plant.

An Binh Energy and Infrastructure Fund (ABEIF) in Vietnam

- RH International (Singapore) Corporation Pte. Ltd., a subsidiary, signed an agreement with Geleximco Group Joint Stock Company (Geleximco) for a 49 percent investment in An Binh Energy and Infrastructure Fund (ABEIF).
- ABEIF holds 49 percent indirect ownership in 620 MW Thang Long Power Plant, boosting RATCH's indirect holding in the project to 22.05 percent. Using anthracite as fuel, the power plant, located in the North of Vietnam, is commercially-operated.



Renewable power plants

Collector Wind Farm, with 226.80-MW capacity. Located in New South Wales, Australia, the plant is entirely owned by RATCH-Australia Corporation Pty Ltd

- The power purchase agreement was signed with Infigen Energy, a listed company on Australian Stock Exchange, which will buy 60 percent of output from first energy generation date through 31 December 2030.
- The power purchase agreement was signed with ALDI Foods Pty. Ltd, a major retailer in Australia, which will buy 19.4 percent of output for 10 years from commercial operations date.

Ecowin Wind Farm, with 29.70-MW capacity, located in Ben Tre Province, south of Ho Chi Minh City, Vietnam

- RH International (Singapore) Corporation Pte. Ltd., a subsidiary, signed an agreement with Asia Investment, Development and Construction Sole Co., Ltd. (AIDC) for the acquisition of a 63.8 percent stake in RATCH & AIDC Wind Energy Pte. Ltd., which boosted RATCH's indirect investment in the wind farm to 51 percent. The project secured a 20-year power purchase agreement from Vietnam Electricity and is slated for commercial operations in October 2021.

Nexif Ben Tre Wind Farm, with 80-MW capacity, located in Thanh Hai, Thanh Phu District, Ben Tre Province, Vietnam

- RH International (Singapore) Corporation Pte. Ltd., a subsidiary, signed a 50:50 joint venture agreement with Nexif Energy Pte. Ltd to jointly develop Nexif Ben Tre Wind Farm in Vietnam.
- The project is under development and negotiation on principal contracts is underway. To supply power to Vietnam Electricity, it is scheduled for commercial operations in 2022.

Infrastructure Business

District 9: Digital Industrial Zones and Intelligent Communities

- The MoU on District 9: Digital Industrial Zones and Intelligent Communities Project was signed with Nava Nakorn Company Limited (NNCL), ALT Telecom Public Company Limited (ALT) and Thammasat University, together with Harvard University's Graduate School of Design, to build smart industrial city in Thammasat University– Rangsit Campus and Nava Nakorn Industrial Promotion Zone, Pathum Thani province.

Smart Infranet Company Limited

- Registered capital was raised to Baht 550 million. Two projects valued at Baht 530 million were transferred from ALT Telecom Company Limited, a 49% shareholder of Smart Infranet, a fiber-optic network along railroads and highways that covers 5,062 km and an underground fiber-optic network covering Sukhumvit Road, Phaholyothin-Pradipat Road, and Phyathai Road.

- The MoU was signed with Electricity Generating Authority of Thailand (EGAT) to maximize the utilization of EGAT's existing and future optical fiber transmission line and relevant equipment base stations. The agreement will allow the company to offer integrated optical fiber services and greater service efficiency. EGAT's network installed on high-voltage transmission towers currently covers about 500,000 core kilometers/ 250 base stations.

Energy-related Business

Wood pellet production in Lao PDR

- SIPHANDONE RATCH-LAO Company Limited was established to operate the project which can produce 80,000 tons of wood pellets per annum. The company was owned by RATCH-LAO Services Company Limited, 25 percent; Buriram Green Energy Company Limited, 65 percent; and Siphandone Bolaven Development Company Limited, 10 percent. The factory will be located in Champasak Province. The construction is planned for 2021 for completion and commercial operations in 2022. Under the project, fast-growing crops like sugar canes will be grown on a 20,000-rai plot. Outputs will be sold to industrial customers in Japan and South Korea, mainly under long-term supply contracts.
- RATCH-LAO Services Company Limited, a subsidiary incorporated in Lao PDR, signed an MoU with Sacksith Consulting & Trading Sole Company Limited and the Lao Government, to conduct a land survey and feasibility study on the plantation of industrial woods like acacia and fast-growing plants in Taoy City and Sa Moay City, Salavan Province, Lao PDR. The trees will be raw materials of the aforementioned wood pellet factory.

O&M Technician recruitment service for power plants in Lao PDR

- RATCH-LAO Services Company Limited, a subsidiary, signed a contract with Electricity Generating Authority of Thailand (EGAT) to provide O&M technician recruitment service for Nam Ngieo 1 Hydroelectric Power Plant. The 58-month contract will run from May 2020 through February 2025. The 269-MW Nam Ngieo 1 Hydroelectric Power Plant is located in Borikamsai Province, Lao PDR. It supplies electricity to EGAT.
- RATCH-LAO Services Company Limited, a subsidiary, signed a contract with Electricity Generating Authority of Thailand (EGAT) to provide O&M technician recruitment service for Hongsa Power Plant. The 36-month contract started in November 2020. The 1,878 MW power plant is located in Xayaburi Province, Lao PDR. It produces and distributes electricity to EGAT.

Financing activities and financial status

Raising funds worth Baht 8,000 million via the Senior and Unsecured Green Debentures (or Environmental Conservation Bond) with Debenture Holders' Representative for investment, offered via a private placement to high networth and institutional investors. The bond issue is split into 4 tranches.

3-year tranche

Interest rate 1.32% pa.
Baht 1,000 million
Maturing: 4 November 2023

5-year tranche

Interest rate 1.76% pa.
Baht 1,500 million
Maturing: 4 November 2025

10-year tranche

Interest rate 2.61% pa.
Baht 1,500 million
Maturing: 4 November 2030

15-year tranche

Interest rate 2.94% pa.
Baht 4,000 million
Maturing: 4 November 2035



The Baht **1,300** million proceeds
to fund MRT Pink and Yellow electric monorail projects

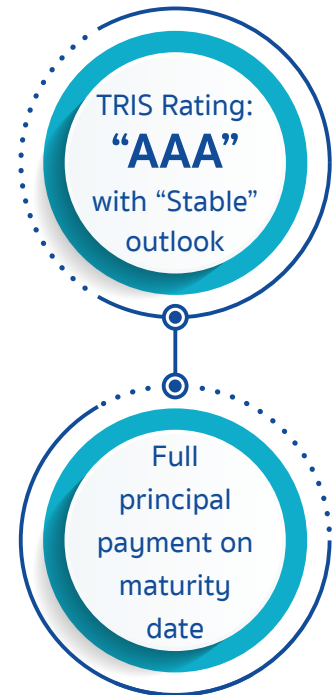


The Baht **6,700** million proceeds
to fund 2 wind farms in Australia;

- 214.2 MW Yandin Wind Farm (70% owned)
- 226.8 MW Collector Wind Farm

and 2 wind farms in Vietnam;

- 29.70 MW Ecowin Wind Farm (51% owned)
- 80 MW Nexif Ben Tre Wind Farm (50% owned)

**Key financial information**

Item	2020	2019
Assets (Million Baht)	112,132.25	100,229.43
Liabilities (Million Baht)	51,610.68	40,815.50
Shareholders' equity (Million Baht)	60,521.57	59,413.93

Financial ratios

Item	2020	2019
Current ratio (times)	2.69	2.70
Profit to total revenue (excluding fuel cost) (%)	37.03	38.90
Return on equity ratio (%)	9.98	10.21
Return on total assets ratio (%)	7.24	8.33
EBITDA to total assets (%)	9.10	9.92
Total debt to equity ratio (times)	0.85	0.69
Net debt to equity ratio (times)	0.57	0.38

Credit Ratings

TRIS Ratings	Moody's	S&P Ratings
AAA	BBB+	Baa1
Outlook: Stable	Outlook: Stable	Outlook: Negative

Shared Value Partnerships

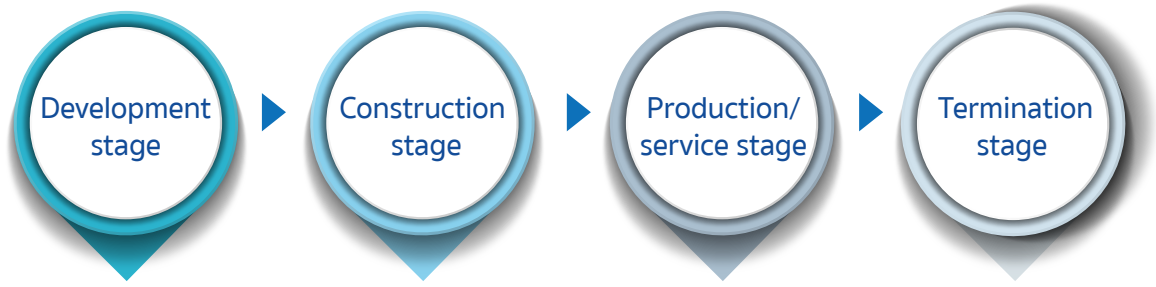
RATCH gave importance to shared value partnerships in its 2020 investment activities covering all business areas – electricity generation, infrastructure and energy-related businesses, as the value chain encompassed service users or small customers. In service industries, customer expectations must be taken into consideration in the formulation of customer relationship management guidelines and a communications plan to achieve what customers demand.

Stakeholders in the value chain

Type of business	Relevant business partners								
Electricity generation	Project development			Construction		Production and distribution		Business termination	
	Partners	Public sector	Regulators	EPC	Contractors	Suppliers (operation and maintenance service)		Suppliers	
	Advisor	Financial institutions	Customers	Workers	Community	Suppliers (fuel/parts)		Customers	
	Community	Suppliers (fuel/parts/ insurance)		Regulators		Regulators	Customers	Regulators	
Infrastructure	Project development			Construction		Operation/service provision		Business termination	
	Partners	Advisors		Partners	Contractors	Customers	Partners	Partner	Suppliers
	Financial institutions	Insurance		Workers	Community	Workers	Community	Customers	
	Suppliers			Regulators		Regulators		Regulators	
Energy-related businesses & others	Project development			Construction		Operation/service provision		Business termination	
	Partners	Advisors		Partners	Contractors	Customers	Partners	Partner	Suppliers
	Financial institutions	insurance		Workers	Community	Workers	Community	Customers	
	Suppliers			Regulators		Regulators		Regulators	

Supply Chain Management Approach

RATCH's operations are carried out in 4 stages: project development, construction, production/service provision, and business termination. The key stakeholders in the four stages' supply chain who influence the Company's achievements are business partners, suppliers, community and the environment. The following guidelines are in place to manage the relationships with each stakeholder:



	Management of relationships with partners and suppliers	Management of relationships with suppliers and community	Management of relationships with suppliers and community	Management of relationships with suppliers and community
Management Approach	<ul style="list-style-type: none"> • Synergize expertise for business strengths • Establish long-term partnership through transparent and fair practices • Define fair and equitable contractual clauses • Abide by agreements and contracts and respect for confidentiality 	<ul style="list-style-type: none"> • Ensure fair and transparent procurement • Assess suppliers’ risks • Comply with laws and international standards relating to occupational health and safety • Seek long-term strategic cooperation • Ensure legal compliance • Employ local workers and establish complaint-receiving channels for community 	<ul style="list-style-type: none"> • Optimize production efficiency and resource utilization • Monitor environmental management and ensure compliance with laws and regulations • Oversee the safeguarding of operational impacts on community • Promote tri-partite engagement and communications with community and society 	<ul style="list-style-type: none"> • Ensure legal compliance • Supervise the management of environment impacts from activities of the Company and stakeholders in the supply chain • Establish a process to receive community’s suggestions and complaints
Actions	<ul style="list-style-type: none"> • Clearly set criteria, expectations, job assignments, responsibilities and decision-making authority • Prepare agreements in writing • Synchronize financial management and investment plans • Clearly set procurement criteria, conditions and methods, as well as establish problem-solving methods for all parties through executive-level discussion • Specify a clear exit clause in the partnership agreement 	<ul style="list-style-type: none"> • Apply appropriate and standardized appraisal criteria/selection/ contract forms • Adopt fair selection process, for fair and equal chance of winning • Establish a system to manage/ monitor contract compliance, to prevent frauds and corruption at all stages • Improve and maintain sustainable relationship with quality suppliers • For executives and employees, do not ask, receive or make fraudulent payments to suppliers • Inform suppliers in advance if unable to meet pre-set conditions and jointly seek solutions • Give priority to local job applicants 	<ul style="list-style-type: none"> • Opt for environmental-friendly production/ service technology • Establish an appropriate environmental quality control and oversight system • Consider the application of 3R principle in production process and at office buildings • Prepare supplier agreements or contracts in line with RATCH’s standards and define penalty clauses • Arrange meetings to continuously follow up on environmental management progress • Give priority to local job applicants 	<ul style="list-style-type: none"> • Communicate with community for their understanding in the process • Contain impacts on the environment and community’s safety from the activities of RATCH, suppliers and partners • Keep open the channels to hear community complaints/suggestions and clearly community with stakeholders on solutions

Partner Relationship Management

Locating strategic partners is a key in driving RATCH towards the 10,000 MW capacity target in 2023, under the long-term corporate strategy.

Objectives

- Drive business towards a shared goal
- Synergize expertise, experiences and strengths
- Share fairly-distributed benefits



RATCH collaborated with 13 existing partners in Thailand and overseas in launching new projects in 2020.

Supplier Relationship Management

RATCH treats suppliers fairly and transparently, to establish trust and long-term partnership. The Company categorizes suppliers in 2 main groups: the manufacturers or procurers of products like machinery and equipment, fuels, parts and others; and the providers of services like specialized consulting, engineering and construction (Engineering, procurement and construction – EPC), operation and maintenance, and other maintenance services. These key suppliers are treated under the following guidelines:

1. Procurement

1.1 Supplier selection

Performance of RATCH Group Public Company Limited

In 2020, RATCH Group subjected a total of 138 suppliers to qualification assessment, or 100 percent of all suppliers. Of total, 91 were existing suppliers and 47 were new ones.

Assessment aspects	No. of suppliers passing the criteria (From all 138 suppliers in the assessment process)			
	Existing suppliers	New suppliers	Total	%
Governance				
1. Integrity/transparency/responsibility				
• Zero corruption history	91	47	138	100
• No history of desertion	91	47	138	100
2. Conflict of interest				
• RATCH's executives/directors hold no position in the companies that submit bids	91	47	138	100

Assessment aspects	No. of suppliers passing the criteria (From all 138 suppliers in the assessment process)			
	Existing suppliers	New suppliers	Total	%
<ul style="list-style-type: none"> No personal relationship with RATCH's executives/employees 	91	47	138	100
Environmental				
3. Environmental management and responsibility				
<ul style="list-style-type: none"> Certified for environmental standard or environment practices (ISO 14000/EIA) 	91	47	138	100
<ul style="list-style-type: none"> Compliance with laws or environmental regulations or environmental management procedures 	91	47	138	100
Social				
4. Labor, community and social care				
<ul style="list-style-type: none"> Zero employment of children or illegal workers 	91	47	138	100
<ul style="list-style-type: none"> Respect for workers' human rights/No infringement to basic human rights 	91	47	138	100
<ul style="list-style-type: none"> Operate with social responsibility, causing no impact on nearby communities 	91	47	138	100

After the assessment, RATCH sent the results and recommendations to all suppliers, who either passed or failed, expecting the suppliers to improve their qualifications and return in the future.

Performance of RATCH's subsidiaries

Ratchaburi Electricity Generating Company Limited

Ratchaburi Electricity Generating Company Limited undertook the supplier qualification assessment that contained environmental aspects for two consecutive years. The assessment results raised awareness in environment management and encouraged suppliers to lift their standards to meet the company's conditions, regulations and preferences.

RATCH-Australia Corporation Pty. Ltd.

- The environmental management standards of key suppliers or their contractors were higher or on par with ISO 14001 standard and relevant conditions. The environmental-stewardship conditions specified in the Terms of Reference (TOR) or the contract covered the management of waste, wastewater and air pollution and/or measures required by the EIA.
- Key suppliers used environmental-friendly practices, having the technology of products/machine that emits least pollutants to the environment. Various technologies were applied in environmental management: for example, HRSG (Heat Recovery Steam Generator) was installed at Townsville power plant, heat was recovered to power steam turbines, which reduced fuel consumption in generating electric power.

- All suppliers' employment guidelines ensured fair treatment of employees/workers or sub-contractors, zero employment of child or illegal labor and zero tolerance to sexual harassment. The guidelines also covered employees' or contractors' welfare, compliance with labor laws, the complaint-receiving process, compensations and full compliance with human rights principles.
- All suppliers were concerned about safety, occupational health and workplace environment for employees or contractors.

1.2 Sourcing of environmental-friendly products and services

RATCH maintained its emphasis on sourcing environmental-friendly products and services as well as giving importance to suppliers with environmental certification.

Procurement of environmental-friendly products and services during 2018-2020 (Head Office)

Item	2018		2019		2020	
	No. of items	Value (baht)	No. of items	Value (baht)	No. of items	Value (baht)
Eco-friendly products/services	45	17,155,843	106	2,639,177	27	19,758,529.55
General products/services	311	132,925,176	495	80,412,220	419	72,421,397.59
Total	356	150,081,020	601	83,051,369	446	92,179,927.14
Ratio of Eco-friendly items to general items (%)	12.64	11.43	17.64	3.18	6.05	21.43

1.3 Control over special procurements

RATCH clearly defined methods in the Company's procurement policy, to ensure the process is transparent and allows fair competition. In 2020, the number of special procurements was lowered by 26 from 2019, or 18 percent.

RATCH Group's product and service procurement sorted by type

Procurement methods	2018				2019				2020			
	No. of transactions		Value (MB)		No. of transactions		Value (MB)		No. of transactions		Value (MB)	
	RATCH	Group of companies	RATCH	Group of companies	RATCH	Group of companies	RATCH	Group of companies	RATCH	Group of companies	RATCH	Group of companies
Price negotiation	160	977	5.0	91.3	141	731	4.3	103.8	85	775	2.8	86.7
Price inquiry	22	17	25.1	21.8	12	16	8.4	22.1	15	25	27.4	25.4
Competitive bidding	7	5	85.8	33.4	1	1	4.3	8.9	2	4	17.2	31.2
Special procurement	51	61	26.9	98.2	38	108	29.2	229.8	36	84	20.8	128.7

Note: Group of companies encompassed Ratchaburi Power Plant and Tri Energy Power Plant.

2. Contract management

Contracts are the legal document that binds RATCH and suppliers, indicating both parties' mutual agreements to conditions. RATCH ensured the criteria and conditions specified in the contracts complied with laws and the Company's rules. All suppliers must endorse the criteria and contractual conditions before signing. In 2020, no suppliers breached contracts.

3. Supplier performance assessment and supplier grouping

RATCH requires the assessment on suppliers' performance in 4 aspects - quality, quantity, delivery and operational practices of suppliers or contractors. The Company sends recommendations to the suppliers who failed in the assessment, for subsequent improvements. Suppliers who pass the assessment are registered to the desirable supplier database, which serves as pre-qualification and ensures more efficient and faster procurement process.

Suppliers are divided to 5 groups, according to contract period, procurement value, qualification assessment result, performance assessment, as well as type of products and services.

Suppliers in 2020	No. of suppliers	%
Suppliers under performance assessment	138	100
Suppliers which failed the assessment (RATCH recommended improvements before they could make new bids.)	0	-
Blacklisted suppliers	0	-



4. Supplier risk management

RATCH assessed risks and economic, social and environmental impacts possibly caused by suppliers' operations, to define preventive measures.

Aspect	Risk factor	Preventive measures	2020 Performance
Economic	Suppliers' financial status and stability	<ol style="list-style-type: none"> 1) Collateral/Bank Guarantee placement 2) Checking financial statements dating back 2 years 	No price collusion or conflict of interest
	Collusion and conflict of interest	<ol style="list-style-type: none"> 1) Define supplier qualification assessment criteria 2) Check information through documents and questioning of individuals in the industry 3) Verify certification letters 4) Put them in the blacklist if found irregularity 	No price collusion or conflict of interest
	Suppliers with over 10 million baht contracts	<ol style="list-style-type: none"> 1) Collateral requirement 2) Inspect compliance with contract and delivery 3) Set a condition to make payment in instalments, based on work progress 4) make a company visit 	2 suppliers were awarded contracts worth more than 10 million baht for RATCH and 7 suppliers served Ratchaburi power plants.
	Job desertion/ failure to meet products and services delivery schedule or product/ service specifications not meeting specified standards	<ol style="list-style-type: none"> 1) Define penalty 2) Confiscate collateral 3) Put on the blacklist 	<ul style="list-style-type: none"> • None of RATCH's suppliers missed delivery deadline or delivered products/services which did not meet specified standards • None of RGCO's suppliers abandoned work.
Social	Employment of child/ illegal labor and violation of human rights or use of forced labor	<ol style="list-style-type: none"> 1) Define supplier qualification assessment criteria 2) Make a suppliers' company visit 3) Report workers' essential information 4) Registration documents for migrant workers 5) Put on the blacklist if violated against the Company's rules 	No supplier employing child/illegal alien labor and violating human rights.
	Workers' safety and occupational health	<ol style="list-style-type: none"> 1) Assess safety-related risks prior to start of work/ orientation 2) Require use of safety equipment necessary for workers written in the contract 	<ul style="list-style-type: none"> • 4 key suppliers of RATCH underwent risk evaluation. • All sub-contractors, numbering 49, of RGCO underwent risk evaluation.
Social & Economic	Suppliers' sub-contractor management	<ol style="list-style-type: none"> 1) Assess safety-related risks prior to start of work 2) Set ESG conditions on sub-contractors in the main contract with the contractors 3) Monitor compliance with the Company's safety measures 	<ul style="list-style-type: none"> • None of RATCH's suppliers were sub-contractors. • RGCO having EGAT as a supplier requested all sub-contractors to comply with specified requirements.
Environment	Suppliers' environmental management and waste management	<ol style="list-style-type: none"> 1) Set conditions in the contract and monitor compliance 2) Make a suppliers' company visit 3) Make it part of the supplier qualification assessment criteria 	Environmental management on risky jobs was a condition in RATCH's contracts with suppliers.

5. Forging long-term strategic relationship with suppliers

RATCH Group gives importance to winning strategic suppliers, to ensure continuous partnership, efficiency and speed. The Group's power plants have also worked with suppliers in enhancing production efficiency, under the goal to continually reduce energy, resources, production cost and the emissions of pollutants and greenhouse gas.

Product and service delivery

The operation and maintenance suppliers delivered 36,735,447 megawatts-hour of electric power and 199,216 tons of steam to the Group's customers in 2020. The generated electric power is dispatched to high-voltage transmission line or the particular system connected with industrial customers.

- Net electric power delivered to Electricity Generating Authority of Thailand= 31,904,392 megawatts-hour
- Net electric power delivered to Provincial Electricity Authority= 175,214 megawatts-hour
- Net electric power delivered to Industrial users=455,348 megawatts-hour and 199,216 tons of steam

The quantity and quality of delivered electric power and steam met the specifications and standards stipulated in power purchase contracts. Details appeared in Customer Satisfaction Section, Page 75.

Operation and maintenance suppliers completed scheduled maintenance within the specified timeframe and budgets.

Furthermore, RATCH convened monthly meetings with suppliers, to explore new approaches that would improve power plant efficiency as well as safety and occupational health measures as well as to discuss on work-related difficulties.



Meeting of RATCH Group with the main supplier



Meeting with the operation and maintenance supplier at RATCH Cogeneration power plant

Customer Satisfaction

It is a great challenge for all companies to churn out products and services that meet customer expectations in the rapidly-changing context. It is even more challenging for a company, like RATCH, that is diversifying from energy business to infrastructure and energy-related businesses as in whatever we do, customers are considered key stakeholders in our value chain who have contributed to our sustainable growth.



Targets

- Deliver contractual orders in accordance with Power Purchase Agreement (PPA)
- Maintain Equivalent Availability Factor (EAF) and Heat Rate at the levels specified in PPAs



Strategy

- To maintain Availability Payment, power plant efficiency must be assured through the setting of power plants' Availability Factor, Reliability Factor and Heat Rate on an annual basis.
- Manage PPAs by delivering customers the contractual volume of electric power and steam.
- Establish communication channels for joint discussion and problem solving.



Guidelines

- Responsibly produce and deliver quality products and services.
- Disclose product and service information completely, accurately and transparently.
- Provide warranty for products and services under an appropriate condition and period of time.
- Provide a complaint system whereby customers can lodge complaints on products and services, to address quick responses.
- Keep customer information confidential and do not exploit the information for their own or related persons' benefits.
- Do not ask for, accept, or make any fraudulent payments to customers.

2020 Performance

Electric power delivered to customers

Power plants in Thailand

- Electric power sold to Electricity Generating Authority of Thailand (EGAT) totaled 31,904,391.97 megawatts-hour.

