

1. Overview of the Business

1.1 Vision and Mission of the Company

Glow Vision

We are a leading power generation company providing sustainable and reliable energy solutions based on innovative use of diversified energy sources.

Glow Mission

Create value for our shareholders and customers in a sustainable manner through reliable products, profitable growth and knowledgeable employees with network of expertise.

Perform the business by developing and implementing environmentally and socially responsible projects while improving the quality of life of communities in areas where we do business.

1.2 Development of the Company and the group companies

Glow Energy Plc. was incorporated as “The Cogeneration Public Company Limited” (“The Cogeneration Plc.”) in October 1993. ENGIE S.A. and its subsidiary through which it holds its stake in Glow Energy are hereafter collectively referred to as “ENGIE”), acquired its initial interest in Glow Company Limited. (“Glow Co., Ltd.”) in September 1997 and in Glow Energy Plc. in November 2000, after which the latter was de-listed. In December 2004, the Company’s majority shareholders adjusted their internal shareholding structure by acquiring shares of Glow Co., Ltd. Under the new structure, Glow IPP Company Limited (“Glow IPP”), Glow SPP 1 Company Limited (“Glow SPP 1”) and Glow Demin Water Company Limited (“Glow Demin”) became the Company’s subsidiaries.

In 2007, we formed two holding companies and one operating company: Glow IPP 2 Holding Company Limited (“Glow IPP 2 Holding”), Glow IPP 3 Company Limited (“Glow IPP 3”), and GHECO-One Company Limited (“GHECO-One”).

In September 2008, GHECO-One signed a long-term power purchase agreement with Electricity Generating Authority of Thailand (“EGAT”) and started construction of a 660 MW (Megawatts) coal fired project located in Map Ta Phut Industrial Estate (“MIE”). Glow Group owns a 65 percent stake in this project; WHA Industrial Development Public Company Limited. (“WHA”) owns the remaining 35 percent stake.

In May 2009, Glow Co., Ltd. acquired a 49 percent stake in Houay Ho Thai Company Limited (“HHTC”) and a 55 percent stake in Houay Ho Power Company Limited (“HHPC”) from ENGIE. HHTC is a holding company with a 25 percent stake in HHPC. Therefore, we effectively hold a 67.25 percent stake in HHPC. HHPC owns and operates a 152 MW hydro power plant in Attapeu province, Lao PDR.

In July 2011, the Company acquired 100 percent stake in Thai National Power Company Limited (“TNP”) from International Power Plc. (“IPR”), our major shareholder at that time, which later became 100 percent owned by ENGIE. TNP holds 100 percent stake in two subsidiaries; Thai National Power 2 Company Limited (“TNP 2”) and Rayong National Power Company Limited (“RNP”). TNP, TNP 2, and RNP changed their names to Glow SPP 11 Company Limited (“Glow SPP 11” or “Glow SPP 11 Phase 1”), Glow

SPP 12 Company Limited (“Glow SPP 12” or “Glow SPP 11 Phase 2”), and Glow SPP 13 Company Limited (“Glow SPP 13” or “Glow SPP 11 Phase 3”) respectively in December 2011. In 2013, Glow SPP 12 and 13 were merged with Glow SPP 11, in which today operates gas-fired cogeneration facilities generating and supplying electricity to EGAT under SPP scheme and electricity and chilled water to industrial customers in Siam Eastern Industrial Park (“SEIP”) (located in Pluak Daeng, Rayong).

In 2016, Eastern Seaboard Clean Energy Co., Ltd. (“ESCE”) was structured as a joint venture (at 33 percent each) between Glow IPP 3, WHA Energy Co., Ltd., and Suez (South East Asia) Ltd., ESCE holds 100 percent stakes in each of Chonburi Clean Energy Co., Ltd. (“CCE”), Rayong Clean Energy Co., Ltd. (“RCE”), and Glow Hemaraj Wind Co., Ltd. (“GHW”). In 2017, CCE was awarded a PPA for awaste-to-energy project (gross capacity of 8.6 MW).