Power plant	Equity installed capacity (MW)	Power purchase agreement period (year)	Electricity sold in 2020 (MWh)
IPPs			
Ratchaburi Power Plant	3,645	2000-2027	12,643,667
Ratchaburi-Power's Power Plant	372.5	2008-2033	2,801,090
Nam Ngum 2 Hydroelectric Power Plant	153.75	2011-2038	910,865
Hongsa Power Plant (Lao PDR)	751.20	2015-2040	10,698,040
Xe-Pian Xe-Namnoy Hydroelectric Power Plant	102.5	2019-2046	1,412,578

Power plant	Equity installed capacity (MW)	Power purchase agreement period (year)	Electricity sold in 2020 (MWh)
SPPs			
Huay Bong 3 Wind Farm	20.7	5-year non-firm with automatic renewal every 5 years	171,292
Huay Bong 2 Wind Farm	20.7		142,935
Ratchaburi World Cogeneration	93.6	2014-2039	1,234,048
Nava Nakorn Electricity	55.65	2016-2041	631,659
Berkprai Cogeneration	34.73	2019-2044	635,617
RATCH Cogeneration	119.11	2013-2038	622,600

Note : Tri Energy Power Plant was not ordered for generation in January-June (PPA expired on 30 June 2020)

- Electric power sold to Provincial Electricity Authority (PEA) totaled 175,214.42 megawatts-hour.

Power plants	Equity installed capacity (MW)	Power purchase agreement period (year)	Electricity sold in 2020 (MWh)
Solar Power's 3 solar farms	8.64	5 years with automatic renewal	33,459
Solarita Solar Farm (8 projects)	20.73		66,131
Songkhla Biomass	3.96		75,625

- Electric and steam output sold to industrial users
 - Electric power = 455,347.80 megawatts-hour
 - Steam output = 199,216.43 tons

Power plant	Equity installed capacity (MW)	Electric output sold in 2020 (MWh)	Steam output sold in 2020 (tons/hour)
Ratchaburi World Cogeneration	93.6	86,636	61,395
Nava Nakorn	55.65	260,898	116,963
Nava Nakorn Power Plant (Extension)	23.99	33,657	-
Berkprai Cogeneration	34.73	6,433	16,246
RATCH Cogeneration	119.11	67,723	4,612

Overseas power plants

Australia

- Generated and distributed electric power totaled 1,950,925 megawatts-hour

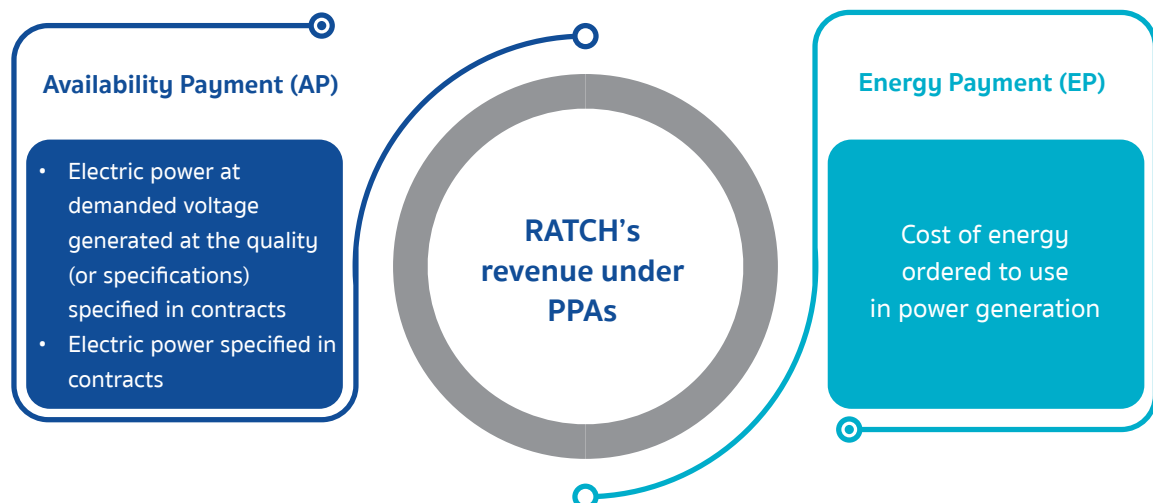
Power plant	Type	Equity installed capacity (MW)	Electric power distributed under PPAs (MWh)	Electric power distributed in National Electricity Market (MWh)
Kemerton	Open cycle gas Turbine	308	94,252	-
BP Kwinana	Cogeneration	35.4	797,000	-
Townsville	Combined cycle	234	212,922	-
Starfish Hill	Wind power	33	89,803	-
Mount Emerald	Wind power	180.45	349,673	-
Collinsville	Solar power	42.5	86,078	-
Kemerton (Black Start)	Diesel engine	7.2	-	-
Windy Hill	Wind power	12	-	24,491
Toora	Wind power	21	-	51,750
Yandin*	Wind power	149.94	236,057	-
Collector*	Wind power	226.8	8,899	-

Note : The under-construction Yandin and Collector Wind Farms are underway of Grid Compliance Test prior to commercial operation.

RATCH has an indirect holding in the Thang Long power plant through 49 percent equity investment in An Binh Energy and Infrastructure Fund (ABEIF), a fund dedicated for investment in energy and infrastructure projects in Vietnam in July 2020.

Management of power purchase agreements

Of total electric power generated by RATCH's power plants, over 87 percent was sold to Electricity Generating Authority of Thailand. As such, the management of the power purchase agreements with EGAT is significant to the Company's revenue management.



Guidelines on the management of key contractual specifications

Availability Payment	Reliability	Heat Rate
<ul style="list-style-type: none"> Target availability is set on an annual basis, aligned with the Contracted Availability Hour (CAH). Inability to maintain contractual availability payment will result in penalties. Crucial to secure customer satisfaction. 	<ul style="list-style-type: none"> Reliability refers to the number of operating hours against unplanned outage hours. In purchase agreements, unplanned outage hour is set at 3-5 percent of contracted availability hour. Unplanned outage hour is a key factor to determine availability payment. 	<ul style="list-style-type: none"> Heat rate is specified in PPAs, covering the amount of energy used to generate one kilowatt-hour (kWh) of electricity. Heat rate reflects customers' cost of electricity. Power plants' maximum generating efficiency must be maintained, to minimize fuels as much as possible. Heat rate is aligned with each power plant's efficiency. Low heat rate indicates high efficiency.

Availability and Reliability of RATCH-controlled power plants

Power plant	Equivalent Availability Factor (EAF)		Reliability Factor (RF)	
	Target	Performance	Target	Performance
Ratchaburi Thermal Power Plant Unit 1	95.47	97.18	95.47	97.18
Ratchaburi Thermal Power Plant Unit 2	95.47	97.18	95.47	97.18
Ratchaburi Combined Cycle Power Plant Block 1	89.16	95.30	92.97	97.94
Ratchaburi Combined Cycle Power Plant Block 2	89.16	95.77	92.97	98.18
Ratchaburi Combined Cycle Power Plant Block 3	79.74	83.67	92.95	97.53
Nava Nakorn Cogeneration	97.77	98.49	Unspecified	
Berkprai Cogeneration Power Plant	97.03	98.75		
RATCH Cogeneration	91.99	96.60		

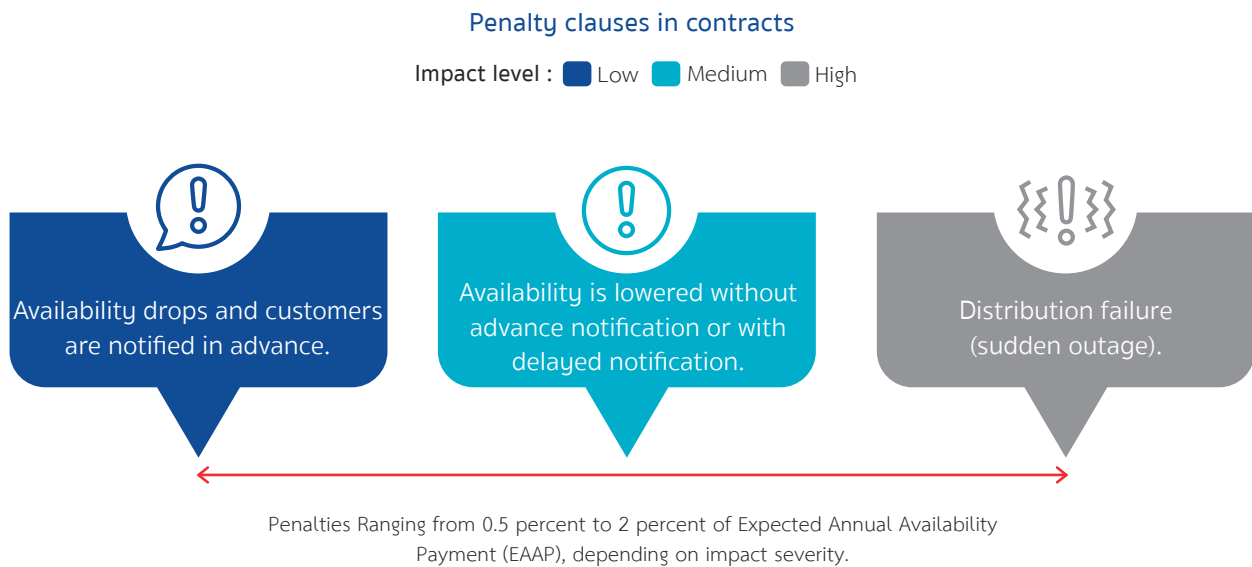
Heat Rate: (Unit: BTU/kWh)

Power plant	Natural gas		Diesel oil	
	Target	Performance	Target	Performance
Ratchaburi Thermal Power Plant Unit 1	Under "reserved shutdown" ordered by National Control Center		Not used	
Ratchaburi Thermal Power Plant Unit 2				
Ratchaburi Combined Cycle Power Plant Block 1	7,184	7,139	Unspecified	
Ratchaburi Combined Cycle Power Plant Block 2	7,166	7,143		
Ratchaburi Combined Cycle Power Plant Block 3	7,204	7,149		
Nava Nakorn Cogeneration	7,873	7,978	Not used	
Berkprai Cogeneration Power Plant	7,383	7,380		
RATCH Cogeneration	7,800	7,907		

Noted : Tri Energy Power Plant was not ordered for generation in January-June (PPA expired on 30 June 2020)

Penalty management

Penalties reflect customer satisfaction as customers cap unplanned outage hours at 3-5 percent of Contractual Availability Hours. The penalties are set at 0.2-5 percent of targeted Availability Payment, depending on the causes and impacts on the national electricity security. As such, power plants must maintain equipment and availability accordingly to the contracts.



Performance

Ratchaburi Power Plant set the acceptable penalty ceiling, based on the condition of significant machinery and equipment as well as customers’ order plan.

Year	Contractual penalties (%)	Target ceiling (%)	Result
2014	0.5-2.0	0.64	0.28
2015			0.53
2016			0.59
2017		0.32	Below target ceiling
2018		0.55	
2019		0.45	
2020		0.32	
		0.62	

Construction management for timely product delivery

To ensure that under-construction projects meet power purchase regulations, generating companies must make down payment. In case that power plant misses the scheduled commercial operation date, the generating companies must forgo the down payment and shoulder damage claims or other payments.

RATCH tasks the Project Development Function to ensure the engineering and construction of under-construction projects strictly meet schedules, budgets, contractual conditions and relevant laws. At present, 7 power plant projects in Thailand and overseas are under construction with 1,326.11 MW in equity installed capacity. Aside, two electric train projects are under construction.

Power plant project

Location	Project	Equity installed capacity (MW)	Scheduled commercial operations	Customer/ stakeholder
Thailand	RATCH Cogeneration (Extension)	29.99	2022	Industrial customers
	Hin Kong Combined Cycle Power Plant	714	2025	EGAT
	Nexif RATCH Energy Rayong Power Plant	45.08	2022	EGAT
Australia	Yandin Wind Farm	149.94	2021	Industrial customers
	Collector Wind Farm	226.8	2021	Industrial customers
Indonesia	Riau Combined Cycle Power Plant	145.15	2021	Perusahaan Listrik Negara
Vietnam	Ecowin Wind Farm	15.15	2021	Vietnam Electricity

Infrastructure

Location	Project	Shareholding (%)	Scheduled operation date	Customer/ stakeholder
Thailand	Monorail Pink Line	10	2022	Commuter/MRT
	Monorial Yellow Line		2022	Commuter/MRT

Communications and customer engagement

RATCH's power plants hold meetings to hear customers' complaints and suggestions, to understand their needs and find mutual solutions so that the operations meet customer expectations.

Methods and patterns of customer engagement

Method/ Platform	Customer/stakeholder	Frequency	Objective/Target
Meeting	EGAT/PEA executives	At least twice a year (depending on incidents in the year)	Discuss issues of concern and production improvement approaches
	Industrial customers' executive-level representatives	At least twice a year (depending on incidents in the year)	Discuss issues of concern and production improvement approaches
Meeting	EGAT/PEA officers	At least 4 times a year (depending on incidents in the year)	Discuss on contractual agreements
	Industrial customers' officers	At least 4 times a year (depending on incidents in the year)	Discuss on contractual agreements
Seminar	Customers and suppliers	At least once a year	Exchange knowledge on machinery efficiency maintenance and improvement as well as production planning
Social activity	Customers' executives and officers	At least once a year	Build good relationships

Actions to satisfy customer needs

Issue	Action
Ratchaburi Power Plant	
Address failure to fulfill the order of EGAT's National Control Center	<p>The power plant and customer met and agreed on the following actions:</p> <ul style="list-style-type: none"> The power plant checked equipment and asked for a review on National Control Center's system. No irregularity was found in the equipment or the signal receiving system. The power plant ran a comprehensive test on the online system and found that the center specified mismatched time, leading to generation failure. EGAT later restarted the online system to fix the problem and the system resumed normal operations. <p>Prevention of repetition</p> <ul style="list-style-type: none"> The power plant ran an offensive test: a computer program was installed to detect orders which may cause problems. It also cooperated with EGAT in improving responses to the online orders.
Nava Nakorn Cogeneration Power Plant	
Contractual electricity delivery	<p>EGAT</p> <ul style="list-style-type: none"> Improved the power plant's generation efficiency to fulfill PPA's electricity distribution.
	<p>Industrial customers</p> <ul style="list-style-type: none"> Improved stabilization of high-voltage transmission line under power grid standard

Berkprai Cogeneration Power Plant	
Contractual electricity delivery	EGAT <ul style="list-style-type: none"> Adjusted faster dispatch and distribution during On- and Off-peak time and maintain efficiency of the power plant
	Industrial customers <ul style="list-style-type: none"> Improved stabilization of transmission line under power grid standard <ul style="list-style-type: none"> Protect the power line from animals or rats by using 3-layer insulated electric cable Prevent short circuit by wiring high voltage transmission line inside the cable duct Use single branded products and service provider Raised 52-week preventive maintenance measure for 22-kV transmission line’s equipment, and daily check for high voltage transmission system and contact the system installation providers to repair degraded equipment
RATCH Cogeneration Power Plant	
Contractual electricity delivery	EGAT <ul style="list-style-type: none"> Improve the power plant ‘s efficiency by changing machines, electricity generation process, and reviewing operation and maintenance plan When production process interrupted, operation team collectively investigated root cause and defined corrective and preventive measures to stabilize the power plant’s generation process
	Industrial customers <ul style="list-style-type: none"> Constructed 22kV switchgear chamber for power distribution system to support industrial users in Nava Nakorn Industrial Zone Built steam distribution system for supporting industrial users in Nava Nakorn Industrial Zone Installed Automatic Meter Reading (AMR) system providing industrial customers for real-time checking on electricity-used volume, electricity-used history and monthly invoice statement. Conducted proactive transmission system’s monitoring by planning daily check, hiring the specialized service provider for annual maintenance ensuring availability and stability of transmission system



Ratchaburi Power Plant held discussion panel with customers



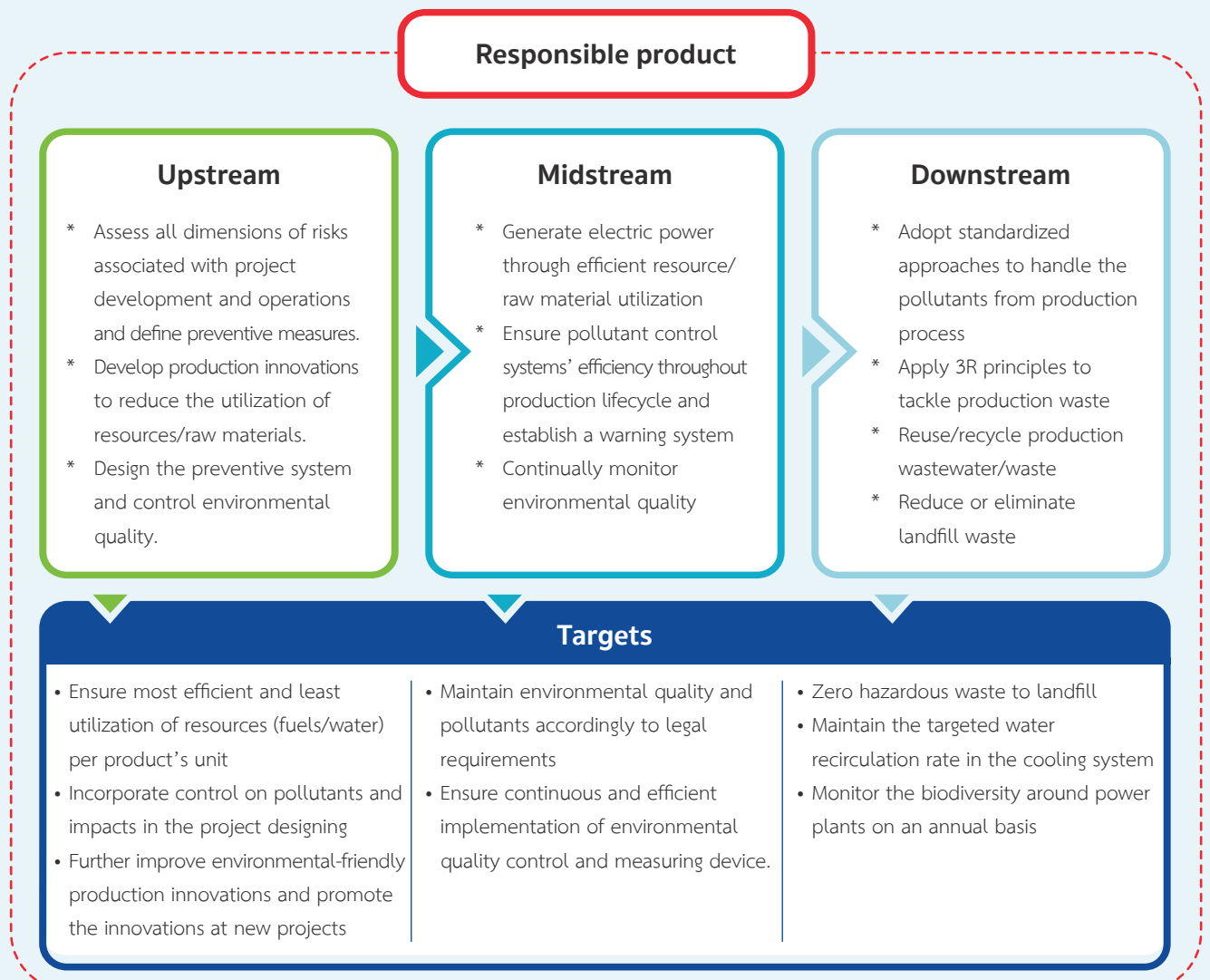
RATCH Cogeneration Power Plant held discussion panel with customers

Environmental Performance

RATCH remains committed to environmental stewardship, through efficient resource utilization and biodiversity conservation as guided by the Company's Code of Ethics and Environmental Policy. Measures have been in place to minimize environmental impacts incurring from the combustion of fuels and the releases of pollutants from the Company's main business. The measures control the Company's activities from the development of production innovation, the designing of systems to prevent and control pollutant quantity and quality and the management of pollutants to the maintenance of ecological balance of the areas around power plants.

Electric power is the electricity generation business' product. RATCH thus strives to optimize production efficiency and keep environmental impacts below regulatory requirements, to ensure the electric power is environmental-friendly. The approach also reflects the Company's responsibility for its products, in line with Target 12.5: Substantially reduce waste generation through prevention, reduction, recycling and reuse under SDG 12 (Ensure sustainable consumption and production patterns).

Environmental management for the production of environmental-friendly electric power



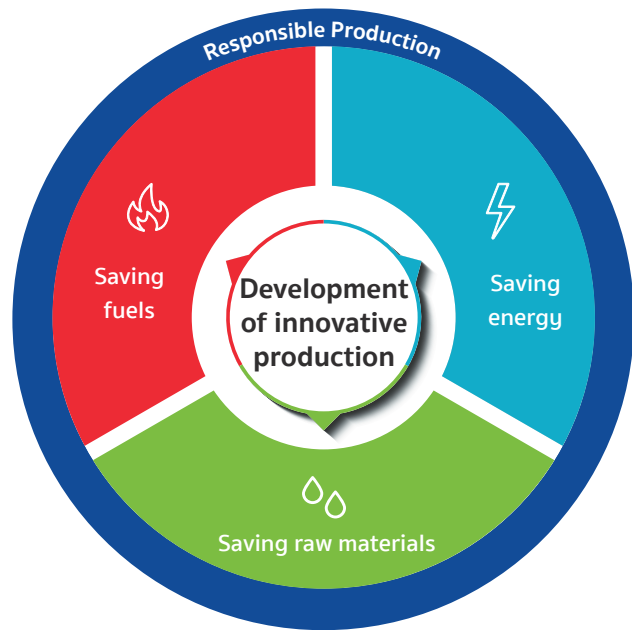
2020 Performance

1. Resource utilization in electricity generation

All power plants emphasize the most efficient utilization of fuels, energy and raw water which are the most important raw materials of electricity generation, for cost benefits as well as the benefits to the environment and community.

1.1 Fuel consumption and heat utilization

The following is fuel consumption and gross electric output of RATCH-controlled power plants - Ratchaburi Power Plant, Tri Energy Power Plant, Nava Nakorn Electricity Power Plant, Berkprai Cogeneration Power Plant and RATCH Cogeneration Power Plant in Thailand as well as Kemerton Power Station and Townsville Power Station in Australia:



Production data	Unit	2020	2019	2018
Net electric output	megawatt-hour	15,240,577	14,542,266	17,171,362
Natural gas used	million cubic feet	132,775	125,706	147,198
Diesel oil used	liter	2,165,175	440,368	563,177
Average heat rate utilization	(IPP plants) BTU/Kilowatt-hour	7,144	7,094	7,118
	(SPP plants) BTU/Kilowatt-hour	7,685	7,640	7,862

Note : Average heat rate utilization data from domestic power plant only

1.2 Water consumption

Power plants in Ratchaburi Province use raw water primarily from Mae Klong River, a major river in the province that receives water from Vajiralongkorn Dam, Tha Thung Na Dam and Mae Klong Dam. As the river chiefly supports irrigation and agriculture, RATCH Group's power plants give importance to the dams' water releases and raw water usage. The data is the basis for the assessment of risks relating to water shortage and conflicts with community over water as well as water stress accordingly to World Resources Institute (Aqueduct Water Risk Atlas and the Water Risk Filter). The monitoring showed there was no fight over water and no sign of shortage in the river, from upstream to downstream.

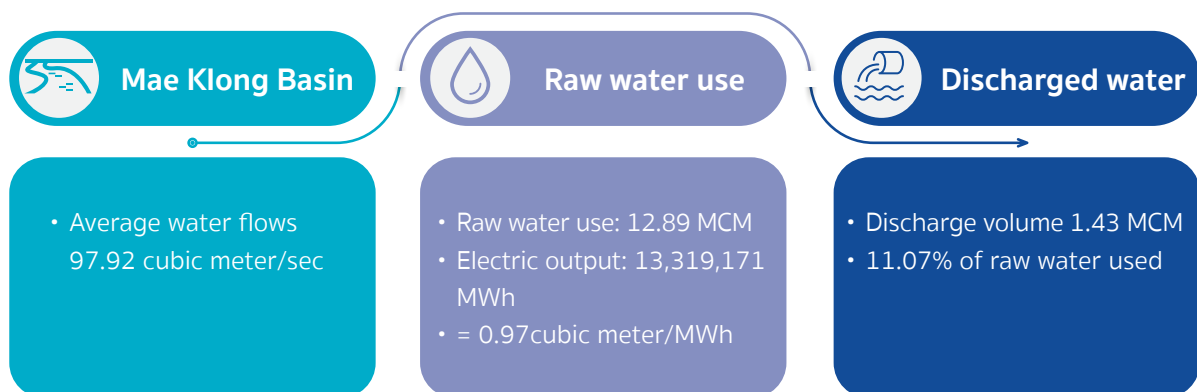
Although, the Chao Praya River as a raw water resource of tap water used in Nava Nakorn Cogeneration and RATCH Cogeneration power plants was designated as area of moderate to high water stress (2-3), there was no sign of water shortage affected to the generation and no fight over water with

community in 2020. The operation plan of the power plants will be consulted with the tap water's producer if concerning of water scarcity arising.

Power plant	Source of water	Raw water volume (million cubic meter)	Water consumption per unit (cubic meter/mgawatt-hour)	Water discharge		Net water consumption (million cubic meter)
				Volume (million cubic meter)	% of raw water used	
Ratchaburi Power Plant	Mae Klong river	11.82	0.93	1.17	0.10	10.66
Tri Energy Power Plant	Mae Klong river	0.08	0.00	0.02	0.04	0.06
Nava Nakorn Power Plant	Tap water from Chao Phraya river	1.56	1.69	0.08	0.19	1.48
Berkprai Cogeneration Power Plant	Mae Klong river	0.98	1.53	0.24	0.04	0.74
RATCH Cogeneration Power Plant	Tap water from Chao Phraya river	0.91	1.32	0.12	0.08	0.79
Power plants in Australia • Kemerton • Townsville	Tap water and surface water	0.09	0.29	0.02	0.04	0.07

Note : Tri Energy Power Plant's data was from January through June, as its power purchase agreement expired on 30 June 2020.

Data shows Ratchaburi Power Plant, Tri Energy Power Plant and Berkprai Cogeneration Power Plant used 0.07 percent of Mae Klong River's water volume. The area was not in the boundary of water stress assessment.



2. Water Management

Power plants' water management

- Adopt a water recycling method for cooling towers, which improves water quality and hence allows more cycles of cooling water.

Comparative cooling water cycles

Power plant	Target (cycle)	Average cycle (cycle)		
		2020	2019	2018
Ratchaburi Power Plant	4-6	4.81	4.91	5.02
Nava Nakorn Power Plant	5	4.16	4.82	4.70
Berkprai Cogeneration Power Plant	5	4.07	-	-
RATCH Cogeneration Power Plant	-	6.67	-	-

Note : Tri Energy Power Plant was ordered reserved shutdown in January–June and its power purchase agreement expired on 30 June 2020.

- Recycle water by treating water with the Reversed Osmosis (RO) and Ultra Filter systems, improving the quality of treated water and reusing the water in the production process.

Volume of recycled water after treatment by RO and Ultra Filter systems at Ratchaburi Power Plant

List	2020	Aggregate volume (2009-2020)
Waste water for RO treatment (cubic meter)	527,870	7,807,889
RO-treated and recycled water (cubic meter)	249,973	3,413,340

3. Power plants' energy saving

RATCH Group's power plants have put in place the energy efficiency and conservation plan, aimed at reducing energy consumption and raising renewable energy. For instance, during a reserved shutdown, Ratchaburi Thermal Power Plant was powered by solar panels floating on its reservoir, which reduced production cost, fuel consumption and Scope 2 GHG emissions. Additional information on energy-saving approaches appeared in GHG Management and Adaptation to Climate Change Section: Page 45

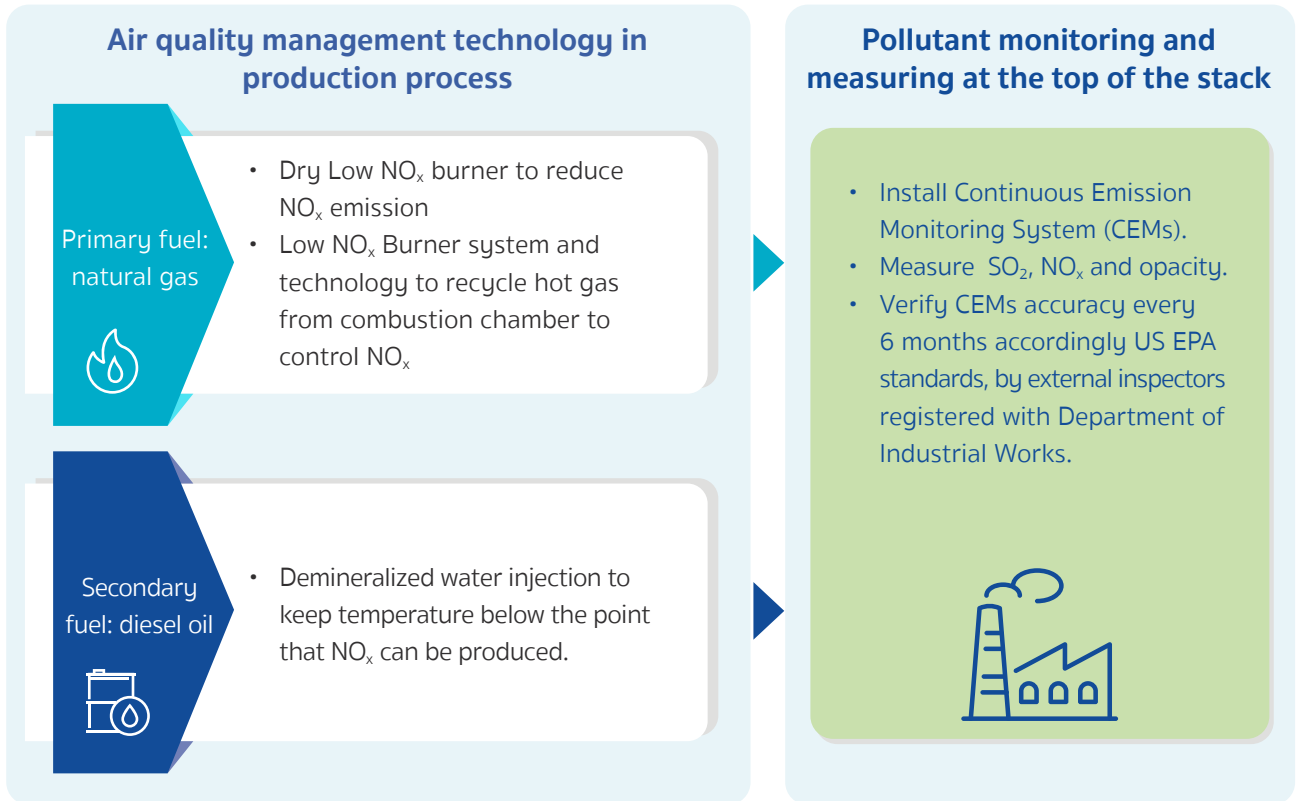
4. Power plants' environmental management

RATCH intends to deliver good environmental management that concerns the quality of air, water, noise, waste and the ecosystem of power plants in accordance with laws and international standards, to earn public recognition. Its power plants thus put in place the environmental management system that covers preventive and elimination measures as well as continuous monitoring on environmental quality within power plants and in community. The environmental data, preventive measures and impact management approaches are reported to the Office of Natural Resources and Environment Policy and Planning every six months. In addition, the ISO14001 environmental standard was applied to enhance the management efficiency such as Ratchaburi Power Plant, the Company's main asset.

In 2020, the power plants completely operated accordingly to environmental laws. They experienced no complaints or penalties relating to incompliance or violations.

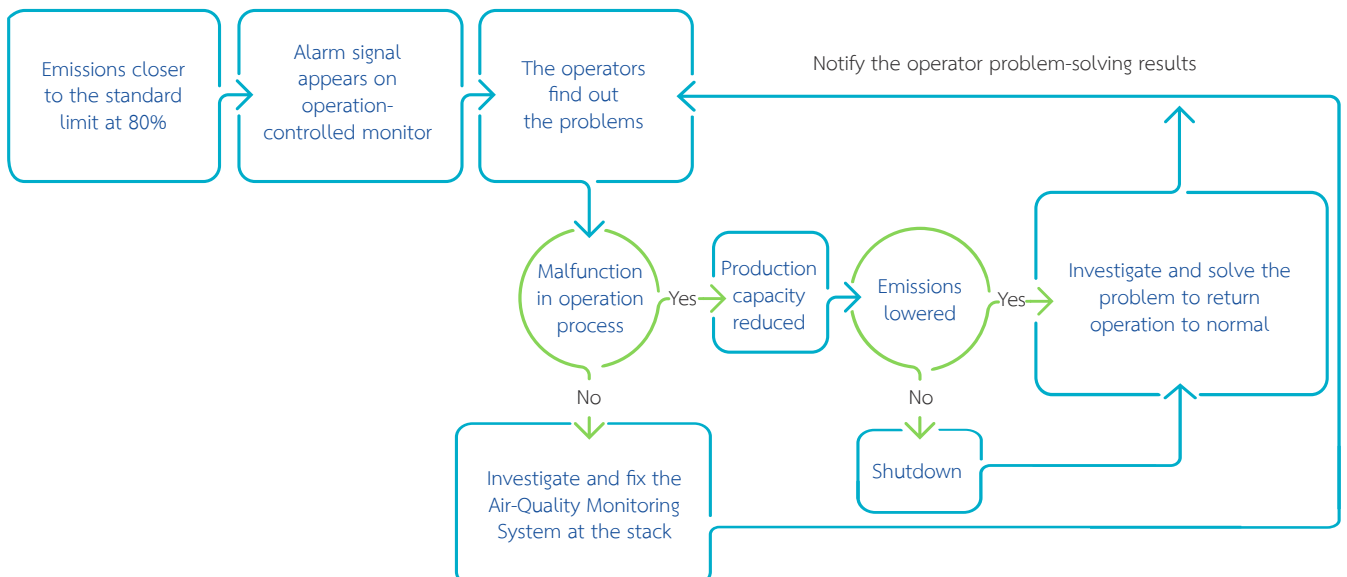
4.1 Air quality management

RATCH-controlled power plants are mainly powered by natural gas, with some using diesel and bunker oil as secondary fuel.



Continuous Emission Monitoring System (CEMs) is installed at the top of the stack of all power plants, to monitor the emitted pollutants. Real-time data is reported to the operation control rooms and the Department of Pollution Control. At Ratchaburi Power Plant, the data is also displayed in front of the power plant.

A warning signal will be triggered if the air quality from the top of the stack increases and moves closer to the standard limits at 80 percent. Power plants follow the guidelines as shown in the graphic below to reduce pollutants.



Results of air quality measurement at the top of the stack

Power plant	Average pollutant density from combustion emitted by power plants in 2020				
	NO _x (ppm)		SO ₂ (ppm)		Backup fuel
	Natural gas	Fuel oil	Natural gas	Fuel oil	
Ratchaburi Combined Cycle Power Plant	20.92	-	1.07	-	Diesel
Standard limits*	120	180	20	320	
Nava Nakorn Power Plant	34.69	-	0.33	-	None
Berkprai Cogeneration Power Plant	43.40	-	1.18	-	
RATCH Cogeneration Power Plant	37.85	-	-	-	
Limit in accordance with EIA requirement	60	-	10	-	

Note : Standards as in the notification of Ministry of Industry on the limit of air pollutants emitted by power-generating, transmission or distribution plants B.E. 2547.

Results of air quality measurement at community around Ratchaburi Power Plant

Ratchaburi Power Plant installed the ambient air quality monitoring systems (AAQMs) to monitor the air quality and assure community of safety. The systems are installed at 4 air quality measuring stations to cover wind directions in all seasons. The system efficiency and accuracy is verified by external inspectors every six months.

Air quality measuring stations at nearby communities	24-hour average			1-hour average		
	Total Suspended Particulate (µg/m ³)	Particulate Matter smaller than 10 micron (µg/m ³)	SO ₂ (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	O ₃ (ppb)
Ban Don Mod Tanoy	42.17	29.50	1.33	2.50	11.83	49.50
Ban Bang Krado	48.60	32.17	1.67	3.00	12.83	51.67
Ban Khlong Khae	37.80	33.20	2.20	3.20	16.60	50.00
Ban Chaonua	32.83	26.50	1.33	2.17	11.60	55.50
Target (Below standard limits)	330 ^[1]	120 ^[1]	120 ^[1]	300 ^[2]	170 ^[3]	100 ^[4]

Note : µg/m³ = microgram per cubic meter

ppb = part per billion

Standard in line with the Notification of National Environment Board:

[1] as specified in the No.24 announcement of the National Environmental Board (B.E.2547) on ambient air quality standards

[2] as specified in the No.21 announcement of the National Environmental Board (B.E.2544) on 1-hour sulfur dioxide standard in ambient air

[3] as specified in the No.33 announcement of the National Environmental Board (B.E.2552) on Nitrogen dioxide standard in ambient air

[4] as specified in the No.10 announcement of the National Environmental Board (B.E.2538) on ambient air quality standards

PM 2.5 alert

Ratchaburi Power Plant has measured fine particulate matter PM_{2.5} in Ban Chaonua community nearby the power plant, and started measuring PM_{2.5} in March and September. It found that the level stays in the level that will not cause impacts on the community quality of life and the environment. The measuring will be conducted every year to surveillance air quality situation of the community.

Result of PM 2.5 measurement

Period	Unit	2020	Standard Level
March (5 consecutive days)	Microgram/cubic meter	23.8	Below 50*
September (5 consecutive days)		19.4	

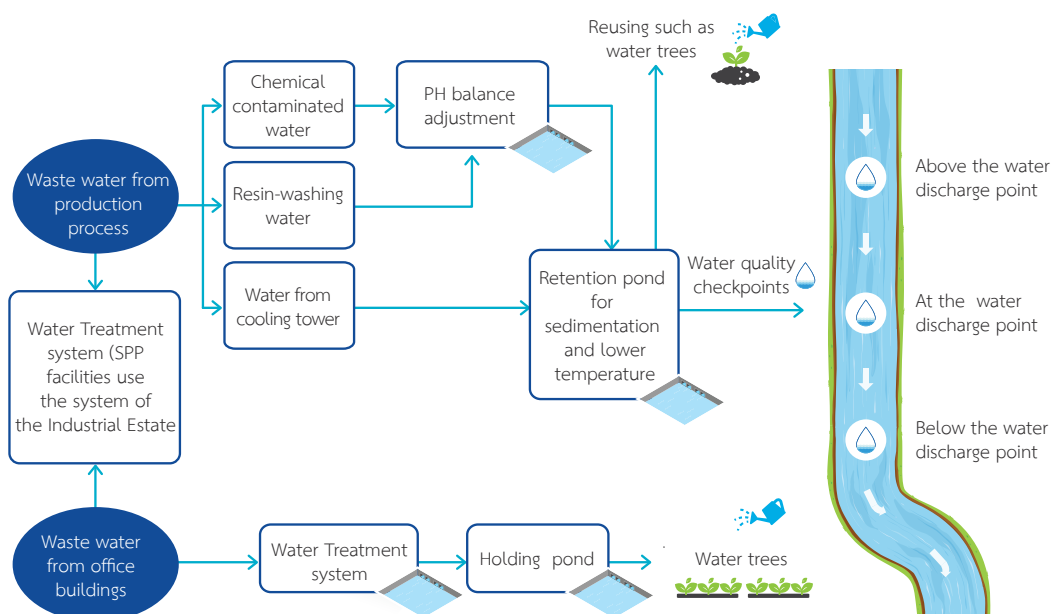
Noted : Notification of National Environment Board No.36 B.E. 2553 (2010) : The standard level of particle size less than 2.5 microns in the ambient air

4.2 Wastewater management

Wastewater from power plants and an office building is treated separately. Parts of treated water are reused, for example, to water demonstration agricultural fields and trees. The rest are recycled and reused before discharge to the last water treatment pond. There, the Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are measured and the results are reported to the Department of Industrial Works through an online system, before being discharged to the natural water channels outside the power plant.

Ratchaburi Power Plant improves the quality of some treated water through the reversed osmosis filter system and reuses the water in the production process. It also checks the quality of water at the discharge point, above and below the discharge point, to ensure that discharged water will not send negative impacts on the natural water channel and that the community downstream can use water safely.

Power plants' wastewater management procedure



Power plants' water discharge

Power plant	Discharge (cubic meter)	Discharge point
Ratchaburi Power Plant	1,168,601	Khlong Bang Pa, Mae Klong River
Tri Energy Power Plant	17,767	Mae Klong River
Nava Nakorn Power Plant	83,082	Nava Nakorn Industrial Zone's treatment system
Berkprai Cogeneration Power Plant	240,465	Mae Klong River
RATCH Cogeneration Power Plant	121,274	Given to other organizations as requested

Results of water quality measurement

Indicator	Unit	Ratchaburi Power Plant ^[1]	Nava Nakorn Power Plant	Berkprai Cogeneration Power Plant	RATCH Cogeneration Power Plant	Target	
						Royal Irrigation Department's standard limit ^[2]	Industry Ministry's standard limit ^[3]
Temperature	degree Celcius	31.1	29.5	29.3	-	Not exceeding 40 (only for Ratchaburi Power Plant not exceeding 33)	Not exceeding 40
pH	-	7.5	7.3	7.8	8.3	6.5-8.5	5.5-9.0
Biochemical Oxygen Demand (BOD)	Milligram/liter	3.1	5.8	2.3	5.7	Not exceeding 20	Not exceeding 20
Chemical Oxygen Demand (COD)	Milligram/liter	32	-	29.9	57.3	Not exceeding 100	Not exceeding 120
Total Dissolved Solids (TDS)	Milligram/liter	1,300	274	837	1,628	Not exceeding 1,300	Not exceeding 3,000
Conductivity	Microsiemens/centimeter	1,011	309	1,410	2,702	Not exceeding 2,000	Unspecified

Note : Biochemical Oxygen Demand (BOD) is the amount of dissolved oxygen needed to dissolve biological organisms.

Chemical Oxygen Demand (COD) is the oxygen required to oxidize soluble and particulate organic matter in water.

Total Dissolved Solids (TDS) is the dissolved combined content of all inorganic and organic substances.

[1] Quality of wastewater from Ratchaburi Power Plant and Ratchaburi-Power's Power Plant

[2] The Royal Irrigation Department's standard is based on Order #73/2011 regarding the prevention and mitigation of low-quality water discharge to irrigation channels and all channels connected with irrigation channels.

[3] Industry Ministry's standard is based on Ministerial Regulation #2 (B.E.2539), issued under Factory Act BE.2535, regarding the specifications of factories' discharged water

4.3 Waste management

All power plants emphasize the 3Rs principle in managing waste, to single out reusable and recyclable waste for the production process and other purposes. They also choose disposal methods that reduce waste to landfill as much as possible; for example, using waste as raw materials for the manufacturing of other products or burning in kilns to produce energy. The efforts are to prevent negative impacts on the environment like contamination to soil, surface and underground water, and the food chain.

In 2020, total waste from power generation and office buildings of main power plants like Ratchaburi Power Plant totaled 4,210.48 tons: 3,842.12-ton non-hazardous waste and 368.36-ton hazardous waste. The waste was disposed of through the following approaches:

Type of waste and waste management methods

Management methods	Type of waste	Volume (Ton)	Disposal method
Reused and recycled wastes (92.05%)	Hazardous waste; used lubricants, discarded lead-batteries	80.08 (1.90%)	<ul style="list-style-type: none"> • Shipment for recycle process by authorized service provider • Monitoring the handling Hazardous Waste Manifest system
	Non hazardous waste; gypsum	3,975.28 (90.15%)	<ul style="list-style-type: none"> • Store it in the gypsum HPDE liner pond waiting for shipment for gypsum broad production. • Monitoring the handling Hazardous Waste Manifest system
Eliminated wastes (7.95%)	Hazardous waste; unusable fluorescent light bulbs, furnace slag, chemical-contaminated oil, water- contaminated oil	273.78 (6.50%)	<ul style="list-style-type: none"> • Hire authorized-work handlers to turn waste to fuel for reuse or eliminate it in accredited incinerators for hazardous waste. • Monitoring the handling Hazardous Waste Manifest system
	Hazardous waste; oil/chemical contaminated packaging, spray cans, discarded electric equipment	3.54 (0.08%)	<ul style="list-style-type: none"> • Hire authorized-work handlers to handle waste stabilization and solidification before proceeding secure landfill • Monitoring the handling Hazardous Waste Manifest system
	Non hazardous waste; filters, fiber glass	57.43 (1.36%)	<ul style="list-style-type: none"> • Hire waste handlers to handle sanitary landfills under non-Hazardous waste method • Monitoring the handling Non-Hazardous Waste Manifest

Utilization of Ratchaburi Power Plant's used gypsum

In 2020, Ratchaburi Power Plant continually utilized gypsum, a by-product from desulfurization stored at the gypsum pond. In cooperation with Knauf Gypsum (Thailand) Company Limited, the power plant manufactured gypsum boards from the gypsum and delivered the gypsum boards to communities around the power plant.

Contracted supplier	Type of waste	Utilization method	Volume utilized in 2020
Knauf Gypsum (Thailand) Company Limited	Gypsum (from desulfurization process) stored in the Ratchaburi power plant's gypsum pond	Use gypsum in gypsum board manufacturing	3,975.28 tons

Management of Tri Energy Power Plant's decommissioning waste

The 720-MW Tri Energy Power Plant ceased operations on 30 June 2020 when the power purchase agreement with Electricity Generating Authority of Thailand expired.

RATCH reported the measures to prevent and control environmental impacts incurring from the dismantling to the Office of Natural Resources and Environment Policy and Planning, the regulatory body, for its acknowledgement. The report contained waste disposal methods.

A specialized company was contracted to handle the dismantlement, and the conditions and impact preventive and control measures was covered in the contract. The contractor's operations are monitored and supervised on a daily basis.

Hazardous waste management under stringent oversight

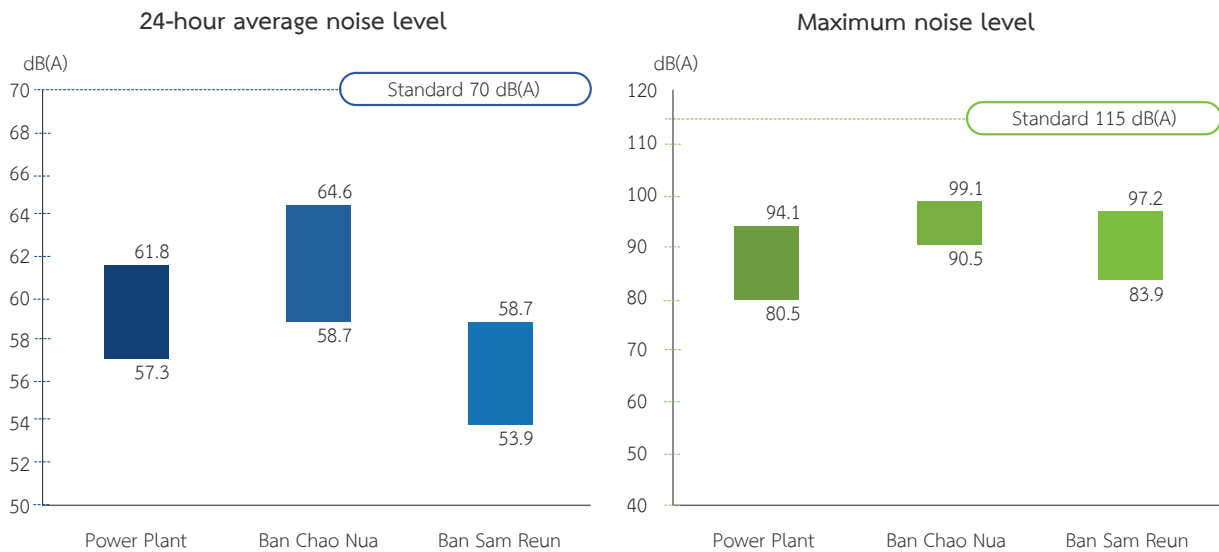
The power plant gives utmost importance to the dismantling of electrical equipment that contains sulfur hexafluoride (SF₆) and R22 refrigerant, the hazardous waste that may cause greenhouse gas and hence worsen global warming. The following disposal measures have been defined:

	Sulfur hexafluoride (SF ₆)	R22 refrigerant
Role at the power plant	Installed at the power plant's power distribution station, as medium-pressure and high-pressure insulator in circuit breakers and switchgear	Supporting the power plant's cooling system
Disposal volume (kg)	184.4	417.4
Greater global warming potential compared to CO ₂ (times)	23,500	1,760
Greenhouse gas emissions if leaked to atmosphere (tCO ₂ e)	4,333	735
Disposal/ elimination method	<ul style="list-style-type: none"> Contract an industrial waste handler to dispatch the SF₆ and R22-containing equipment to the Industrial Waste Management Center (industrial waste incinerator) in Bang Poo, Samut Prakan Province. The dispatch is done by a vehicle licensed for hazardous waste with 60 km/h speed limit and GPS system that allows control from the contractor's control center. Eliminate in accredited incinerators for hazardous waste. 	

4.4 Noise management

Noise in power plants is chiefly generated by generators, water pumps or maintenance activities. Silencers are installed to fully cover the machine. Buffers for noise control are in place and operators are required to wear proper protection gears. Noise level is monitored and benchmarked against standard limit, to ensure zero impacts on job operators and the community.