In 2018, the PV solar rooftop project installed on the roof of the parking area at the factory of Michelin Siam Co., Ltd. (Michelin) in the WHA Saraburi Industrial Estate (“WHA SIL”) in Nong Khae, Saraburi province has completed construction and achieved COD. The rooftop solar system has an installed capacity of 867.24 kW.

The following timeline shows the key events in Glow Energy’s history and development

October 1993:	Glow Energy incorporated under the name “The Cogeneration Public Company Limited”.
February 1996:	The Cogeneration Plc. listed on the Stock Exchange of Thailand (“SET”).
April 1996:	The Cogeneration Plc.’s cogeneration plant began initial commercial operation.
September 1997:	ENGIE formed a joint venture with WHA, in which each party shared a 50 percent stake in Glow Co., Ltd. (Formerly known as H-Power Company Limited). At the time, H-Power owned 100 percent of Glow SPP 1 (formerly known as Industrial Power Company Limited) and 51 percent of Glow IPP (formerly known as Bowin Power Company Limited).
February 1998:	Glow SPP 1’s 124 MW cogeneration plant began commercial operation.
March 1999:	Glow SPP 2/Glow SPP 3 (hybrid plant) began commercial operation.
May 1999:	Glow Co., Ltd. acquired the remaining 49 percent stake in Glow IPP from International Generating Company Limited., increasing its interest to 100 percent.
June 2000:	ENGIE increased interest in Glow Co., Ltd. to 75 percent.
2000-2004:	ENGIE progressively increased its interest in Glow Co., Ltd. to 100 percent in a series of transactions involving the indirect sale of a 5 percent stake in Glow IPP to WHA.

November 2000:	ENGIE acquired a 62 percent stake in the Cogeneration from Sithe Pacific Holdings Limited.
February/March 2001:	ENGIE increased its shareholding in the Cogeneration to 99 percent by purchasing Banpu's shares and conducting a tender offer for the remaining outstanding shares.
August 2002:	The Cogeneration's shares delisted from the SET.
January 2003:	Glow IPP's 713 MW plant in WHA Chonburi Industrial Estate 1 ("WHA CIE 1"), Bowin began commercial operation.
May 2003:	Company name changed from The Cogeneration Public Company Limited to Glow SPP Public Company Limited.
December 2004:	Glow SPP Public Company Limited ("Glow SPP Plc.") acquired 100 percent of Glow Co., Ltd. from ENGIE.
February 2005:	Company name changed from Glow SPP Plc. to Glow Energy Plc.
April 2005:	Glow Energy Plc. listed shares on the SET.
September 2008:	Signed Power Purchase Agreement with EGAT and started construction of GHECO-One project in October 2008.
May 2009:	Glow Co., Ltd. acquired 49 percent stake in HHTC and 55 percent stake in HHPC from ENGIE S.A. subsidiaries.
November 2010:	Glow Energy's 115 MWeq (Megawatt Equivalent) coal-fired plant ("CFB 3") started commercial operation.
December 2010:	SUEZ-Tractebel Energy Holding Cooperative U.A. was merged with GDF SUEZ Energy Asia, Turkey and Southern Africa B.V. holding 25 percent in Glow Energy.
February 2011:	ENGIE merged its Energy International Business with International Power Plc. ("IPR"). Stake of Glow Energy held by ENGIE is part of the merger. After the combination, GDF SUEZ holds 70 percent of enlarged IPR.
July 2011:	Glow Energy Plc. acquired 100 percent stake in TNP, which holds 100 percent stake in TNP 2 and Glow RNP.
September 2011:	Glow Energy's 382 MWeq gas-fired cogeneration plant ("Phase 5") started commercial operation.
December 2011:	TNP, TNP 2, and RNP changed names to Glow SPP 11, Glow SPP 12, and Glow SPP 13 respectively.
June 2012:	ENGIE completed buyout of the minority shareholders of IPR.