Results of noise measurement



In 2020, the community around the power plant filed no complaint regarding to noise level

5. Biodiversity conservation at Ratchaburi Power Plant

Ratchaburi Power Plant's environmental impact management involves the maintenance of ecological balance, to benefit all living beings in the area and to increase biodiversity.

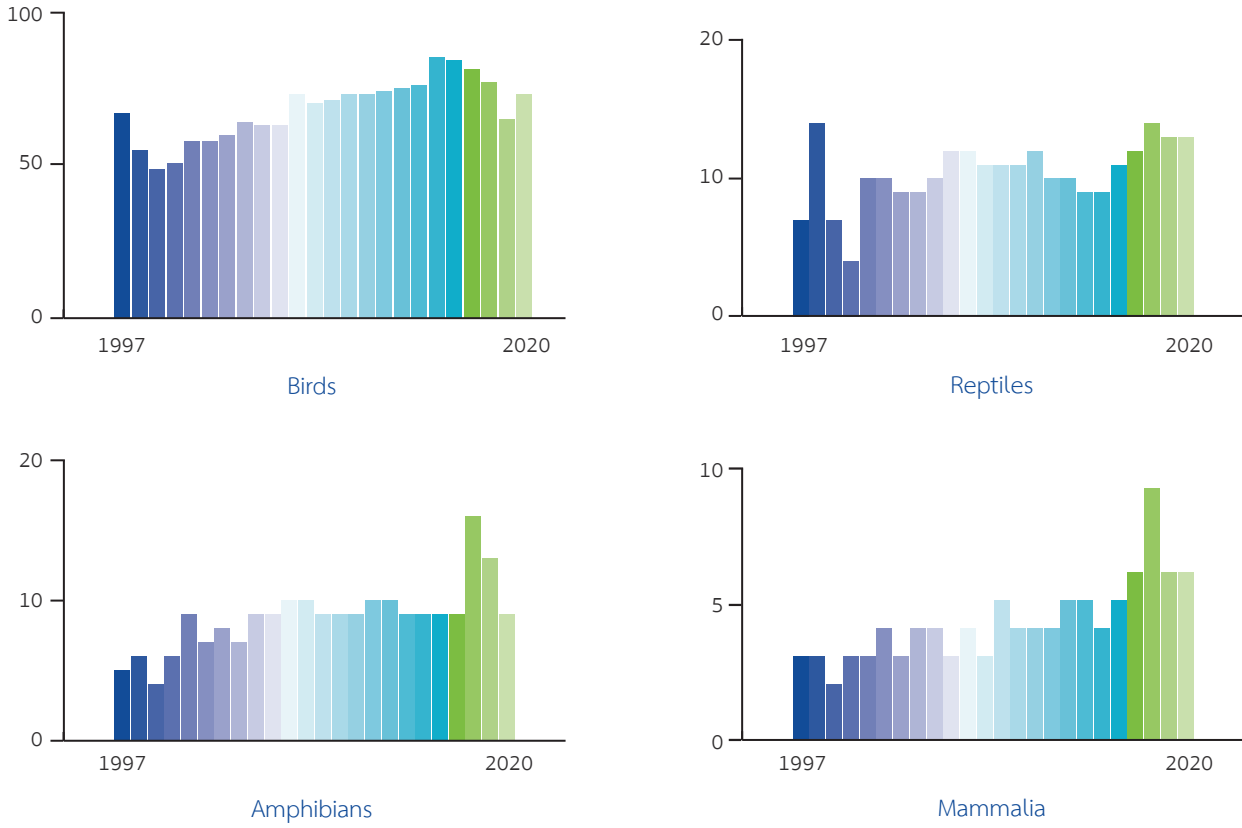
The power plant has monitored biodiversity change by focusing on 4 categories of species namely mammals, birds, reptiles, and amphibians. Its efforts entail the preservation of wetlands, which serve as the animals' habitat and the food chain of plants and animals.

Since the construction began in 1997, the power plant has conducted biannual surveys on the number, diversity, population, dispersal, concentration and status of wild animals, one in the rainy season (August) and the other in the dry season (December). The survey covers the 1-square kilometer of the power plant's buffer area. The results in the past 23 years the ecosystem of the buffer area thrived and successfully coexisted with the power plant's operations.

2020 survey result

In 2020, Ratchaburi Power Plant found 100 species of wild animals which are: 72 bird species, 6 mammal species, 9 amphibian species, 13 reptile species

Wildlife species found in Ratchaburi Power Plant’s buffer zone during 1997-2020



Wildlife categorized by conservation status

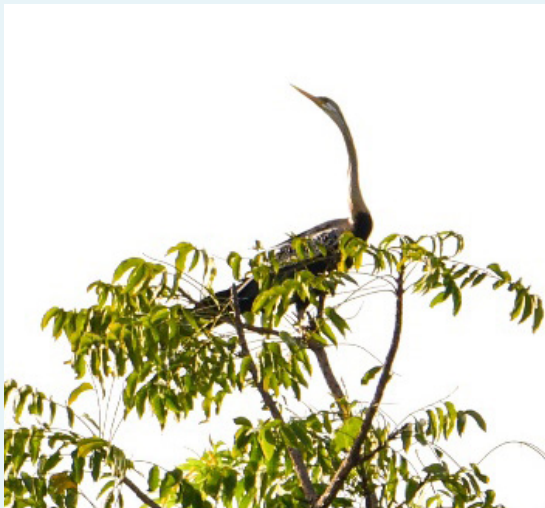
	Animals protected under Wildlife Reservation and Protection Act B.E. 2535 (1992)	Animals classified under Thailand’s bio-resources status (2017)	Animals enlisted in IUCN Red List (2020)
Total (species)	73	99	93
Classification by category	<ul style="list-style-type: none"> • 68 birds, mostly protected because of their beauty or for their roles in getting rid of agricultural pests including those in Cattle Egret (<i>Bubulcus ibis</i>), Baya Weaver (<i>Ploceus philippinus</i>), and Common Myna (<i>Acridotheres tristis</i>) • 5 reptile species namely Calotes versicolor, Ptyas korros, Python reticulatus, Varanus salvator, and Malayemys macrocephala 	<ul style="list-style-type: none"> • 2 near-threatened species: Indian cormorant (<i>Phalacrocorax fuscicollis</i>) and Golden sparrow (<i>Ploceus hypoxanthus</i>) • 2 vulnerable species: Red heron (<i>Ardea purpurea</i>) and Cormorant (<i>Anhinga melanogaster</i>) • 95 least concern species which are of high numbers and show low risk of extinction 	<ul style="list-style-type: none"> • 2 near threatened species: Cormorant (<i>Anhinga melanogaster</i>) and Golden sparrow (<i>Ploceus hypoxanthus</i>) • 91 Least Concern species

Aside from the conservation of the power plant’s ecosystem, RATCH supports biodiversity conservation in community forests through the “Love the Forest and the Community Project”. The project has been implemented in cooperation with the Royal Forest Department since 2008. The community forests serve as the nation’s natural carbon sinks. Details appear in GHG Management and Adaptation to Climate Change: Page 45

Vulnerable species



Red heron
(*Ardea purpurea*)



Cormorant
(*Anhinga melanogaster*)

Near threatened species



Asian Golden-Weaver
(*Ploceus hypoxanthus*)

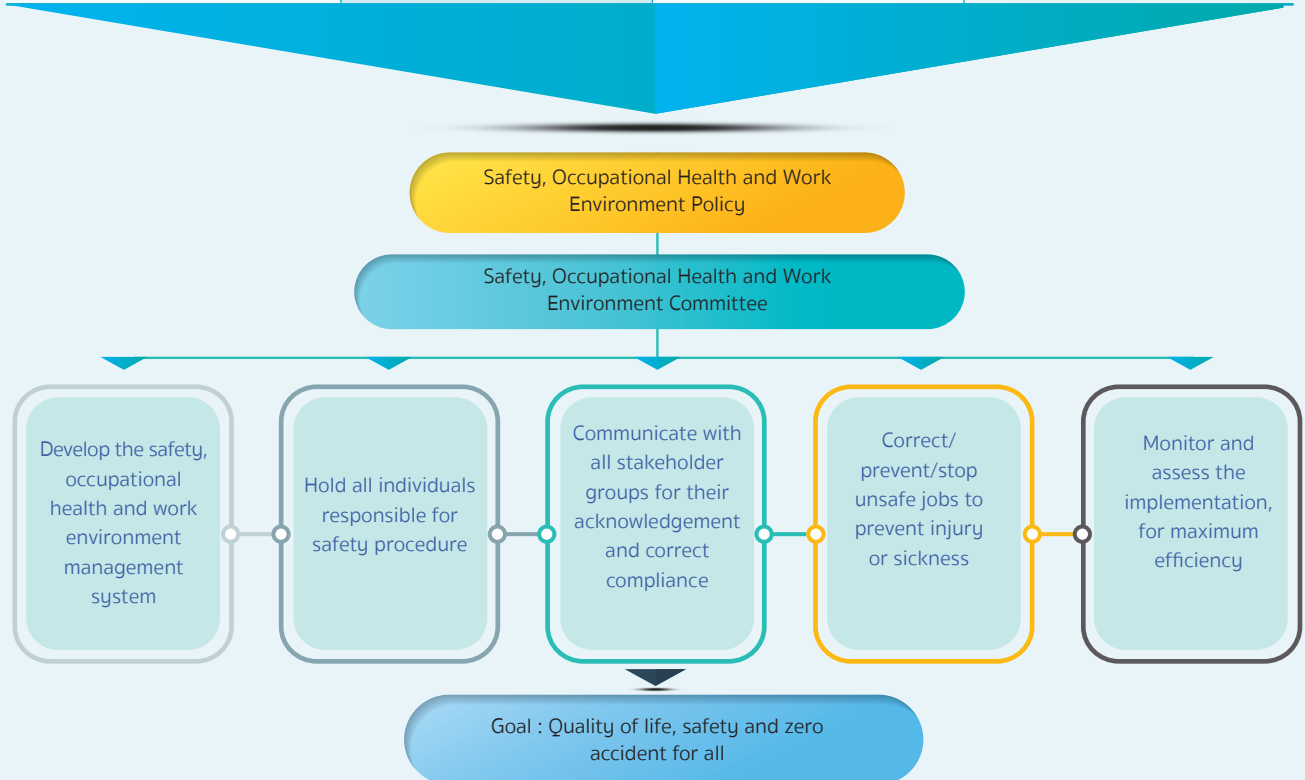


Indian cormorant
(*Phalacrocorax fuscicollis*)

Safety and Occupational Health Management

RATCH has followed the Code of Conduct in safeguarding the safety, occupational health and work environment of employees, contractors, sub-contractors, community and stakeholders. Complimenting this are the Company’s safety policy and the continuous implementation of occupational health and safety management system, to assure all of the quality of life, safety and zero work-related accidents that cause injury or sickness.

Code of Conduct-guided approach			
Occupational health and safety	Drug prevention	Security measures	Crisis management
<ul style="list-style-type: none"> • Set rules and standards • Prevent work-related injury/sickness • Exercise emergency response plan • Communicate with and educate employees/suppliers/ contractors about safety measures • Stop unsafe tasks 	<ul style="list-style-type: none"> • Define rules and measures on drug prevention and rehabilitation • Demand all parties’ engagement and responsibility • Require all supervisors to be role models and watch out for wrongdoing • Cooperate with the authorities in terms of drug-related information 	<ul style="list-style-type: none"> • Put in place appropriate security guidelines/equipment • Build and maintain workplace safety • Check the background of employees and contractual parties to watch out for possible terrorist attacks • Inform responsible persons if spotting irregularities 	<ul style="list-style-type: none"> • Prepare crisis management and crisis communication plans with regular reviews, aimed at preventing damage and losses • Synchronize the Company’s crisis management plan with subsidiaries’ emergency response plans. • Educate employees and all involved to ensure efficient crisis management and communications



Performance in 2020

year	Lost Time Injury Frequency Rate : LTIFR (per 200,000 hours worked)						Total Injury Frequency Rate (per 200,000 hours worked)					
	RATCH	RGCO	TECO	NNEG	BPC	RCO	RATCH	RGCO	TECO	NNEG	BPC	RCO
2018	0.49	0	0	0	-	-	1.47	0.28	0	0	-	-
2019	0	0	0	0.22	-	-	0	0.21	0	0	-	-
2020	0	0	0	0	0	0	0	0.14	0	0	0	2.99

Note : RATCH = RATCH Group PCL
 RGCO = Ratchaburi Power Plant
 TECO = Tri Energy Power Plant
 NNEG = Nava Nakorn Power Plant
 BPC = Berkprai Cogeneration Power Plant
 RCO = RATCH Cogeneration Power Plant

Head office/ Power Plant	Safety targets	Safety performance
Head Office	<ul style="list-style-type: none"> Zero work-related accident 	<ul style="list-style-type: none"> No work-related accident
Ratchaburi Power Plant	<ul style="list-style-type: none"> Total Injury Frequency Rate (TIFR) ≤ 1.5 (Per million hours worked) Zero Serious Accident (Class A accident on life and property caused by fire) 	<ul style="list-style-type: none"> Total Injury Frequency Rate (TIFR) per million hours worked at 0.68 as targeted No Serious Accident (Class A accident on life and property caused by fire)
Tri Energy Power Plant	<ul style="list-style-type: none"> Total Injury Frequency Rate (TIFR) = 0 	<ul style="list-style-type: none"> Total Injury Frequency Rate (TIFR) = 0
Nava Nakorn Power Plant	<ul style="list-style-type: none"> Zero work-related accident 	<ul style="list-style-type: none"> Zero lost time injury at Nava Nakorn Power Plant and Extension phase
Berkprai Cogeneration Power Plant	<ul style="list-style-type: none"> Zero work-related accident 	<ul style="list-style-type: none"> Zero lost time injury
RATCH Cogeneration Power Plant	<ul style="list-style-type: none"> Zero work-related accident 	<ul style="list-style-type: none"> Zero lost time injury

Safety statistics (Target = Zero accident)

Power plant/Head Office	Ratchaburi Power Plant	Tri Energy Power Plant	Nava Nakorn Power Plant	Berkprai Power Plant	RATCH Cogeneration Power Plant	RATCH-Australia's power plants	Head Office
No. of job operators (person)	425	77	471	70	42	23	267
Hours worked (hour)	1,470,161	95,724	950,749	213,170	133,643	41,814	733,752
Fatality per 200,000 hours worked	0	0	0	0	0	0	0
Lost time injury per 200,000 hours worked	0	0	0	0	0	0	0
Occupational illness per 200,000 hours worked	0	0	0	0	0	0	0

RATCH and all power plants achieved targets in 2020, thanks to the approach and guidelines on safety, occupational health and work environment as well as strict compliance. The performance landed the Group the following occupational health and safety awards:

Safety awards in 2020



ASEAN Building Fire Safety Awards 2020 for RATCH Group



Ratchaburi Power Plant won the third-year Outstanding Enterprise Award for Safety, Occupational Health, and Work Environment (Gold Class) from Thailand Labor Management Excellence Award 2020 organized by Ministry of Labour.



Ratchaburi Power Plant won a bronze plaque of the Zero Accident campaign for 2020 from Thailand Institute of Occupational Safety and Health (Public Organization)

RATCH Group received ASEAN Building Fire Safety Awards 2020 for its Head Office from ASEAN Federation of Engineering Organization (AFEO) and the Engineering Institute of Thailand under the royal patronage. The Head Office was praised for its exemplary design, standard safety equipment and building management. The contest took into consideration corporate policy, legal compliance, inspection, maintenance, continuous safety equipment test, and the optimization of standard safety equipment.

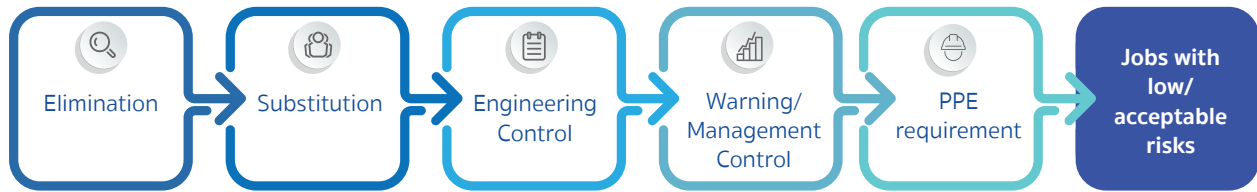
Furthermore, Ratchaburi Power Plant received “the Outstanding Enterprise Award for Occupational Health, Safety and Work Environment: National Level-Gold Award” for the third year and a bronze plaque due to its Zero Accident campaign for 2020. In the year, the power plant has applied ISO 45001 safety standard, replacing the OHSAS 18001 standard, to raise confidence as the new standard encompasses the safety of job operators and contractors in and outside the power plant’s premises.

Ratchaburi Power Plant’s safety operational framework



1. Job risk assessment and risk management guidelines

All jobs that undergo risk assessment will be assigned risk-prevention measures, to minimize risks or keep risks at acceptable levels.



During working hours, work areas will fall under strict inspection. The inspection frequency is determined accordingly to risk levels.

Work area inspection frequency

Level of risks	Inspection frequency			
	Supervisor	Safety Officer Supervisor	Safety Officer Professional Level	Safety, Occupational Health and Work Environment Committee
High-risk job (Work in confined space/ hot work that causes heat and sparks/ work on high ground/)	All the time	Every day	Every day	Every month or accordingly to work schedules
Medium-risk job	Every hour	Every day	Every day	Every month or accordingly to work schedules

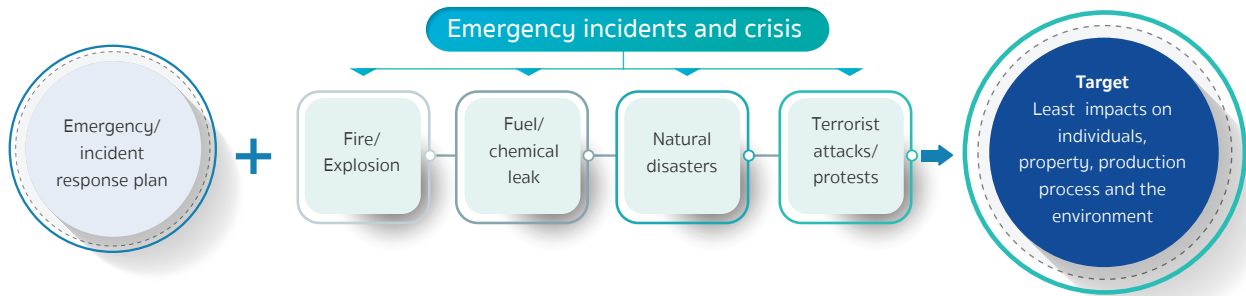
2. Supervision

Supervisors and all relevant responsible persons have duty to ensure that the operations strictly follow the prescribed measures, guidelines and methods. Under their control are operators, tools/ equipment, work environment and the Stop Work authority which must be exercised in light of unsafe situations

Control factors	Operations	Result
Operators	<ol style="list-style-type: none"> 1) Identify the qualifications of operators for each task 2) Organize training and coaching on safety and the operations of particular tasks 3) Observe work operation 4) Follow safety measures for particular tasks/ particular areas 	<ul style="list-style-type: none"> - All meet prescribed qualifications - Full training and coaching on safety measures implementation
Tools/equipment	<ol style="list-style-type: none"> 1) Check safety features before use or on scheduled maintenance 2) Check or test safety accordingly to legislative requirements 3) Complete scheduled maintenance of tools and equipment 	<ul style="list-style-type: none"> - Tools/ equipment in ready conditions
Work environment	<ol style="list-style-type: none"> 1) Assess/ inspect work environment before the start of work 2) Measure and analyze work environment 3) Clear the work areas after work 	<ul style="list-style-type: none"> - Complete the required work environment inspection - Improve/correct below-standard work environment before start of work
Stop Work authority	<ol style="list-style-type: none"> 1) When below-standard actions or conditions are seen 2) When the scope of work or work procedure is changed 3) When an emergency occurs 	<ul style="list-style-type: none"> - When the Stop Work authority is exercised, job operators must correct work conditions before seeking approval to resume the operations.

3. Incident and crisis management

In case of unexpected incidents or events, operators must follow the Company and power plants' corrective guidelines under the emergency response plan that covers each incident. Under the plan, responsible persons are identified. The plan also specifies the controlling and corrective actions and measures to prevent reoccurrence, in order to prevent and minimize impacts on individuals, property, production process and the environment.



Emergency Response drills in 2020

Emergency situations	No. of drills					
	Ratchaburi Power Plant	Tri Energy Power Plant	Nava Nakorn Power Plant	Berkprai Cogeneration Power Plant	RATCH Cogeneration Power Plant	Head Office
Level 1 fire and explosion	27	No drill due to the plant's reserved shut down and PPA's expiration on 30 June 2020	2	-	-	12
Level 2 fire and explosion	1		1	1	-	-
Level 3 fire and explosion	1		-	-	1	1
Gas leak	4		2	-	-	-
Oil leak	2		2	-	-	-
Chemical leak	4		1	1	-	-
Radiation leak	1		-	-	-	-
Waste/sewage transfer	-		-	-	-	-
Natural disasters (Storm/ flood/ earthquake)	1		1 (Flood)	-	-	-
Epidemic	-		-	-	-	-
Snake bite	-		-	-	-	-
Broken lift	1		-	-	-	12
Bomb threat	-		-	-	-	-
Community protests	1		-	-	-	-
Others	2 (pressure pipe broken / emission)		-	-	-	-

Crisis management

In 2020, RATCH reviewed the Business Continuity Plan which allowed each function to review, update and improve their plans. Training on Business Continuity Management Plan and Crisis Communication Management Plan was organized, to enhance all employees' understanding and acknowledgement of their required actions.

The outbreak of the novel coronavirus 2019 (COVID-19) posed challenges to RATCH Group and all of its power plants as they must overcome the crisis while preventing business disruptions. The Board of Directors and the Management ran an assessment on risks and impacts induced by the pandemic and defined the measures to tackle risks as well as prevent and mitigate impacts as follows:

Risk factor	Impact	
	on Operations	on Supply Chain
<ul style="list-style-type: none"> • Employees or RATCH, power plants, key suppliers and companies in the supplychain contract COVID-19 (covering suppliers for Head Office, O&M and EPC services) • Declaration of an emergency situation applicable to the whole Kingdom under Section 5 of Public Administration in Emergency Situation, to prevent and contain the spread of COVID-19 infections • Lockdown in the areas or countries where RATCH's power plants are located • Remedial government measure to save electricity charges for the business sector and households 	<ul style="list-style-type: none"> • In case of infection, the premise falls under cleaning for at least 3 days as required by Public Health Ministry's Department of Public Health. The operations may be affected as employees working closely with the infected are put in the high risk group and subjected to 14-day quarantine. • Delayed project construction as foreign suppliers cannot export machinery and equipment while the countries where projects are located are under national lockdown. • Delays in overseas business negotiations, resulting in a delay in investment in Thailand and overseas and disruption in the Company's targets concerning long-term capacity and enterprise value. 	<ul style="list-style-type: none"> • Foreign contractors and/or technical advisers cannot enter project sites, resulting in construction delays. • Machinery imports are disrupted. • Operational disruption as power plants employ the shift work practice. The government's curfew may cause difficulties for some workers in leaving home for work.
Risk management and impact prevention/mitigation	<ul style="list-style-type: none"> • Adjust way of working by applying digital technology to assist business meetings and using applications to remotely keep track of project progress. • Define Work from Home measures and prepare supporting technology, to prevent the spread of COVID-19 which may disrupt business continuity. • Prepare COVID-19 emergency response plan that defines management guidelines and the list of responsible persons. • Prepare COVID-19 crisis communication plan. • Exercise the Business Continuity Plan, as ordered by the Board of Directors and the Management, when an employee of the Company or suppliers working at Head Office contracts the disease. • Prepare for the exercise of the Business Continuity Plan, which requires backup office and Work from Home guidelines; prepare measures to prevent infection at backup office or at employees' home; define new work process; prepare necessary IT system and working tools; and etc. 	<ul style="list-style-type: none"> • Declare power plants "restricted zones" and impose new operational measures for operation and maintenance activities. • Order the Plant's Operation Department Manager to impose safety measures which must be strictly honored by all subordinates and other units' staff while conducting activities at power plants. • Always seek Operation Department Manager's clearance for all activities that must be completed in "restricted zones", except for scheduled activities by the maintenance division. • Prohibit the Plant's operators from associating with outsiders or getting out of "restricted zones" during work hours, without a necessary cause and approval from the Plant's Operation Department Manager. • Have the Plant's Operation Department Manager define and exercise work guidelines in case that COVID-19 spreads to "restricted zones". • Prepare emergency response plan if COVID-19 spreads to "restricted zones", by clearly defining response protocol and responsible persons.

By the order of the Board of Directors and the Management, RATCH and all power plants came up with proactive measures so as to prevent impacts on job operators, relevant stakeholders and business operations. The following are preventive measures introduced by Head Office and key power plants.

Preventive measures against COVID-19

Head Office	
<p><u>General Measures</u></p> <ol style="list-style-type: none"> 1) Mandatory temperature check on personnel entering: employees with temperature above 37.5 degree Celcius must enter the screening process and follow the measures by the Public Health Ministry's Disease Control Department. No entry for visitors. 2) Place alcohol gel at entrance/exit doors, elevators, meeting rooms and central areas. 3) Increase frequency of cleaning with disinfectants and apply ozone disinfection system on a weekly basis. 4) Maintain social distancing at meetings and inside elevators. 5) Ask employees to avoid traveling to areas or countries at high risk, per the Company's announcement. Those returning from risk areas must come under 14-day quarantine or immediately seek medical advice if developing symptoms. 6) Order all personnel, key suppliers' staff working at Head Office and visitors to wear face masks all the time in the office area. 8) Define "Work at Home" guidelines, to reduce congestion and possible inflections. 	<p><u>Work at Home guidelines</u></p> <ol style="list-style-type: none"> 1) Function chiefs hold the authority to decide which operator or team can work at home, without disrupting overall business operations. 2) Put in place measures to supervise those work at home, particularly during working hours. 3) Prepare computer programs, network, necessary information, operator database and work at home guidelines to assist operators.
Independent Power Producers (IPPs)	
<p><u>General measures</u></p> <ol style="list-style-type: none"> 1) Announce safety guidelines for implementation during the peak of the COVID-19 outbreak. 2) Prepare the guidelines to screen operators and visitors suspected of contracting COVID-19. 3) Regularly monitor news updates and safety-related announcements. 4) Cancel all plant visits and allow only necessary meetings. 5) Check body temperature prior to entering power plants. The operator with temperature above 37.5 degree Celcius must enter respective hospital' screening process and follow relevant measures. Visitors are denied entry. 6) Hand out alcohol gel to all units and place alcohol gel at all central areas. 	<p><u>Measures on generator operations</u></p> <ol style="list-style-type: none"> 1) Turn control rooms to restricted areas, where only responsible operators can enter. 2) Fix a single entrance/exit and prepare alcohol gel. 3) Hand out cloth face masks which must be worn by operators while working in control rooms. 4) Send and receive information from shift to shift via electronic media as much as possible. 5) Immediately subject operators with symptoms to hospitals' investigation.

Independent Power Producers (IPPs)

Preventive measures during maintenance outage

- 1) All operators and contractors must fill up “COVID-19 screening during planned outage Form” prior to the start of work.
- 2) The operators and contractors returning from risk countries or risk areas must present health check results that guarantee no sign of disease and completion of 14-day quarantine.
- 3) Medical room’s nurses study the screening results and watch out for possible spread of COVID-19 among operators and contractors during the maintenance outage. The nurses have the final decision who can or cannot enter the premises.
- 4) All operators and contractors must follow the power plants’ COVID-19 screening guidelines.
- 5) All operators and contractors must have their body temperature checked every day before the start of work. Operators and contractors who fail to do so are prohibited from entering the premises.

Measures when there is someone with known COVID-19 at the workplace

- 1) Single out the person and close his/her work area for further investigation.
- 2) Call health officers for the pickup of the person and collect information from those with close contact in support of investigation process.
- 3) Close the building where the person works, coordinate for disinfectant spray, and block entry to the building for at least 3 days.
- 4) Consider assigning operators under self-quarantine to work from home.

Small Power Plants (SPPs)

Measures

- Operators at risk, showing signs of sickness, or having COVID-19 symptoms
 - 1) Do not come to work or immediately stop work. They must inform supervisors, see doctors and report health results.
 - 2) If contracting COVID-19, they must immediately inform supervisors; rest at home until full recovery or stay under 14-day quarantine; and ask for supervisor’s decision when to resume work.
 - 3) Operators with close contact with COVID-19 patients must be home-quarantined. They are to work at home, subjecting to normal reporting for work; and must periodically inform supervisors of their conditions.
 - 4) When someone with known COVID-19 is at the workplace, the top executive may consider ordering all operators to work from home, except generator technicians and maintenance officers.

- Contractors, sub-contractors and visitors
 - 1) Arrange teleconference with all contractors and sub-contractors.
 - 2) If having necessary reasons to enter the premises, contractors, sub-contractors and visitors must park their vehicles outside the premises and have their temperature body checked. They will be asked if having traveled to risk countries and if persons close to them have traveled to anywhere in the past 14 days. The data is filled in the power plants’ form. They must also wear face masks and are not allowed to wait in offices.
 - 3) Meeting rooms outside buildings are prepared for necessary cases.

Work from home guidelines

- 1) All units are instructed to prepare tools and equipment and network and stand ready at all time for Work from Home order.
- 2) Only generator operators and maintenance officers can work at the power plants, when other operators work from home.

Small Power Plants (SPPs)

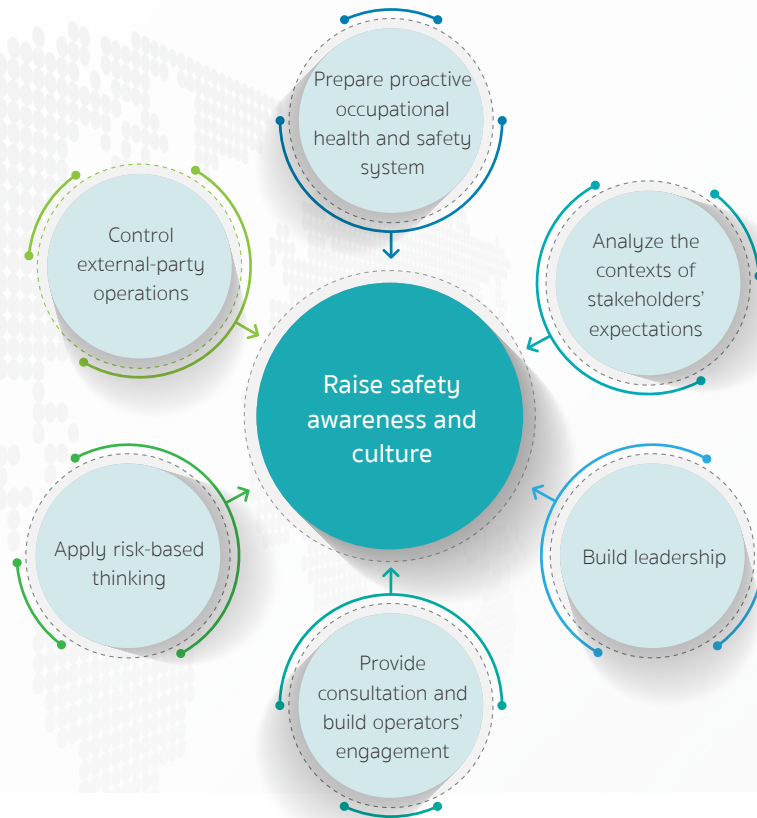
- General measures

- 1) All operators must save themselves for the sake of all; for example, by not going to crowded places.
- 2) All operators must check body temperature before entering the premises (temperature check by security officers). Safety Officers Professional Level check the temperature of security officers prior to the start of work and demand all to wear face masks at all time.
- 3) Daily online meetings are held between generating/maintenance teams and the management team.
- 4) All units send information and work reports to supervisors and relevant persons via email or phone calls, instead of meetings.
- 5) Operators must stay in their work areas, avoid crowding their work areas and keep a distance of at least 1 meter from others.
- 6) All operators must follow these rules:
 - Wash hands before entering premises
 - Clean toilets before use and wash hands after use
 - Avoid using serving spoons or sharing same dishes
 - Always wear face masks when meeting outsiders or being in public or crowded places
- 7) Only operators are allowed entry to control rooms and other operators are moved to temporary offices.

- Measures on workplace and vehicles

- 1) Turn control rooms to sterile areas, open only to generation officers. A spare room is prepared for other units' officers having to contact the control rooms.
- 2) Outsiders' vehicles are not allowed in power plants' premises, except for product delivery.
- 3) A temporary meeting room is prepared outside buildings, fully equipped with facilities like desks, chairs, fans and drinking water. It can accommodate up to 8 persons at a time.
- 4) The operator who doesn't have a personal vehicle and needs to see doctor can use the power plants' on-call vehicle service, to avoid using public transport.
- 5) If any operators are at risk or contract the virus, the power plants will be immediately sprayed with disinfectants to stop the spread of the infections.
- 6) Cleaners must regularly clean high-risk areas.

4. Raise safety awareness and culture



RATCH promotes safety culture and is concerned about stakeholders and job operators as well as leadership building. The risk-based thinking requires control on the jobs provided by outside job providers. In 2020, the Company implemented the following activities and projects to further build the Group's safety culture:

Business unit	Project/ activity	Result
Operators' health promotion		
Head Office	RATCH-Step Up # 2 Activity	RATCH has organized an exercise campaign to promote employees' good health since 2015. In 2020, the activity attracted 90 participants who contributed a total of 137.7 million accumulated steps through running and other exercises.
	Hello-Saratem 2020	Talk on "Thai clean food keeps away NCDs and Food against COVID-19" was held for employees by a health and nutrition expert who is the adviser to Network of Fatless Belly Thais. Participants were pleased with the given information.
Ratchaburi Power Plant	Disease-free, Drug-free: Good Health and Happy Mind Project and Safety Clinic for 2020	To safeguard staff from work-related diseases and reduce work-related injuries with a goal to achieve zero new case on work-related diseases and drugs. A system was set up to watch out for work-related diseases and accidents.

Business unit	Project/ activity	Result
Operators' health promotion		
	Health Day Activity	To safeguard staff from work-related diseases and promote health tips to reduce health risks. The activity featured "Sabayjai Clinic", massages dedicated for Office Syndromes, and sharing of knowledge on Thai herbs. Participants' average satisfaction score was 86 percent.
Raising awareness on occupational health and safety		
Head Office	Best Suggestion Award 2020 Activity	RATCH received 5 employee suggestions relating to occupational health and safety. The suggestions were forwarded to the Safety, Occupational Health and Work EnCommittee for corrective actions for greater work safety.
Ratchaburi Power Plant	Safety Day 2020 Activity	Job operators at the power plant, neighboring communities and external offices joined Safety Day 2020, an activity to promote work-related safety which will prevent and control work-related harms. The activity featured Safety Talk on "New Normal-styled Safety" and contests on safety and drug-related clip videos and slogans. Participants' average satisfaction and earned benefits score was 88 percent.
Berkprai Cogeneration Power Plant	<ul style="list-style-type: none"> • Training program to prepare security officers for security officer supervisor role. • Training program on safety-chemical storage and emergency response 	<ul style="list-style-type: none"> • Security officers learn what the security officer supervisor role requires and apply the knowledge with their work. • Employees can apply knowledge with their work and respond to chemical incidents.
RATCH Cogeneration Power Plant	SAFE CARD...SAVE RCO Project	Employees were invited to submit recommendations relating to dangers, risks and the environment, to improve the safety, occupational health and work environment condition. The project was also aimed at raising awareness in work safety, to reduce unsafe behaviors and work conditions.
	RCO Day 2020	Through a talk by an external expert, an exhibition and an activity dedicated to eliminate risks, employees learnt about safety, occupational health and work environment and were aware of work-related dangers.

Training for building awareness on occupational health and safety

Aspects /Training topic	Organizer						No. of attendees	Operators	Contractors
	Ratchaburi Power Plant	Tri Energy Power Plant	Nava Nakorn Power Plant	Berkprai Power Plant	RATCH Cogeneration Power Plant	Head Office			
Orientation before work start	1,809	280	551	545	2,281	38	5,504	✓	✓
Safety, occupational health and work environment for workers and new hired workers	1	-	12	54	-	31	98	✓	✓
Crane controller (Immovable crane),hand signaler, and handler	1	-	1	1	-	-	3	✓	-
Crane truck driver (moveable crane),hand signaler, and handler	5	-	-	-	-	-	5	✓	-
Forklift drivers	5	-	1	-	11	-	17	✓	-
Crane controller	-	-	1	-	-	-	1	✓	-
Refresh crane controller's knowledge	14	-	-	-	-	-	14	✓	-
Safety of work in confined space	-	-	8	4	-	-	12	✓	-
Basic fire suppression	-	40	4	1	32	34	111	✓	✓
Advanced fire suppression	1	-	1	3	-	1	6	✓	✓
Safety, Occupational Health and Work Environment Committee	1	-	8	31	-	-	40	✓	-
Safety officer – supervisor level	1	-	4	32	8	-	45	✓	-
Safety officer – executive level	10	-	5	-	3	-	18	✓	-
Boiler controller	-	-	12	-	-	-	12	✓	-
Refresh boiler controller's knowledge	58	-	3	9	-	-	70	✓	-
Safety from radiation and hazardous chemicals	11	-	1	1	-	-	13	✓	-

Aspects / Training topic	Organizer						No. of attendees	Operators	Contractors
	Ratchaburi Power Plant	Tri Energy Power Plant	Nava Nakorn Power Plant	Berkprai Power Plant	RATCH Cogeneration Power Plant	Head Office			
Hearing conservation	65	-	-	-	-	-	65	✓	-
Electrical safety practices	10	-	41	-	13	-	64	✓	-
Gas handler of factory in using or maintaining	4	-	2	-	-	-	6	✓	-
Operators at locations where natural gas is in use	5	-	2	2	-	-	9	✓	-
Operators at oil depot and oil transmission pipeline	4	-	-	-	-	-	4	✓	-
First-aid and resuscitation	-	-	4	3	-	-	7	✓	-
Operators at oil storage terminals	3	-	-	-	-	-	3	✓	-
Operators of air pollution management system	1	-	8	-	-	-	9	✓	-
Operators of water pollution treatment system	5	-	2	-	-	-	7	✓	-
Operators of industrial waste management system	-	-	2	-	-	-	2	✓	-
Controllers of air pollution management system	1	-	2	1	1	-	5	✓	-
Controllers of water pollution treatment system	2	-	2	-	-	-	4	✓	-
Controllers of industrial waste management system	-	-	2	-	-	-	2	✓	-
Radiation Protection	11	-	-	-	-	-	11	✓	-
Safety techniques on scaffolding installation and test	-	-	1	-	-	-	1	✓	-
Awareness enhancement on environment and work safety	352	-	-	-	-	-	352	✓	✓
Incident's root cause investigation	1	-	-	1	-	-	2	✓	-
Own of armament under the Control of Armament Act B.E. 2530	-	-	-	1	-	-	1	✓	-
Work safety, Chemical storage and emergency response	-	-	-	30	-	-	30	✓	-

Progress on Ratchaburi Power Plant's project to enhance community capability in disaster prevention and mitigation

In 2019, Ratchaburi Power Plant together with Ratchaburi Provincial Disaster Prevention and Mitigation Office launched a project to enhance the disaster prevention and mitigation capability of 6 communities around the power plant. Together, they worked on disaster prevention and mitigation plan or a community emergency plan, applying the Community Base Disaster Risk Management practices. The project was aimed at addressing the communities' need and enabling them to prevent disasters and rehabilitate the impacts. The communities took part in the project from the beginning, from sketching the plan to preparing actions to assist their members and rehabilitate the impacts. The project ably raised awareness on safety and uplifted community safety standards, which improved their resilience to risks and impacts.

In 2020, Ratchaburi Power Plant organized a safety training session by the power plant's safety officers professional level; as well as a talk and workshop on disaster prevention in community level, Cardiopulmonary resuscitation (CPR) for life saving, evacuation rappel line, rescue from high grounds and extinguisher of household and community fire presented by Ratchaburi and Suphanburi provinces' Disaster Prevention and Mitigation Office for 54 community leaders and community members as well as disaster prevention and mitigation officers from Tambon Pikunthong, Tambon Ban Rai, Tambon Ban Singha, Tambon Samruan and Tambon Tharap and the power plant's security officers.



Ratchaburi Power Plant's project to enhance community capability in disaster prevention and mitigation

Respect to Human Rights

RATCH realizes that it is necessary for the business sector to take serious actions in reinforcing respect to human rights. The Company's guidelines on this aspect are as follows:

1. Compliance with labor laws, labor standards and human rights principles

- RATCH integrates human rights principles into Code of Conduct (Link: <https://www.ratch.co.th/en/cg/the-code-of-conduct>) and Corporate Sustainability Policy (Link: <https://www.ratch.co.th/en/cg/corporate-policy/corporate-sustainability-policy>).
- RATCH adopts fair treatment of labor in line with Thailand's labor standards and strictly complies with labor laws.
- RATCH regularly strengthens knowledge on labor laws, labor standards, and human rights principles among relevant units and employees.
- RATCH, as required by law, cooperates with government agencies in reporting its compliance with labor law, labor standards and human rights principles when requested.

2. Labor rights and welfare

- RATCH's welfare, extended to employees and their families, cover health insurance for workers and spouses and up to 2 legal under-aged children; baby delivery expenses; and assistance program in case of employee's death or the death of family members.
- RATCH applies a voluntary overtime system and systematic overtime rate calculation and disbursement.
- RATCH has all employees registered under the social security system for related benefits, obligating the Company and employees to contribute to the Social Security Fund aside from the government's contribution. RATCH also sets up a provident fund and provides employees health insurance as well as medical examination.

3. Equal treatment at workplace

- RATCH ensures fair opportunities, with a fair and systematic process involving recruitment, employment, compensation payments, dismissal and promotion.
- RATCH deems sexual harassment in the workplace the most disciplinary offence.
- RATCH designs the workplace accordingly to universal architecture principles with facilities for people with disabilities, for safety and comfort of all.

4. Whistleblowing mechanism and remediation

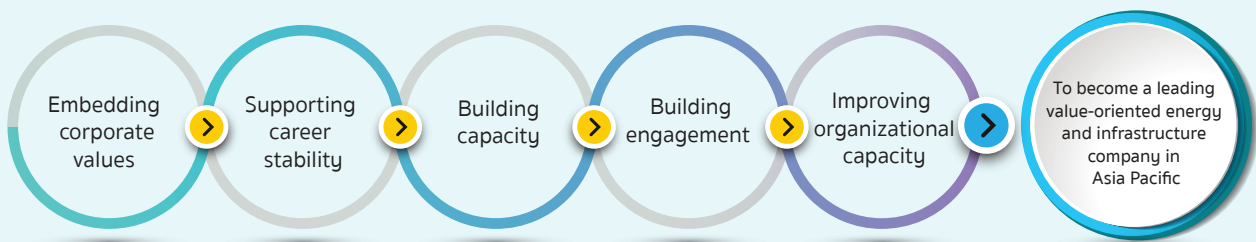
- RATCH sets up an internal whistleblowing channel and also allows reporting on the Company's website (<https://www.ratch.co.th/en/cg/whistleblower>), that all complainants can easily access and follow up on investigation results. Such channels are for reports of troubles concerning work, work condition, employment condition, supervision, assignment, compensations, or supervisors' inappropriate actions. The information is kept confidential. Complainants and relevant individuals who are interviewed and produce data and facts and other evidence are protected against dismissal, punishment or other ill actions even when the Company is troubled by their information.
- RATCH allows an appeal from employees placed on warning or probation or suspension, or those exempted from salary increase or annual bonus. The appeal process must be completed within 30 days from the filing date.
- RATCH clearly specifies the rules for dismissal, compensations and special compensations.

In 2020, RATCH received no complaints relating to human rights.



Employee Stewardship and Capacity Building

It is a great challenge to take care of employees and enhance their capabilities and preparedness in terms of knowledge, talent and experience accordingly to business directions in tandem with building and retaining their engagement. But the challenge must be accomplished to lead the organization towards sustainability and the goal to become a leading value-oriented energy and infrastructure company in Asia Pacific.



RATCH’s Code of Conduct outlines human resource management approach in line with labor laws and human rights principles. The Corporate Administration Function is tasked to formulate human resource management strategies, targets and work plans under the supervision of the Executive Management Committee, the Human Resource and Remuneration Committee, and the Board of Directors.

Major achievements in 2020

1. Protecting employees against COVID-19

Health protection	COVID-19 coverage insurance was bought on top of general health insurance.
Protective measures at workplace	<ul style="list-style-type: none"> • Temperature screening was mandatory for all entering workplace. Any employee with temperature exceeding 37.5 degree Celcius must be screened and processed accordingly to the Department of Disease Control’s measures. • Face masks were handed out to operators. • Employees were instructed to avoid the areas or countries with a high risk of infection. If returning from such places and developing symptoms, they must see doctors immediately and take a 14-day leave. • Employees and suppliers’ workers as well as visitors are required to wear face masks all the time while in Head Office.
Work at home measure	<ul style="list-style-type: none"> • The top executives of each function considered assigning employees who traveled by means of public transport and had an elderly or any family member with chronic diseases to work from home. • Remote operation control measures were defined. • Computer program, network, operators’ database and work at home guidelines were prepared.

2. Progress on actions under High Performance Organization framework

RATCH prepared and has implemented the plans to improve work process in 2 aspects since 2018, following a gap analysis in 2017 on business processes that covered 9 aspects.

Performance

Improved process	Work plan	Performance
1. Building Future Capabilities	Culture transformation	Workshops under Power of Professional and Power of Teamwork values were organized. The workshops were organized for all executives and employees from all functions. Split into 5 classes, the workshops welcomed a total of 237 attendees. The post-workshop test showed employees' average awareness at 89.55 percent. Employees were encouraged to show their skill, professionalism and excellence with adherence to ethics and governance as well as assume the leading and supporting roles accordingly to their assignments.
	Continuous process improvement	<ul style="list-style-type: none"> Internal audit manual was completed and endorsed by the Audit Committee. Improvement on Work Flow Process Chart for Corporate Administration Function was completed.
2. Communication and Collaboration Enhancement	Clarify cross-function job duplications	Complete document on job transfers between Business Development and Project Development functions.
	Data Classification	Organize training on Kool Keeper system for document keepers of each function.
	Implementing knowledge management	Transfer knowledge on 5 fronts through Knowledge Sharing activities and raise No. of Community of Practice to 10.

- Knowledge transfers by internal and external experts through Knowledge Sharing activities in 2020 and gained benefit

Knowledge Sharing Activity	Expert	% of satisfaction and knowledge utilization			Benefits
		High	Medium	Total	
1. Key Issues: RAC asset management	Asset Management Function's executive	97	3	100	<ul style="list-style-type: none"> Ability to deal with problems and arising conflicts Ideas for future contracts of Australia-based projects
2. CSR: Enterprise Value Building Tool	Corporate Administration Function's executive	93	7	100	Understanding in business strategies and overall picture of benefits and ably apply activities that fit each operation area

Knowledge Sharing Activity	Expert	% of satisfaction and knowledge utilization			Benefits
		High	Medium	Total	
3. Incidents and development challenges involving Xe-Pian Xe-Namnoy Hydroelectric Power Plant	Project Development Function's executive	70	30	100	Ideas on project risk assessment as well as the technique and management of project crises
4. EGAT's Renewable Energy Certificates (REC) mechanism	Electricity Generating Authority of Thailand's expert (external expert)	53	47	100	<ul style="list-style-type: none"> • Further improvement of the Company's projects, in support of the green energy policy • Apply in development of renewable energy projects
5. Lessons from Pink Line/ Yellow Line electric train bidding	Business Development Function's executive	100	-	100	Understanding in bidding process, preparation and participation as well as related risks and limitations regarding the bidding for PPP projects; and tips in building good relationships with business partners
Average		82.6	17.4	100	

3. Employee Capability Development

Actions		Results
In-house Training	To broaden employees' perspectives, capacity and knowledge with courses adjusted accordingly to the organization's business context.	12 sessions
External Training	To develop competency required by their respective assignments. Employees were assigned to attend seminars and training programs organized by external organizations accordingly to the organizations' expertise.	68 sessions
On the Job Training	To improve employees' skills with hands-on experiences for greater work efficiency.	5 sessions
Job Assignment	To improve employees' analytical skills through assigned jobs or projects, having supervisors or specialists as trainers or advisors. The skill-based method is a tool to help them achieve the skills required by the specific areas.	1 sessions
Field Experience	To allow employees to work for under-development projects. Aside from hands-on experiences, the employees will learn how to collaborate with others which will extend their network within the organization.	Suspended due to the pandemic of COVID-19 and social distancing measures
Cross Functional Team	To improve the skills of personnel with distinct characteristics, who have to collaborate with others and bridge their knowledge for a common goal.	

- In 2020, RATCH's internal and external training for personnel at all levels covered 98.3 percent of all employees. (Total employees = 206 persons)

List	Average number of training hours of employees classified by level			
	High-level executives	Mid-level executives	Primary-level executives	Employees
hours/ person/ year	17.71	34.72	32.99	27.92
Male (%)	90.91	88.46	100.00	90.48
Female (%)	100.00	100.00	92.86	98.36

- Training courses in 2020

Types of courses	Courses	Training hours	Target group
Job-based courses	Financial statement reading	12	Operators of relevant units
	Power purchase agreements	18	
	Basic Vietnamese language	30	
	Bahasa (Indonesian language) for communications	16	
Courses based on corporate policy/ requirements	Safety, occupational health and workplace environment	6	Newly-recruited employees
	Basic fire fighting	6	
	Governance and corporate governance	3	Operators at all levels
	Environmental awareness	3	
	Anti-corruption	3	
	Safety, Occupational Health and Work Environment Committee	12	RATCH's Safety, Occupational Health and Work Environment Committee
	Communications for relationship building and corporate image communications	6	Primary-level and mid-level executives
Corporate culture promoting course	RATCH Professional Teamwork	12	Operators at all levels
Total		127	hours

4. Employees' remuneration and welfare

Actions	
Remuneration and welfare	<ul style="list-style-type: none"> • Define remuneration criteria in compliance with law and labor regulations, taking into account factors and conditions like knowledge, capability, educational degrees, experiences, economic conditions and cost of living in a particular country. The criteria are fair to all employees regardless of their gender and age. • Provide welfare, life insurance, health insurance, emergency assistance and safe lodging for employees and expenses for overseas-posted employees who want to briefly return home.

Actions	
Compliance with laws and regulations	<ul style="list-style-type: none"> Strictly comply with labor and relevant laws and regulations on safety, occupational health and workplace environment and monitor compliance practices (Details appear in Safety and Occupational Health Management Section: Page 96) Set employees' work criteria, corporate rules and regulations in line with labor law and human rights principles.
Quality of life at workplace (More details in Safety and Occupational Health Management Section: Page 96)	<ul style="list-style-type: none"> Ensure clean and supportive workplace environment accordingly to the laws and standards on safety and occupational health. Workplace environment indicators are monitored and examined every 6 months, as specified in EIA. Apply 5S standards in achieving orderly, safe, clean and positive work environment and the environment that promotes disciplines, unity and contribution from employees at all levels.

Performance

- Review the remuneration structure for greater suitability to positions, experiences and expertise as well as to attract the talented.

Salary	Compared to average minimum wage (times)	Compared to Nonthaburi Province's minimum wage (times)
Entry-level salary for employees with diploma degrees	1.24	1.20
Salary for employees with diploma degrees and at least 3 years of work at RATCH	1.41	1.37
Entry-level salary for employees with bachelor's degree	2.28	2.21

- Review overseas-posted employees' allowances and welfare to fit the cost of living and risks in the countries where they are posted; and prepare assistance in case of emergencies like disease outbreaks, natural disasters and riots.

5. Career stability

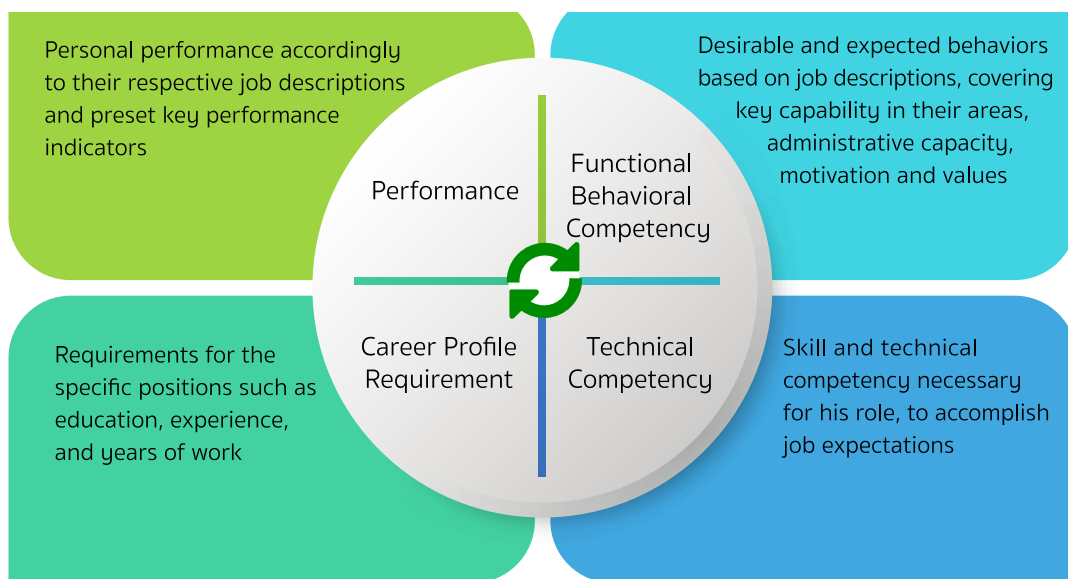
Actions	
Succession plan	<ul style="list-style-type: none"> Competency development plans to find the replacements for mid-level and high-level executives, in support of corporate expansion. They are classified into 2 levels: <ol style="list-style-type: none"> Succession Planning Management Development: Personnel preparations for key positions which require leadership and administrative skills Talent Planning Management Development: Personnel preparations for primary and mid-level executive
Career advancement, rewarding and punishment	<ul style="list-style-type: none"> Apply standardized performance evaluation system in rewarding capable employees with impressive performance based on the KPI mutually preset by supervisors and subordinates: improve capabilities that match job assignments; and prepare for career advancement. Set clear criteria on appointment, transfer, disciplinary actions and punishments and ensure employees' acknowledgement

Performance

- 100 percent of employees underwent annual evaluation against the KPI mutually set and agreed upon by supervisors and subordinates and recorded in the standardized evaluation system.
- Succession plans covered personnel preparation for 4 executive positions, consisting of 3 Executive Vice Presidents and 1 Vice President.

List	2020	2021	2022
Retiring executives (persons)	6	5	1

- Review successor and talent selection criteria

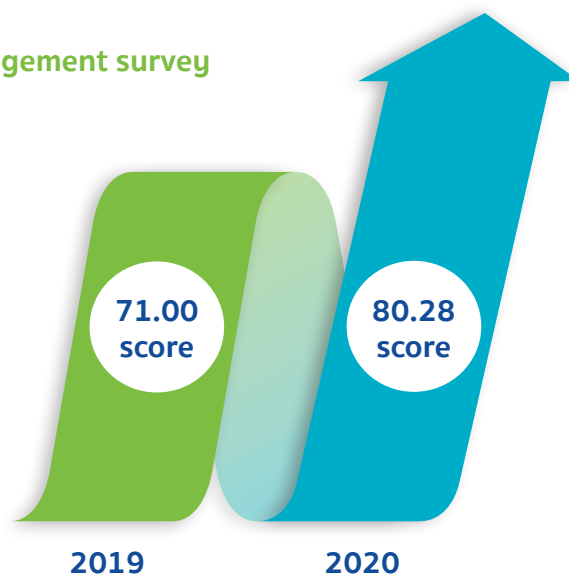


6. Company engagement

Actions		Results
Participation in organizational development and willingness to hear opinions and suggestions	<ul style="list-style-type: none"> • Establish communications channels to receive employees' opinions or suggestions, like opinion box, Intranet and email, and use them as input in shaping improvement plans. • Organize regular employee meetings and functional meetings as two-way communications channels. • Organize activities to strengthen employee relationships at function and organizational levels, as a way to promote understanding. 	<ul style="list-style-type: none"> • The Management and relevant units considered appropriate actions accordingly to employees' suggestions.
Treating employees with respect to individuality and human dignity	<ul style="list-style-type: none"> • Adopt fair and equal treatment of employees regardless of gender, age, nationality and religion and respect their basic rights and freedom as stipulated in the Constitution. • Prohibit from employing child, illegal and forced labor. • Appoint a welfare committee that comprises the employer' and employees' representatives, as a respect to employees' freedom of association. 	<ul style="list-style-type: none"> • No complaint on discriminatory actions or violation of privacy. • Welfare and work environment were improved accordingly to suggestions by employee representatives.

	Actions	Results
Fair treatment of employees	<ul style="list-style-type: none"> Formulate standard evaluation system, human resource development plan and career advancement plan, with continual communication with employees. Set appeal criteria under which employees can launch appeals against unfair treatment and establish complaint-receiving channels and protection measures for complainants. 	<ul style="list-style-type: none"> Supervisors and subordinates jointly set KPI for annual performance evaluation. No complaint on unfair evaluation.
Complaint-receiving channels in case of unfair treatment	<ul style="list-style-type: none"> Clearly set complaint-receiving and whistleblowing channels and notify employees accordingly. Define the complaint-handling protocol with protection against retaliation and remedy mitigation for complainants or collaborators who report breach or violation of the Company's Code of Conduct/regulations. 	<ul style="list-style-type: none"> No complaint from employees.
Socialization of corporate values	<ul style="list-style-type: none"> Raise awareness in Power of Professional and Power of Teamwork corporate values. Employees were encouraged to show their skill, professionalism and excellence with adherence to ethics and governance as well as assume the leading and supporting roles accordingly to their assignments. 	<ul style="list-style-type: none"> 89.55% of relevant trainees was aware of the corporate values.
Employee engagement survey	<ul style="list-style-type: none"> The employee engagement survey has been conducted annually since 2017. Engagement activities within function groups or at the organization level are designed accordingly to the survey results. 	<ul style="list-style-type: none"> Engagement level increased 9.28 percent from 2019.

Result of employee engagement survey



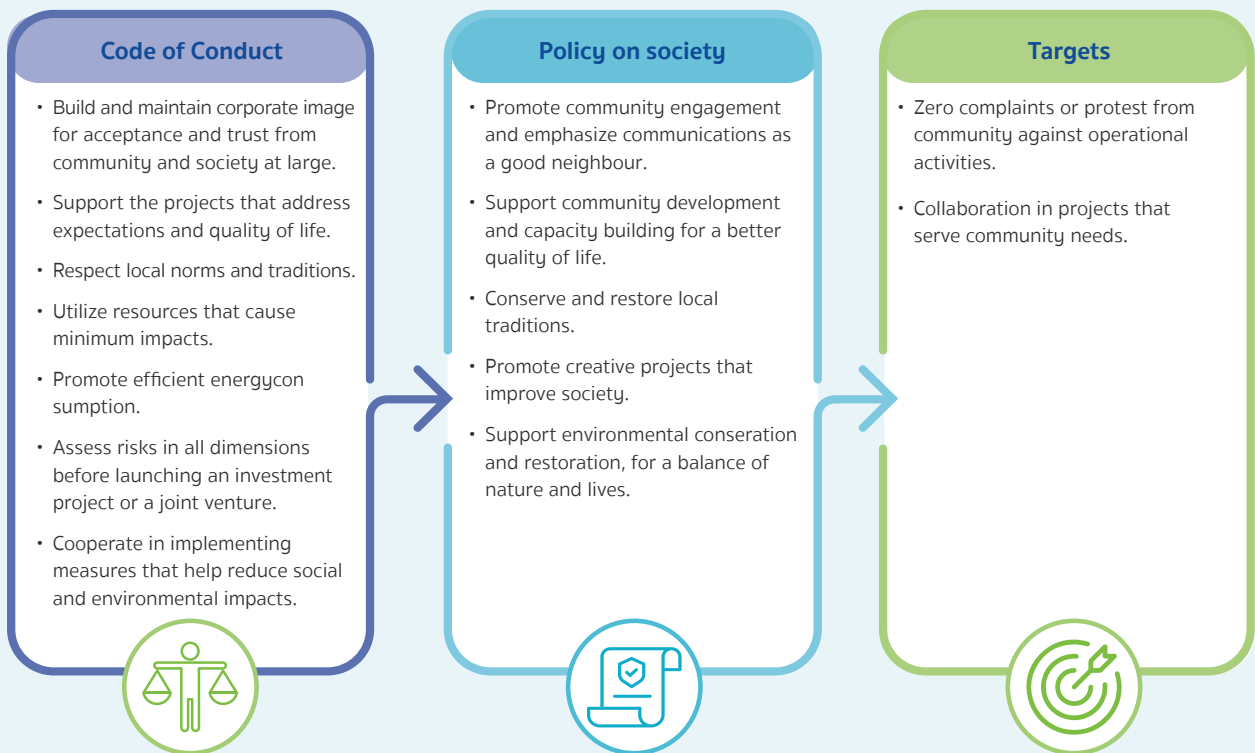
- Based on 2019 survey results, the following engagement activities were scheduled in 2020:

List	No. of activities
Organization-level activities	3
Activities within function groups	80

Social Stewardship

RATCH takes community and society as a stakeholder in the value chain who can be impacted by the Company’s operations and influence impacts on the Company. RATCH therefore operates with responsibility for community and society, with emphasis on the management of environmental impacts, safety and occupational health, engagement in improving the quality of life and creation of shared values. The goal is to achieve community trust and enable coexistence based on confidence and mutual benefits.

Operational framework of community and social responsibility



Operational guidelines

The Company implements the policy in 2 levels, to deal with 2 target groups.

- 1) Community Relations, focusing on communities near power plants.
- 2) Social development, focusing on other communities or society at large.



Responsibility for community

1) Establish understanding and trust

Activity	Objective/ Target	Target group	Result
Ratchaburi Power Plant and Tri Energy Power Plant			
1) Ratchaburi Power Plant's Youth Guide project	<ul style="list-style-type: none"> Educate the youth about electricity generation process Train young guides for the power plant, encouraging them to demonstrate communication and problem-solving skills and improving their personality. 	Two Grade 5 students and two Grade 8 students, selected from the power plant's networked 27 schools	<ul style="list-style-type: none"> Host learning activities on electricity generation, to equip them with basic knowledge. Organize workshops on communication and public speaking skills. 72 students from 24 schools joined workshops, with 15 teachers as observers. The score of satisfaction was 91.81%.
2) Relationship-building communication project	<ul style="list-style-type: none"> Community knowledge/ understanding in production process and environmental management Stronger relationship and confidence in Ratchaburi Power Plant's operations 	A total of 550 students from the School for the Elderly and members of the elderly's clubs in 9 Tambons near Ratchaburi Power Plant	<ul style="list-style-type: none"> 9 community activities at 9 Tambons The project drew 490 participants or 89.09% (of the 550 target). The score of satisfaction was 90.02%.
3) Communications via online social media	<ul style="list-style-type: none"> Additional channels to promote information, knowledge and activities of neighboring communities and Ratchaburi Province as well as those of Ratchaburi Power Plant Accurate understanding in the power plant's operations among neighboring communities and the general public, and hence positive corporate image 	Neighboring communities that can access Facebook Fan Page: บ้านเรา By โรงไฟฟ้าราชบุรี (Our home by Ratchaburi Power Plant)	<ul style="list-style-type: none"> Publish at least 5 posts a week concerning general information, knowledge and activities. The Fan Page had 24,365 followers (as of 2 December 2020), tripling from 5,228 followers in 2019.
4) "Inviting friends home" Project	<ul style="list-style-type: none"> Understanding in Ratchaburi Power Plant's operations and environmental management among communities outside the 5-km radius Reinforced relationships and confidence in Ratchaburi Power Plant's operations 	Community leaders, community representatives, relevant government offices, farmer groups and etc, staying far from Ratchaburi Power Plant and Tri Energy Power Plant and those in neighboring provinces like Samut Songkhram.	<ul style="list-style-type: none"> Organize 5 visiting trips for 230 retired government officers from Muang Ratchaburi, Damnoen Saduak District, Photharam District and Bang Phae District. The score of satisfaction towards understanding in Ratchaburi Power Plant's operations and environment management was 85.77%.

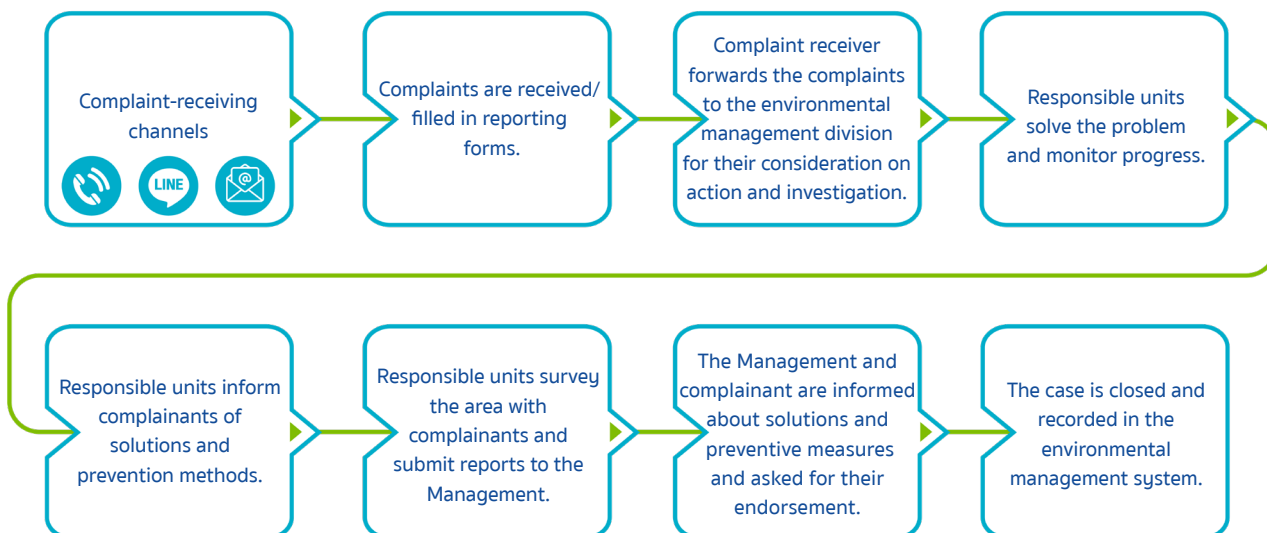
Activity	Objective/ Target	Target group	Result
5) Welcoming group visits	Promote understanding in the power plant's operations and environmental management among the interested	Students, government officers and the general public	<ul style="list-style-type: none"> 14 groups were welcomed, consisting of 614 visitors. (The power plant was closed for group visits during March-July 2020 because of the outbreak of COVID-19). The satisfaction score towards understanding and welcoming was 96.68%.
6) Environmental inspector program	<ul style="list-style-type: none"> Establish a tri-partite environmental inspector committee as a communications linkage for Ratchaburi Power Plant and its stakeholders. Promote knowledge and understanding and deal with possible conflicts over the power plant's operations by listening to community representatives' comments and recommendations. 	Government offices in Ratchaburi Province and representatives from 9 Tambons. <ul style="list-style-type: none"> Muang Ratchaburi: Tambon Pikunthong, Tambon Samruan, Tambon Tha Rap and Tambon Bang Pa Damnoen Saduak District: Tambon Ban Rai and Tambon Phaeng Phuay Photharam District: Tambon Ban Sing and Tambon Don Sai Bang Phae District: Tambon Wat Kaew 	In 2020, the environmental inspector committee <ul style="list-style-type: none"> Convened 2 meetings. Visited bunker oil station in Tambon Tha Rap and Ratchaburi Power Plant's water discharge point, to observe wastewater quality. Organized a field trip for the new 27-member committee to Khao Khor Wind Power Company Limited in Phetchabun Province.
7) Display of environment quality through LED screen near power plants' entrance	<ul style="list-style-type: none"> Directly deliver the power plant's information to community Demonstrate transparency in performance disclosure 	Neighboring communities and commuters	Communities showed better understanding and obtained more information on environmental management.
8) Updating community leaders via letter/SMS	To keep community informed about major events to take place at power plants	Community leaders and neighboring communities	Community leader were informed of major events and passed on the information to community members thoroughly and timely.
9) Communications via local media	To publicize power plants' activities to communities and society	Local-area community and society	Society were better informed about the power plants' activities.
10) Welcoming of recommendations or complaints	To hear opinions and recommendations on power plants' operations that may affect communities and the environment	Communities or stakeholders involved with the power plants' operations	No complaints against power plants' operations were filed in 2020.
Nava Nakorn Power Plant			
1) 2020 "Open House: Nava Nakorn Power Plant" Program	To build community understanding in the power plant's operations and establish another communications channel	Communities in Sam Khok District, Pathum Thani Province	Ban Pathum Tambon Administrative Office's delegation and community members, totaling 30, observed and learnt about the generating process. Meanwhile, the power plant learnt about community opinions.

Activity	Objective/ Target	Target group	Result
2) Education on air quality and noise metering Project	To enhance community knowledge and understanding in air quality and noise metering as well as tools	Community leaders living near the 3 air quality and noise metering stations at: 1) Nava Nakorn Industrial Zone’s Civil Works Office 2) Wat Tham Nawa School 3) Tambon Chiang Rak Noi Health Promotion Hospital	Community understanding in the power plant’s environmental metering process and better knowledge about the power plant’s operations.
3) Neighboring community visit activity	To communicate with the community, hear their opinions and build relationship with neighbors	Wat Puednimit Community located next to the power plant	The power plant’s executives, staff and contractors visited the community and talked with community members for positive understanding and relationship.
4) Information disclosure via online channel	To inform community and government offices about the power plant’s operations	Public offices/community leaders and communities within 5-km radius	The power plant informed public offices, community leaders and local residents living nearby about internal activities, to ensure fast and accurate acknowledgement and mutual understanding.

Welcoming of opinions and complaints

Community opinions, recommendations or complaints can be sent to the power plants through community relations, phone, opinion box located in front of power plants, email, postal mail, electronic channels like LINE Group or SMS, and community leaders or the environmental inspector committee. Their problems or concerns can be filed 24 hour a day. Once receiving complaints, power plants will launch investigation and fix the problems. The results will be notified to communities for their approval.

Complaint receiving and solving process



In 2020, RATCH Group’s power plants received zero complaints or compensation claims from neighboring communities.

2. Improvement of quality of life

RATCH Group's power plants have engaged with activities that promote and improve the quality of life. The activities were based on the public hearing on community needs when the power plants were in the development stage, to promote community engagement and ensure their maximum benefits. The activities also address the power plants' goal in being a good neighbor that improves community quality of life.

All power plants started off with the employment of local workers, to generate income, promote a sense of ownership and strengthen the local economy. Activities that support community needs follow.

Activity	Objective/ Target	Target group	Result
Ratchaburi Power Plant and Tri Energy Power Plant			
CSR in School Project	To promote social responsibility among Ratchaburi Power Plant's networked schools towards the schools and communities in terms of energy, environment, safety and occupational health, and morals and ethics	27 schools in the network covering 9 Tambons	<ul style="list-style-type: none"> • 26 out of 27 schools joined the project in 2020 and passed the assessment test: • 140 representatives from the schools joined field trips to Electricity Generating Authority of Thailand's EGAT Learning Center and Space Inspirium in Sri Racha District, Chon Buri Province. • The schools that passed the assessment were divided into 4 levels: <ol style="list-style-type: none"> 1) Beginner Level: 2 school 2) Smart Level: 8 schools 3) Network Level: 8 schools 4) Network Continuous Level: 8 schools
Scholarship program	To promote and extend learning opportunity to students living around power plants who lack financial means but possess excellent academic records and good behaviors. Such program is to help relieve their parents' burden.	Students of 27 networked schools	Ratchaburi Power Plant awarded 471 scholarships as follows: <ol style="list-style-type: none"> 1) Kindergarten level: 80 scholarships 2) Elementary level: 283 scholarships 3) Secondary Level: 108 scholarships

Activity	Objective/ Target	Target group	Result
<p>For Our Home Project - Teachers, an effective teacher development program that applies GRIT (Gather - RunImprove - Transfer) Model to enhance students' English reading skill through classroom research process)</p>	<p>To evaluate teachers' capability in the designing of learning activities based on WPSC approach; assess teachers' satisfaction towards GRIT Model; and evaluate the reading skills of students covered by the 2018 program.</p>	<p>English teachers of Ratchaburi Power Plant's 27 networked schools</p>	<ul style="list-style-type: none"> • Launch an effective teacher development program (GRIT Model) to support the designing of learning activities based on WPSC approach that fosters students' English reading skills. 1) Training on WPSC approach for 27 schools' teachers 2) Following up on teachers' development of research tools through Coaching/Reflection. 3) Analyzing, summarizing and discussing the GRIT Model project result. • 5 schools participated in the GRIT Model project. They were awarded as models for other networked schools.
<p>Mobile medical and dental project</p>	<p>Promote preventive healthcare for communities around Ratchaburi Power Plant and Tri Energy Power Plant, by highlighting local wisdom and reducing health risks of or loss of life</p>	<ul style="list-style-type: none"> • Communities in 9 Tambons around Ratchaburi Power Plant and communities in 3 Tambons around Tri Energy Power Plant • 19 Tambon Health Promoting Hospitals around both power plants 	<ul style="list-style-type: none"> • Alcohol gel and Infrared thermometers were handed to 19 Tambon Health Promoting Hospitals for public use. • Medical checkup was omitted due to the outbreak of COVID-19.
<p>For Our Home Health Project (public health)</p>	<p>To promote professional skills and medical knowledge as well as the attitudes towards traditional Thai medicine's diagnostic, treatment and therapeutic approaches among public health officers.</p>	<ul style="list-style-type: none"> • Tambon Health Promoting Hospitals' officers • Village health volunteers • The elderly and the general public who can physically apply the knowledge with themselves and family members • Those interested to seek a new career 	<ul style="list-style-type: none"> • A 2- day capability and knowledge training on "rebalancing and therapeutic massage" was organized for the Thai massage club in Ratchaburi Province, Tambon Health Promoting Hospitals' officers and health volunteers in 9 tambons. • 50 attendees finished the training and received certificates that enabled them to pursue a new career.

Activity	Objective/ Target	Target group	Result
4 Neighboring Districts Project	To use the engagement process in building and reinforcing relationships and confidence between communities in Ratchaburi Province and Ratchaburi Power Plant, which is “part of community and a good neighbor”	Community leaders (local administrative offices/ area administrative offices) in 3 districts surrounding Ratchaburi Power Plant’s 9-tambon circle	<ul style="list-style-type: none"> • A discussion with the chiefs of 4 districts was organized to design projects that address demands in each area. • The power plant allocated budgets and participated in activities in 3 districts. <ol style="list-style-type: none"> 1) Muang Ratchaburi: Visiting bed-ridden patients, and the underprivileged 2) Damnoen Saduak District: Handing out of life-support bags to the poor under “Sharing of love and happiness in fight against COVID-19” activity 3) Photharam District: Visiting bed-ridden patients, and the underprivileged and organizing a music program for the public
Reinforcing development groups project	To strengthen development groups for their self-reliance	Groups of people in 9 tambons around Ratchaburi Power Plant which show development potential, such as those involved with organic agriculture, environmental conservation, financial management, food processing, youth, women and the elderly	<ul style="list-style-type: none"> • A field trip on sustainable agriculture was arranged, to observe OTOP projects (Golden tamarind and Aiyara) in Phetchabun Province. • 44 representatives from 11 groups joined the trip.
Nava Nakorn Power Plant			
Diabetes screening program	To screen people with early diabetes symptoms for prompt treatment, to reduce the number of community members at risk	The elderly and members of neighboring communities: <ul style="list-style-type: none"> • Moo 11 Chiang Rak Noi Community • Moo 12 Chiang Rak Noi Pattana Community • Wat Puednimit Community 	Early diagnosis of diabetes as well as handouts of sugar testing device and sugar patches, to ensure the elderly and people in risk groups get advice before seeking treatment.
Support on mobile high-power suction machine	To boost Tambon Chiang Rak Noi Health Promotion Hospital’s dental service capacity	Tambon Chiang Rak Noi’s residents using Tambon Chiang Rak Noi Health Promotion Hospital’s dental service	Provide financial supports for the procurement of mobile high-power suction machine for Tambon Chiang Rak Noi Health Promotion Hospital’s dental department.

Activity	Objective/ Target	Target group	Result
Scholarship program	To promote and extend learning opportunity to students living around the power plant who are poor but have excellent academic records and good behaviors and relieve their parents' burden	Students living around the power plant	Extend 6 scholarships to poor but well-behaved students living around the power plant.
Rice box to fight COVID-19 project	To ease economic impacts on people affected by the COVID-19 outbreak	Wat Puednimit Community and nearby communities	Nava Nakorn Electricity Generating Company Limited, Navanakorn Public Company Limited and contractors jointly delivered 900 food boxes to families in Wat Puednimit Community who are affected by the COVID-19 outbreak. Tha Khlong Health Office assisted in queue management with focus on social distancing.
Returning life to water #5 project	To restore the abundance and diversity of aquatic animals in natural waters and build relationship with community	<ul style="list-style-type: none"> • Wat Puednimit School's teachers and students • Wat Puednimit • Chiang Rak Noi Community Moo 11 and Moo 12 	Provide 15,500 fish - 5,000 Nile Tilapia, 5,500 striped catfish and 5,000 Climbing Perch - together with tools. About 60 students and local residents helped release the fish to natural waters.
Children's Day activity	To promote children's physical, emotional and intellectual development through opportunities to learn and show their talents	Children in 33 neighboring communities	Organize learning and other activities to promote children's physical, emotional and intellectual development; and hand out gifts and souvenirs to young members of neighboring communities.
Berkprai Cogeneration Power Plant			
Community job creation for sustainable development project	To train the trainers with knowledge on the making of unfried rice crust as well as packaging design and development, as a way to generate more income	Members of Ban Tha Tonchan Community Moo 1, Ban Pong District, Ratchaburi Province, which is located near the power plant	<ul style="list-style-type: none"> • Theoretical and practical training on the making of unfried rice crust as well as packaging design for 100 community members. • At least 30 trainees can become trainers, to pass on the knowledge to other community members. • Establish Ban Tha Tonchan Moo 1 community enterprise as a rice crust learning center. • Generate more than Baht 6,000 per month per household from selling the rice crust. • Complete 1 packaging design. • Project participants showed 93.8 percent in satisfaction score.

Activity	Objective/ Target	Target group	Result
Support on agricultural product processing tools	To provide agricultural product processing tools which ensures the greater quality of processed fruits	Housewife Community Enterprise at Ban Huasa Pattana Moo 5, Tambon Berkprai, Ban Pong District, Ratchaburi Province, which is located within 3-km radius from the power plant	<ul style="list-style-type: none"> • 50 members of Housewife Community Enterprise at Ban Huasa Pattana Moo 5 joined the project • The power plant handed a can sealing machine and a packaging pattern. • The community enterprise is turned to an agricultural processing learning center. • Project participants showed 91.58 percent in satisfaction score.
“Community Development under Sufficiency Economy Philosophy” Project, under Ratchaburi Province’s eco-industrial strategy	To promote and support community engagement in the development under Sufficiency Economy Philosophy, with its own resources	Communities in Tambon Suan Kluay, Ban Pong District, Ratchaburi Province, which is located within 5-km radius from the power plant	<ul style="list-style-type: none"> • Quality of life development training under Sufficiency Economy Philosophy, attended by about 100 attendees. • 3 community sufficiency learning centers established. • Project participants showed 95 percent in satisfaction score.
Fish release/ resource conservation project	To conserve aquatic animals in Mae Klong River	Leaders and members of Tambon Berkprai Moo 8 community, local government offices and power plant staff	<ul style="list-style-type: none"> • 40 participants released 20,000 fish to help conserve resources. • Project participants showed 84.4 percent in satisfaction score.
Medical supplies support to Ban Pong Hospital (due to COVID-19 outbreak)	To provide local hospitals with medical supplies, supporting their fight against COVID-19	Ban Pong Hospital’s staff	<ul style="list-style-type: none"> • Procure medical supplies and 10 standard PPE for Ban Pong Hospital.
Community health promotion activity	To promote health checkup and raise public awareness on healthcare	Residents in Tambon Berkprai, which is within the 3km radius to the power plant	<ul style="list-style-type: none"> • 100 breakfast sets are prepared per month for people using medical check services at Ban Bang Pang Health Promotion Hospital and Berkprai Health Promotion Hospital which cater services to 100 people a month on average.
COVID-19 rehabilitation activity	To assist those affected by the outbreak with financial support for local government health offices’ making of alcohol gel and face masks	Local residents living near the power plant and Tambon and provincial government offices	<ul style="list-style-type: none"> • Provide financial support to local government offices in the making of alcohol gel and face masks and help distribute the items to Tambon Berkprai’s residents. • Provide financial supports to help rehabilitate outbreak-hit people: Baht 50,000 to Ratchaburi Province, Baht 5,000 each to Tha Maka and Ban Pong districts.

Activity	Objective/ Target	Target group	Result
RATCH Cogeneration Power Plant			
COVID-19 impact rehabilitation activity for neighboring communities	To build relationship with communities around the power plant and assist those affected by COVID-19 outbreak	Neighboring communities	<ul style="list-style-type: none"> Contribute Baht 10,000 to government offices' Pansuk (happiness-sharing) cabinet project and COVID-19 test facility. Provide dried food to help the affected and funding to support the erection of COVID-19 screening facilities, totaling Baht 185,000.
Provision of PM2.5 detector	To inform the public of air quality in their areas and watch out for health impacts from PM2.5	Communities and schools in the vicinity	<ul style="list-style-type: none"> Hand out PM2.5 detectors to neighboring communities, so that community members and the public know the areas' air quality. Hand out a PM2.5 detector to Chatusornbamrung School, so that teachers can plan outdoor classes accordingly to the particle level.
RCO CARE Project	To improve community safety for better quality of life	Neighboring communities	<ul style="list-style-type: none"> Replace light bulbs on the road where the power plant is located, to increase brightness and help reduce accidents with more brightness. Provide financial supports to Tha Khlong Municipality for home and building fixing. Providing financial supports to landscape improvement, to guard against dangerous animals. Extend scholarships to Chatusornbamrung School students who are poor but show good academic records.
Power plants in Australia			
Community supports	Promote engagement in community and social development	Power plants' neighboring communities/society at large	Total financial supports reached 382,015.71 Australian dollars (8.24 million baht)
RATCH Group's power plants			
Contributions to Power Development Fund and payments of local taxes and income taxes	To finance community and national development	Community and society	<ul style="list-style-type: none"> The contributions to Power Development Fund by Ratchaburi Power Plant, Tri Energy Power Plant, Nava Nakorn Power Plant (and its extension part), Berkprai Cogeneration Power Plant and RATCH Cogeneration Power Plant totaled 134 million baht. RATCH Group paid 2.78 million baht in local taxes and 569.66 million baht

Social responsibility

RATCH's activities are not limited only to neighboring communities. We have launched other activities in Thailand and overseas, to benefit society at large. Chief among them are supports to community forests, community energy conservation and education.

Performance in 2020

RATCH carried out social and environmental responsibility projects to achieve targets in four priority areas:

Community forests

The “Love the Forest and Community” project has been undertaken since 2008 in collaboration with the Royal Forest Department (RFD), according to the “Grow trees in people’s hearts” royal initiatives of King Rama IX. The project aims to promote community participation in forest conservation, by establishing community forests which will increase the country’s green areas and store carbon dioxide (carbon sink) to ease global warming and climate change impacts.

Community forest contests are organized, to praise the community showing best performance in forest management which ensures sustainability and efficient utilization of forest resources. The communities receive award money, to support their endeavor in further improving their forests.

Performance in 2020	Performance during 2008-2020
<ul style="list-style-type: none"> Award money to 145 community forests totaled 3,115,000 baht. The forests covered 93,023.45 rai. Carbon dioxide storage capacity reached 153,050.90 tons per year (ton CO₂e/y). 	<ul style="list-style-type: none"> Award money to 1,828 community forests totaled 39,865,000 baht. The forests covered 1,605,871.44 rai. Carbon dioxide storage capacity reached 3,211,742.88 tons per year (ton CO₂e/y).

Note : Forests' carbon dioxide storage capacity per year (ton CO₂e/y) = 2 tons/rai.

Other activities under the projects are aimed at building community capability, targeting the youth and community leaders throughout the country who will support further conservation efforts.

Activity	No. of people in target groups	
	Performance in 2020	Aggregate performance from 2008 to 2020
Kla Yim Youth Camp	31	1,978
Community Forest Leadership Seminar	106	1,882

Community energy conservation

RATCH has carried out the Community Energy Project in collaboration with provincial energy offices since 2014. The objective is to raise awareness and extend knowledge on energy management as well as develop energy technology from local resources for the locals. The project has ably helped communities save energy expenses and earned extra income.

Operational process



Performance during 2014-2020

Phase	Target area	Result			
		Community member's capability enhancement		No. of learning centers established	Promoted community energy technology
		Energy volunteers	Community technicians		
1 (2014-2016)	<ul style="list-style-type: none"> Nam Phu, Muang, Ratchaburi Nong Rong, Phanom Thuan, Kanchanaburi Tha Mai Ruak, Tha Yang, Phetchaburi 	96	37	15	<ul style="list-style-type: none"> - 49 biogas digesters - 17 solar-powered ovens - 20 biomass stoves - 12 biomass (wood) stoves - 24 biomass (can) stoves - 53 (vertical) charcoal-making stoves - 55 (horizontal) charcoal-making stoves - 13 charcoal briquette machines - 1 water-pumping bicycle - 395 energy-saving stoves
2 (2017-2019)	<ul style="list-style-type: none"> Mae Faek, Sansai, Chiang Mai Pasak, Muang, Lamphun Pua, Chiang Klang, Nan 	148	105	15	<ul style="list-style-type: none"> - 12 low-smoke 200-liter charcoal-making stoves - 24 biomass stoves - 6 biomass (rice husk) stoves - 3 solar-powered ovens - 11 (vertical) charcoal-making stoves - 4 energy-saving stoves - 40 biochar-making stoves - 1 biogas digester
3 (2020-2022)	<ul style="list-style-type: none"> Yang Hak, Pak Thor, Ratchaburi 	40	-	-	<ul style="list-style-type: none"> - 8 mobile solar-powered agricultural water pumps
Total		284	142	30	

Education support

RATCH launched the Education for Career Empowerment Project in Lao PDR, a major investment base, in 2011. In its second phase which ran from 2018 through 2023, the project has been implemented jointly with Ministry of Education and Sports in response to the government's education strategy. Under the strategy, Lao PDR aims to produce vocational technicians in support of the electricity industry, to further drive the economy forward.



Performance in 2020

- Renewable energy lab (solar power) was built at Khammouane Technical-Vocational College.
- Develop 70-hour training courses on the installation of 3 solar electric power modules for senior students in vocational and higher vocational levels.
- 4 training courses were organized for teachers and students, for a total of 74 attendees: 12 teachers and 12 students.

Course	Target group	Training venue	Training period	No. of attendees
Renewable power (solar) installation	Vocational teachers	Khammouane Province’s renewable energy learning center	5 days	12 people
Metal welding	Vocational-level senior students	Luang Prabang Technical College	12 days	20 people
PLC technicians	Higher vocational-level senior students	Luang Prabang Technical College	10 days	22 people
General maintenance	Vocational-level senior students	Lao-German Technical College in Vientiane	11 days	20 people
Total				74 people

Stakeholders’ reactions

RATCH commissioned Suan Dusit Rajabhat University to conduct a survey on stakeholders’ opinions on the Company’s social development activities. Covering 300 samples, the Suan Dusit Poll showed that:

- 99.10 percent of stakeholders was satisfied with RATCH’s social development activities, praising it for the efforts in creating education opportunities, forest conservation, community development, and promotion of energy knowledge and understanding.
- The stakeholders encouraged RATCH to proceed with forest conservation and social development programs that address stakeholders’ demands and contribute continual and sustainable benefits to stakeholders.

About this Report

This Sustainability Report is prepared to disclose RATCH Group Public Company Limited's sustainability performance in 2020, covering economic (incorporating governance), social and environmental dimensions relating mainly electricity generation which is the Company's main business. The Company has issued annual sustainability reports since 2014. Disclosed in this report is sustainability performance that is crucial to the Company's growth and sustainability as well as benefits of stakeholders.

Reporting approach

The information appearing in this report covered the performance from 1 January 2020 to 31 December 2020. Its reporting was applied to the Global Reporting Initiative (GRI) Standards: Core option and also contained additional indicators for the Electric Utilities Sector.

Reliability of this report

To assure stakeholders of the accuracy and completeness of information, this reporting was aligned with GRI Standards and the information was reviewed under the following process:

- 1) The central unit responsible for this report gathered information and prepared the report, pending for verification of information completeness and accuracy by the units which owned the information.
- 2) High-level executives reviewed and endorsed the information.
- 3) The Board of Directors considered and endorsed the information disclosed in this report.
- 4) The disclosed information was verified by a third party for alignment with GRI Standards: Core option and additional indicators for the Electric Utilities Sector.

The external assurer of sustainability information under GRI Standards is independent and not related to the Company. The process to select the external assurer has correctly followed the Company's procurement regulations. The Assurance Statement of the external assurer appeared on Page 146.

Scope of the report

This report disclosed the economic, social and environmental performance of all subsidiaries and joint ventures over which the Company has operational control as shown in Performance Data. The list of 2020 controlled companies differed from 2019 with the inclusion of the two following companies:

- Berkprai Cogeneration Company Limited, a joint venture of which the Company's seconded officer served as the top executive.
- RATCH Cogeneration Company Limited, a 99.97 percent-owned subsidiary.

Companies covered by the 2020 reporting scope

Business/ Company	Material Issues								
	Economic	Environmental						Social	
	Production	Air	Water	Waste	Biodiversity	GHG	Energy usage	Safety	Occupational health
RATCH Group PCL	-	-	-	-	-	√	√	√	√
Electricity Generation									
Ratchaburi Electricity Generating Co., Ltd.	√	√	√	√	√	√	√	√	√
RATCH-Australia Corporation Pty Ltd	√	√	√	-	-	√	√	√	√
RATCH Cogeneration Co., Ltd.	√	√	√	√	-	√	√	√	√
Nava Nakorn Electricity Generation Co., Ltd.	√	√	√	√	-	√	√	√	√
Solarta Co., Ltd.	√	-	-	-	-	-	-	-	-
Berkprai Cogeneration Co., Ltd.	√	√	-	√	-	√	√	√	√

Reporting Assurance

The economic data disclosed in this report was the financial information appearing in 2020 Annual Report, which were audited and verified by a certified auditor. The environmental and safety data was verified for the accuracy and completeness in accordance with GRI Standards. RATCH also sought assurance for 10 significant environmental and safety indicators which were significant to the Company and stakeholders. The 10 indicators are as follows:

- 1) Materials used by weight or volume
- 2) Energy consumption within the organization
- 3) Energy Intensity
- 4) Water withdrawal
- 5) Direct (Scope 1) GHG emissions
- 6) Energy Indirect (Scope 2) GHG emissions
- 7) GHG emissions intensity
- 8) Nitrogen oxides (NO_x), sulfur oxides (SO_x), and other significant air emissions
- 9) Work-related injury
- 10) Work-related illness

Channels for information inquiry and recommendations



Corporate Relations Division: Coordinating and report responsible unit



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Performance data

Abbreviation

RATCH = RATCH Group PCL.

RATCHGEN = Ratchaburi Power Plant

TECO = Tri Energy Power Plant

NNEG = Nava Nakorn Power Plant

BPC = Berkprai Cogeneration Power Plant

RCO = RATCH Cogeneration Power Plant

RAC = RATCH-Australia Corporation Pty Ltd

RL = RATCH-Lao Services Company Limited

Note : The 2020 data of TECO was reported until 30 June 2020 due to the end of the Power Purchase Agreement with EGAT.

Economic

Data	Unit	2020	2019	2018
Revenues	Million THB	39,521.99	43,220.07	45,083.54
Operating costs	Million THB	30,228.69	33,228.03	35,170.09
Employee wages and benefits	Million THB	705.01	713.24	724.26
Dividend to all shareholders	Million THB	3,480.00	3,480.00	3,480.00
Payments to government	Million THB	572.45	822.43	1,280.86
Community investments	Million THB	185.75	181.71	214.47
Spent on local suppliers				
Company in Thailand ^[1]	Million THB	35,916.12	38,090.36	39,412.34
Company in Australia (RAC)	Million AUD	18.39	21.73	27.03
Spent on foreign suppliers				
Company in Thailand ^[1]	Million THB	1,006.59	1,067.95	590.74
Company in Australia (RAC)	Million AUD	0.02	0.09	0.06

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

Health and Safety^[2]

Data	Unit	2020	2019	2018	
RATCH	Employees	person (Male : Female)	105 : 105	107 : 102	110 : 102
	Workers	person (Male : Female)	35 : 22	32 : 25	32 : 22
RATCHGEN	Employees	person (Male : Female)	29 : 25	32 : 25	35 : 25
	Workers	person (Male : Female)	295 : 76	299 : 76	300 : 75
TECO	Employees	person (Male : Female)	42 : 3	49 : 44	44 : 6
	Workers	person (Male : Female)	26 : 6	41 : 7	41 : 7
NNEG	Employees	person (Male : Female)	19 : 15	19 : 14	15 : 13
	Workers	person (Male : Female)	339 : 98	411 : 71	42 : 7
BPC	Employees	person (Male : Female)	8 : 11	-	-
	Workers	person (Male : Female)	39 : 12	-	-
RCO	Employees	person (Male : Female)	2 : 1	-	-
	Workers	person (Male : Female)	30 : 9	-	-
RAC	Employees	person (Male : Female)	18 : 5	20 : 5	19 : 4
	Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0

Data		Unit	2020	2019	2018
Number of Hours Worked					
RATCH		Hours worked	733,752.0	567,620.0	551,780.0
RATCHGEN		Hours worked	1,470,161.0	1,902,869.5	1,431,484.5
TECO		Hours worked	95,724.0	205,353.0	251,136.0
NNEG		Hours worked	950,974.0	1,517,185.0	175,954.0
BPC		Hours worked	213,170.0	-	-
RCO		Hours worked	133,643.0	-	-
RAC		Hours worked	41,814.2	40,668.0	37,369.2
Total workforce represented in formal joint management—worker health and safety committees					
RATCH		persons (%)	9 (3.37%)	9 (4.31%)	15 (7.08%)
RATCHGEN		persons (%)	15 (3.53%)	15 (3.47%)	15 (3.45%)
TECO		persons (%)	13 (16.88%)	13 (13.40%)	13 (13.27%)
NNEG		persons (%)	16 (3.40%)	14 (2.72%)	7 (25.00%)
BPC		persons (%)	11 (15.71%)	-	-
RCO		persons (%)	5 (11.90%)	-	-
RAC		persons (%)	5 (21.74%)	5 (20.00%)	6 (26.09%)
Number of Fatalities (result of work-related injuries)					
Employees		person (Male : Female)	0 : 0	0 : 0	0 : 0
Workers		person (Male : Female)	0 : 0	0 : 0	0 : 0
Fetalities Rate (FR) by Gender					
Employees		No/200,000 Hours worked	0	0	0
Workers		No/200,000 Hours worked	0	0	0
Number of high-consequence work-related injuries					
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 : 0	0 : 0	0 : 0
TECO	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0
NNEG	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	person (Male : Female)	0 : 0	1 : 0	0 : 0
BPC	Employees	person (Male : Female)	0 : 0	-	-
	Workers	person (Male : Female)	0 : 0	-	-
RCO	Employees	person (Male : Female)	0 : 0	-	-
	Workers	person (Male : Female)	0 : 0	-	-
RAC	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
	Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0

Data		Unit	2020	2019	2018	
Rate of high-consequence work-related injuries						
RATCH	Employees	No/200,000 Hours worked (Male : Female)	0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0 : 0	0 : 0	
RATCHGEN	Employees		0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0 : 0	0 : 0	
TECO	Employees		0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0 : 0	0 : 0	
NNEG	Employees		0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0.13 : 0	0 : 0	
BPC	Employees		0 : 0	-	-	
	Workers		0 : 0	-	-	
RCO	Employees		0 : 0	-	-	
	Workers		0 : 0	-	-	
RAC	Employees		0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0 : 0	0 : 0	
Number of recordable work-related injuries						
RATCH	Employees		person (Male : Female)	0 : 0	0 : 0	0 : 1
	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 : 0	2 : 0	1 : 0	
TECO	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0	
	Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0	
NNEG	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0	
	Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0	
BPC	Employees	person (Male : Female)	0 : 0	-	-	
	Workers	person (Male : Female)	0 : 0	-	-	
RCO	Employees	person (Male : Female)	0 : 0	-	-	
	Workers	person (Male : Female)	0 : 0	-	-	
RAC	Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0	
	Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0	
Rate of recordable work-related injuries						
RATCH	Employees	No/200,000 Hours worked (Male : Female)	0 : 0	0 : 0	0 : 0.35	
	Workers		0 : 0	0 : 0	0 : 0	
RATCHGEN	Employees		0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0.27 : 0	0.2 : 0	
TECO	Employees		0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0 : 0	0 : 0	
NNEG	Employees		0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0 : 0	0 : 0	
BPC	Employees		0 : 0	-	-	
	Workers		0 : 0	-	-	
RCO	Employees		0 : 0	-	-	
	Workers		0 : 0	-	-	
RAC	Employees		0 : 0	0 : 0	0 : 0	
	Workers		0 : 0	0 : 0	0 : 0	

Data	Unit	2020	2019	2018
Number of Fatalities (result of work-related ill health)				
Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0
Number of cases of recordable work-related ill health				
Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0
Rate of recordable work-related ill health				
Employees	person (Male : Female)	0 : 0	0 : 0	0 : 0
Workers	person (Male : Female)	0 : 0	0 : 0	0 : 0

Remark : ^[2] Presented information covers safety data of RATCH, RATCHGEN, TECO, NNEG (include expansion phase) BPC, RCO and RAC.
All Employees of RATCH, RATCHGEN, TECO, NNEG (include expansion phase) BPC, RCO are Thai, and RAC's employees are Australian and Thai.

People^[3]

Data	Unit	2020		2019		2018	
		Male	Female	Male	Female	Male	Female
Total Employee	Persons	468		462		453	
	Persons	310	158	310	152	302	151
Employee by employment contract							
Permanent	Persons	309	158	310	152	300	150
Temporary	Persons	1	0	0	0	2	1
Employee by age group							
<30 years	Persons	120	28	132	26	153	26
30-50 years	Persons	141	116	138	113	107	109
>50 years	Persons	49	14	40	13	42	16
Employee by category							
Top Management	Persons	14	6	15	3	13	3
	%	2.99	1.28	3.25	0.65	2.87	0.66
Middle Management	Persons	39	19	39	13	44	15
	%	8.33	4.06	8.44	2.81	9.71	3.31
Junior Management	Persons	36	34	50	40	43	40
	%	7.69	7.26	10.82	8.66	9.49	8.83
Officer	Persons	220	99	206	96	201	93
	%	47.01	21.15	44.59	20.78	44.37	20.53
Worker	Persons	1	0	0	0	1	0
	%	0.21	0.00	0.00	0.00	0.22	0.00
Employee by Nationality							
Thai	%	58.33		59.69		61.37	
Lao	%	37.39		35.73		34.44	
Australian	%	4.27		4.58		4.19	
Other	%	0.00		0.00		0.00	
New Hires by Age Group							
<30 years	Persons	40	5	14	9	15	9
	%	8.5	1.1	3.0	1.9	3.3	2.0
30-50 years	Persons	3	7	8	4	10	5
	%	0.6	1.5	1.7	0.9	2.2	1.1

Data	Unit	2020		2019		2018	
		Male	Female	Male	Female	Male	Female
>50 years	Persons	1	0	1	1	1	0
	%	0.2	0.0	0.2	0.2	0.2	0.0
Total	Persons	44	12	23	14	26	14
	%	9.4	2.6	5.0	3.0	5.7	3.1
Turnover by Age Group							
<30 years	Persons	41	2	7	6	5	4
	%	8.8	0.4	1.5	1.3	1.1	0.9
30-50 years	Persons	3	7	7	4	5	7
	%	0.6	1.5	1.5	0.9	1.1	1.5
>50 years	Persons	5	2	4	5	7	0
	%	1.1	0.4	0.9	1.1	1.5	0.0
Total	Persons	49	11	18	15	17	11
	%	10.5	2.4	3.9	3.2	3.8	2.4
Parental leave							
Parental leave	Persons	-	5	-	2	-	5
Returning to work after parental leave ended	Persons	-	4	-	0	-	2
Returning to work after parental leave ended (12 months after return to work)	Persons	-	0	-	0	-	-
Training and Development							
Top Management	hour/person/year	26.86	16.67	44.79	35.67	100.08	66.17
Middle Management	hour/person/year	57.95	47.49	64.65	139.33	70.71	140.37
Junior Management	hour/person/year	44.11	40.52	52.21	66.81	78.35	66.03
Officer	hour/person/year	24.88	24.72	41.07	29.15	49.57	54.71
Worker	hour/person/year	0.00	0.00	0.00	0.00	0.00	0.00
Employee receiving career development review							
Top Management	%	100		100		100	
Middle Management	%	100		100		100	
Junior Management	%	100		100		100	
Officer	%	100		100		100	
Worker	%	100		100		100	
Employee receiving regular performance review							
Top Management	%	100		100		100	
Middle Management	%	100		100		100	
Junior Management	%	100		100		100	
Officer	%	100		100		100	
Worker	%	100		100		100	
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, RL and RCO

Environment ^[4]

Data	Unit	2020	2019	2018
Energy ^[5]				
Total energy consumption	TJ	79,644	74,878	87,580
Total direct energy consumption	TJ	135,509	128,236	150,162
- Natural Gas	TJ	135,430	128,220	150,142
- Bunker Oil	TJ	0	0	0
- Diesel Oil	TJ	79	16	21
Total Indirect Energy Consumption	TJ	172	247	199
- Electricity purchased	TJ	172	247	199
- Heating purchased	TJ	0	0	0
- Steam purchased	TJ	0	0	0
Total energy sold	TJ	56,037	53,605	62,782
- Electricity sold	TJ	55,588	53,215	62,475
- Heating sold	TJ	0	0	0
- Steam sold	TJ	449	390	307
Net Generation (Total)	MWh	15,441,032	14,781,912	17,354,121
Net Generation (Only Fossil Fuel)	MWh	15,243,611	14,614,348	17,171,362
Total energy intensity (within organization)	GJ/MWh	8.78	8.68	8.65
Total Energy Reduction	GJ	254,091	164,387	189,825
- Fuel saving	GJ	43,376	10,124	24,880
- Electricity saving	GJ	210,715	154,263	164,944
- Steam saving	GJ	0	0	0
GHG Emission ^[6]				
Direct GHG emissions (Scope 1)	tCO ₂ e	6,261,297	5,875,291	6,935,752
Indirect GHG emissions (Scope 2)	tCO ₂ e	26,960	43,955	33,618
Total GHG emissions (Scope 1 + 2)	tCO ₂ e	6,288,258	5,919,245	6,969,370
GHG emission intensity (Scope 1 + 2)	tCO ₂ e/MWh	0.4125	0.4050	0.4059
Total GHG emissions reductions	tCO ₂ e	29,263	24,944	26,672
Emission ^[7]				
NO _x emissions	Tons	3,228	2,561	2,757
	kg/MWh	0.21	0.18	0.16
SO _x emissions	Tons	1,057.4	32.5	40.7
	kg/MWh	0.0694	0.0022	0.0024
Opacity	%	0.69	2.31	2.48
TSP	Tons	260.8	280.4	359.1
Water ^[8]				
Total water withdrawal	Million m ³	16.42	15.91	19.60
- Surface water (total)	Million m ³	12.83	13.47	16.62
Freshwater (≤1,000 mg/L Total Dissolved Solids)	Million m ³	12.83	13.47	16.62
Other water (>1,000 mg/L Total Dissolved Solids)	Million m ³	0	0	0
- Groundwater (total)	Million m ³	0	0	0
Freshwater (≤1,000 mg/L Total Dissolved Solids)	Million m ³	0	0	0
Other water (>1,000 mg/L Total Dissolved Solids)	Million m ³	0	0	0
- Seawater (total)	Million m ³	0	0	0
Freshwater (≤1,000 mg/L Total Dissolved Solids)	Million m ³	0	0	0
Other water (>1,000 mg/L Total Dissolved Solids)	Million m ³	0	0	0
- Produced water (total)	Million m ³	0	0	0
Freshwater (≤1,000 mg/L Total Dissolved Solids)	Million m ³	0	0	0
Other water (>1,000 mg/L Total Dissolved Solids)	Million m ³	0	0	0

Data	Unit	2020	2019	2018
- Third-party water (total)	Million m ³	1.12	1.09	1.56
Freshwater (≤1,000 mg/L Total Dissolved Solids)	Million m ³	0.95	0.75	1.23
Other water (>1,000 mg/L Total Dissolved Solids)	Million m ³	0.17	0.33	0.33
- Third-party water (total) in Water Stress Area	Million m ³	2.47	1.35	1.41
Freshwater (≤1,000 mg/L Total Dissolved Solids)	Million m ³	2.47	1.35	1.41
Other water (>1,000 mg/L Total Dissolved Solids)	Million m ³	0	0	0
Recycled and reused water	m ³	1,464,838	1,509,439	1,303,777
	% of total water withdrawal	8.92	9.49	6.65
Water Footprint	m ³ / MWh (net)	1.06	1.08	1.13
Total water discharge	Million m ³	2.69	2.89	3.88
- Surface water	Million m ³	2.48	2.82	3.83
- Third-party water	Million m ³	0.20	0.06	0.06
Water discharge by freshwater and other water				
Freshwater (≤1,000 mg/L Total Dissolved Solids)	Million m ³	2.57	2.89	3.50
Other water (>1,000 mg/L Total Dissolved Solids)	Million m ³	0.12	0.00	0.38
COD loading	Tons	107	150	120
BOD loading	Tons	10	12	13
Total water consumption	Million m ³	13.73	13.02	15.72
Waste^[9]				
Total waste disposal	Tons	4,296	18,682	3,063
Total hazardous waste disposal	Tons	417	359	451
- Reuse	Tons	0	2	0
- Recycling	Tons	80	12	21
- Recovery (including energy recovery)	Tons	297	321	408
- Secured Landfill	Tons	37	24	23
- Onsite storage	Tons	3	0	0
Total non-hazardous waste disposal	Tons	3,878	18,323	2,612
- Reuse	Tons	3	0	0
- Recycling	Tons	3,796	18,203	2,551
- Recovery (including energy recovery)	Tons	0	32	52
- Landfill	Tons	77	88	9
- Onsite storage	Tons	3	0	0
- Waste from non-routine operation	Tons	0	0	0

Remark ^[4] Presented environmental data are of RATCHGEN, TECO, NNEG, BPC, RCO 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 (4th edition, February 2020) 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, BPC and RCO 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, BPC and RCO 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

Disclosure	Description	Page Number (s) and/or URL (s)		Omission	External Assurance
		Sustainability Report	Annual Report		
GRI 102 : General Disclosures 2016					
Organizational profile					
GRI 102-1	Name of the organization	8	-	-	-
GRI 102-2	Activities, brands, products, and services	8-13	-	-	-
GRI 102-3	Location of headquarters	8	-	-	-
GRI 102-4	Location of operations	8-13	-	-	-
GRI 102-5	Ownership and legal form	13	-	-	-
GRI 102-6	Markets served	9-13, 75-77	-	-	-
GRI 102-7	Scale of the organization	14, 137	-	-	-
GRI 102-8	Information on employees and other workers	14, 137-138	-	-	-
GRI 102-9	Supply chain	17-18, 67-74	-	-	-
GRI 102-10	Significant changes to the organization and its supply chain	19-22, 40-58, 17-18, 132-133	-	-	-
GRI 102-11	Precautionary Principle or approach	37-39, 56-58, 73, 99-104	-	-	-
GRI 102-12	External initiatives	14-16, 23-28, 37-39, 40-44, 47-48, 54-55, 57, 68-70, 81-82, 109, 120-131	-	-	-
GRI 102-13	Membership of associations	16	-	-	-
Strategy					
GRI 102-14	Statement from senior decision-maker	5-7	-	-	-
GRI 102-15	Key impacts, risks, and opportunities	34, 37-39, 40-44, 56-58, 73, 99-104	61-65	-	-
Ethics and integrity					
GRI 102-16	Values, principles, standards, and norms of behavior	2-3, 31-33, 105-108	-	-	-
GRI 102-17	Mechanisms for advice and concerns about ethics	31-33, 111	-	-	-
Governance					
GRI 102-18	Governance structure	29-30	67-96, 97-137	-	-
GRI 102-19	Delegating authority	29-30	67-96, 97-137	-	-
GRI 102-20	Executive-level responsibility for economic, environmental, and social topics	29-30	83-84	-	-
GRI 102-21	Consulting stakeholders on economic, environmental, and social topics	24-28, 29-30, 80-82, 110-111, 120-131	-	-	-
GRI 102-22	Composition of the highest governance body and its committees	29-30	68-69	-	-
GRI 102-23	Chair of the highest governance body	29-30	67-69, 97-137	-	-

Disclosure	Description	Page Number (s) and/or URL (s)		Omission	External Assurance
		Sustainability Report	Annual Report		
GRI 102-24	Nominating and selecting the highest governance body	-	70-74	-	-
GRI 102-25	Conflicts of interest	29-30	67-96, 119-120, 127, 152-166	-	-
GRI 102-26	Role of highest governance body in setting purpose, values, and strategy	29-30	74-78	-	-
GRI 102-27	Collective knowledge of highest governance body	-	131	-	-
GRI 102-28	Evaluating the highest governance body's performance	-	128-130	-	-
GRI 102-29	Identifying and managing economic, environmental, and social impacts	-	61-65	-	-
GRI 102-30	Effectiveness of risk management processes	29-30, 37-39, 40-44, 56-58	21-22	-	-
GRI 102-31	Review of economic, environmental, and social topics	37-39, 40-44, 56-58	16-20, 168	-	-
GRI 102-32	Highest governance body's role in sustainability reporting	29-30, 34, 132	-	-	-
GRI 102-33	Communicating critical concerns	29-30, 32	-	-	-
GRI 102-34	Nature and total number of critical concerns	31-33	-	-	-
GRI 102-35	Remuneration policies	29-30, 115-116	-	-	-
GRI 102-36	Process for determining remuneration	115-116	89	-	-
GRI 102-37	Stakeholders' involvement in remuneration	29-30	-	-	-
Stakeholder engagement					
GRI 102-40	List of stakeholder groups	23-28	-	-	-
GRI 102-41	Collective bargaining agreements	-	-	Not applicable	-
GRI 102-42	Identifying and selecting stakeholders	23-24	-	-	-
GRI 102-43	Approach to stakeholder engagement	24-28	-	-	-
GRI 102-44	Key topics and concerns raised	34-36	-	-	-
Reporting practice					
GRI 102-45	Entities included in the consolidated financial statements	132-133	-	-	-
GRI 102-46	Defining report content and topic Boundaries	132-133	-	-	-
GRI 102-47	List of material topics	34	-	-	-
GRI 102-48	Restatements of information	132-133	-	-	-
GRI 102-49	Changes in reporting	132-133	-	-	-
GRI 102-50	Reporting period	132	-	-	-
GRI 102-51	Date of most recent report	132	-	-	-
GRI 102-52	Reporting cycle	132	-	-	-
GRI 102-53	Contact point for questions regarding the report	133, 149	-	-	-

Disclosure	Description	Page Number (s) and/or URL (s)		Omission	External Assurance
		Sustainability Report	Annual Report		
GRI 102-54	Claims of reporting in accordance with the GRI Standards	132	-	-	-
GRI 102-55	GRI content index	141-145	-	-	-
GRI 102-56	External assurance	146-147	-	-	-
GRI 200 : Economic					
GRI 201 : Economic Performance 2016					
GRI 103 :	Management Approach	37-38, 40-43	-	-	-
GRI 201-1	Direct economic value generated and distributed	59	-	-	-
GRI 205 : Anti-corruption 2016					
GRI 103 :	Management Approach	31-33	-	-	-
GRI 205-3	Confirmed incidents of corruption and actions taken	33	-	-	-
GRI 300 : Environmental					
GRI 301: Materials 2016					
GRI 103 :	Management Approach	40, 83-86	-	-	-
GRI 301-1	Materials used by weight or volume	84-85, 139-140	-	-	✓
GRI 301-2	Recycled input materials used	86, 91, 140	-	-	-
GRI 302: Energy 2016					
GRI 103 :	Management Approach	40, 42, 45-47	-	-	-
GRI 302-1	Energy consumption within the organization	139	-	-	✓
GRI 302-3	Energy intensity	139	-	-	✓
GRI 302-4	Reduction of energy consumption	50-52, 139	-	-	-
GRI 303 : Water and Effluents 2018					
GRI 103 :	Management Approach	40, 83	-	-	-
GRI 303-1	Interactions with water as a shared resource	84-85	-	-	-
GRI 303-2	Management of water discharge-related impacts	86, 89-90	-	-	-
GRI 303-3	Water withdrawal	84-85, 139-140	-	-	✓
GRI 303-4	Water discharge	85, 140	-	-	-
GRI 303-5	Water consumption	85, 140	-	-	-
GRI 304 : Biodiversity 2016					
GRI 103 :	Management Approach	40, 93	-	-	-
GRI 304-2	Significant impacts of activities, products, and services on biodiversity	93-95	-	-	-
GRI 305 : Emissions 2016					
GRI 103 :	Management Approach	40, 45, 83	-	-	-
GRI 305-1	Direct (Scope 1) GHG emissions	53, 139	-	-	✓
GRI 305-2	Energy indirect (Scope 2) GHG emissions	53, 139	-	-	✓

Disclosure	Description	Page Number (s) and/or URL (s)		Omission	External Assurance
		Sustainability Report	Annual Report		
GRI 305-4	GHG emissions intensity	50, 139	-	-	✓
GRI 305-5	Reduction of GHG emissions	46, 49, 51-55, 139	-	-	-
GRI 305-7	Nitrogen oxides (NO _x), sulfur oxides (SO _x), and other significant air emissions	88, 139	-	-	✓
GRI 306 : Waste 2020					
GRI 103 :	Management Approach	40, 83, 90	-	-	-
GRI 306-1	Waste generation and significant waste-related impacts	90-92	-	-	-
GRI 306-2	Management of significant waste-related impacts	90-92	-	-	-
GRI 306-3	Waste generated	91-92	-	-	-
GRI 306-4	Waste diverted from disposal	91, 140	-	-	-
GRI 306-5	Waste directed to disposal	91-92, 140	-	-	-
GRI 307 : Environmental Compliance 2016					
GRI 103 :	Management Approach	40, 83	-	-	-
GRI 307-1	Non-compliance with environmental laws and regulations	84-95	-	-	-
GRI 308 : Supplier Environmental Assessment 2016					
GRI 103 :	Management Approach	67-68	-	-	-
GRI 308-1	New suppliers that were screened using environmental criteria	69-70	-	-	-
GRI 400 : Social					
GRI 401 : Employment 2016					
GRI 103 :	Management Approach	112-118	-	-	-
GRI 401-1	New employee hires and employee turnover	137-138	-	-	-
GRI 403 : Occupational Health and Safety 2018					
GRI 103 :	Management Approach	96	-	-	-
GRI 403-1	Occupational health and safety management system	96, 98-105	-	-	-
GRI 403-2	Hazard identification, risk assessment, and incident investigation	99, 100-101	-	-	-
GRI 403-3	Occupational health services	101-106	-	-	-
GRI 403-4	Worker participation, consultation, and communication on occupational health and safety	101-108	-	-	-
GRI 403-5	Worker training on occupational health and safety	105-108	-	-	-
GRI 403-6	Promotion of worker health	105-106	-	-	-
GRI 403-7	Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	99-106	-	-	-
GRI 403-9	Work-related injuries	97, 135-136	-	-	✓

Disclosure	Description	Page Number (s) and/or URL (s)		Omission	External Assurance
		Sustainability Report	Annual Report		
GRI 403-10	Work-related ill health	97, 137	-	-	✓
GRI 404 : Training and Education 2016					
GRI 103 :	Management Approach	112-115	-	-	-
GRI 404-1	Average hours of training per year per employee	115, 138	-	-	-
GRI 404-2	Programs for upgrading employee skills and transition assistance programs	113-115	-	-	-
GRI 404-3	Percentage of employees receiving regular performance and career development reviews	117, 138	-	-	-
GRI 406 : Non-discrimination 2016					
GRI 103 :	Management Approach	110-111, 115-118	-	-	-
GRI 406-1	Incidents of discrimination and corrective actions taken	111, 117-118	-	-	-
GRI 413 : Local Communities					
GRI 103 :	Management Approach	40, 119	-	-	-
GRI 413-1	Operations with local community engagement, impact assessments, and development programs	120-128	-	-	-
GRI 414 : Supplier Social Assessment 2016					
GRI 103 :	Management Approach	68-73	-	-	-
GRI 414-1	New suppliers that were screened using social criteria	69-70	-	-	-
GRI 419 : Socioeconomic Compliance 2016					
GRI 103 :	Management Approach	40, 75, 119	-	-	-
GRI 419-1	Non-compliance with laws and regulations in the social and economic area	20-21, 59, 79, 112	-	-	-
GRI-G4 Electric Utilities Sector Disclosures					
EU 1	Installed capacity, broken down by primary energy source and by regulatory regime	8-13	-	-	-
EU 2	Net energy output broken down by primary energy source and by regulatory regime	20, 75-77	-	-	-
EU 5	Allocation of CO ₂ e emissions allowances or equivalent, broken down by carbon trading framework	53	-	-	-
EU 10	Planned capacity against projected electricity demand over the long term, broken down by energy source and regulatory regime	9-10, 40-43	-	-	-
EU 11	Average generation efficiency of thermal plants by energy source and by regulatory regime	78	-	-	-
EU 21	Disaster/Emergency Planning and Response	38, 56-57, 101-104, 107-108	-	-	-
EU 30	Average plant availability factor by energy source and by regulatory regime	78	-	-	-



LR Independent Assurance Statement

Relating to RATCH Group PCL.'s Sustainability Report for the calendar year 2020

This Assurance Statement has been prepared for RATCH Group PCL. (RATCH) in accordance with our contract but is intended for the readers of this Report.

Terms of engagement

Lloyd's Register Quality Assurance Ltd. (LR) was commissioned by RATCH Group PCL. (RATCH) to provide independent assurance on its Sustainability Report 2020 "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 LR's verification approach. LR's verification procedure is based on current best practice, is in accordance with ISAE 3000 and uses the following principles of - inclusivity, materiality, responsiveness and reliability of performance data.

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

- Confirming that the report is in accordance with:
 - GRI Standards (2016) and core option
 - GRI Electricity & Utilities sector disclosures
- Evaluating the accuracy and reliability of data and information for only the selected indicators listed below:¹
 - Environmental: *GRI 301-1 Materials used by weight or volume, GRI 302-1 Energy consumption within the organization, GRI 302-3 Energy intensity, GRI 303-3 Water withdraw (2018 edition), GRI 305-1 Direct (scope 1) GHG emissions, GRI 305-2 Energy indirect (scope 2) GHG emissions, GRI 305-4 GHG emissions intensity, GRI 305-7 Nitrogen Oxide (NO_x), Sulphur Oxide (SO_x), and other significant air emissions.*
 - Social: *GRI 403-9 Work-related injuries (2018 edition) and GRI 403-10 Work-related ill health (2018 edition)*

Our assurance engagement excluded the data and information of RATCH's subsidiaries where it has no operational control and all 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.

LR's responsibility is only to RATCH. LR 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.

LR's Opinion

Based on LR's approach nothing has come to our attention that would cause us to believe that RATCH has not, in all material respects:

- Met the requirements above
- Disclosed accurate and reliable performance data and information 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. Consequently, the level of assurance obtained in a limited assurance engagement is substantially lower than the assurance that would have been obtained had a reasonable assurance engagement been performed.

LR's approach

LR's assurance engagements are carried out in accordance with our verification procedure. 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

¹ GHG quantification is subject to inherent uncertainty.



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 electricity generating unit (RATCH Cogeneration Power Plant and Berkprai Cogeneration Power Plant) and decommission site of Tri Energy Power Plant to sample performance data and information for the selected specific standard disclosures to confirm its reliability.

Observations

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

- Stakeholder inclusivity:
We are not aware of any key stakeholder groups that have been excluded from RATCH's stakeholder engagement process. RATCH has open dialogue with all of its stakeholders to understand their growing expectations.
- Materiality:
We are not aware of any material issues concerning RATCH's sustainability performance that have been excluded from the report. It should be noted that RATCH has established extensive criteria for determining which issue/aspect is material and that these criteria are not biased to the company's management.
- Responsiveness:
RATCH has addressed the concerns of stakeholders in Thailand and South East Asia region. However, as RATCH has more investments and diversified from power generation business, we believe that future reports should discuss how RATCH governance the new investment businesses i.e., mass transit and aviation fuel services.
- Reliability:
Data management systems are considered to be well defined, but the implementation of these systems varies across RATCH's operational facilities. RATCH should consider interim verification to further improve the reliability and timeliness of its disclosed data and information.

LR's standards, competence and independence

LR 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 together with TGO CFO (Carbon Footprint for organization Scheme of Thailand Greenhouse Gas Management Organization (Public Organization)) are the only works undertaken by LR for RATCH and as such does not compromise our independence or impartiality.

Dated: 26 February 2021

Opart Charuratana
LR Lead Verifier

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Feedback Form: 2020 Sustainability Report RATCH Group PCL.



Scan QR Code for
feedback

1. Reader Profile

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

2. Please identify your stakeholder type

- Shareholder Investor Partner/ Supplier
 Community Employee Scholar/ Independent Organization
 Customer Mass Media Other (Please specify)

3. Where do you receive this sustainability report?

- AGM Company's website
 Other (Please specify.....)

4. Why do you prefer reading this sustainability report?

- 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 2020 sustainability report

- | | | | |
|--|----------------------------|------------------------------|---------------------------|
| <input type="radio"/> Attractive topics | <input type="radio"/> High | <input type="radio"/> Medium | <input type="radio"/> Low |
| <input type="radio"/> Information adequacy | <input type="radio"/> High | <input type="radio"/> Medium | <input type="radio"/> Low |
| <input type="radio"/> Reliable information | <input type="radio"/> High | <input type="radio"/> Medium | <input type="radio"/> Low |
| <input type="radio"/> Presentation methods | <input type="radio"/> High | <input type="radio"/> Medium | <input type="radio"/> Low |
| <input type="radio"/> Readability | <input type="radio"/> High | <input type="radio"/> Medium | <input type="radio"/> Low |
| <input type="radio"/> Design | <input type="radio"/> High | <input type="radio"/> Medium | <input type="radio"/> Low |
| <input type="radio"/> Overall satisfaction | <input type="radio"/> High | <input type="radio"/> Medium | <input type="radio"/> Low |

6. After reading this sustainability report, 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.



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