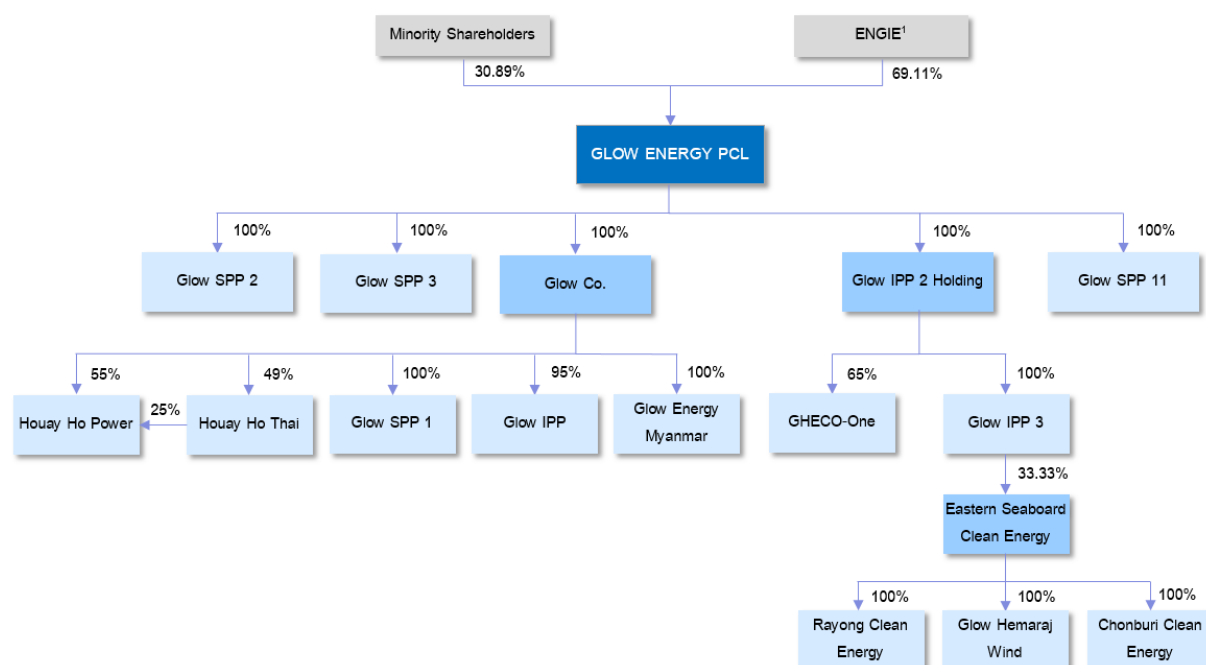
July 2012:	GHECO-One's 660 MW coal-fired IPP plant started commercial operation.
August 2012:	Glow's 1.55 MW PV-Solar plant started commercial operation.
December 2012:	Glow SPP 12's 110 MW gas-fired cogeneration plant started commercial operation.
June 2013:	Glow SPP 12 and Glow SPP 13 transferred their entire business to Glow SPP 11.
August 2014:	The liquidation process for Glow SPP 12 and Glow SPP 13 was completed.
April 2015:	Glow SPP 11's 19 MW new gas engine units (expansion of Glow SPP 11 Phase 3 plant) started commercial operation.
October 2016:	Chonburi Clean Energy ("CCE") was awarded a waste-to-energy project (gross capacity of 8.6 MW). CCE is a joint venture (at 33 percent each) between Glow IPP 3, WHA Energy Co. Ltd., and Suez (South East Asia) Ltd.
October 2016:	Glow Energy Myanmar Company Limited ¹ is established, as a wholly-owned-subsiidiary of Glow Co., Ltd.
November 2017	CCE's 8.6 MW waste-to-energy plant started construction, with commercial operations expected to start in November 2019.
June 2018	ENGIE signed an agreement with Global Power Synergy PCL ("GPSC") to sell its entire (69.11%) stake in Glow Energy, subject to, among others, Energy Regulatory Commission ("ERC") approval.
November 2018	The PV solar rooftop project of 867.24 kW for Michelin Siam Co., Ltd. started commercial operations.
December 2018	ERC approved the acquisition by GPSC of the entire stake held by ENGIE in Glow Energy, subject to, among others, Glow Energy first divesting its entire stake in Glow SPP 1.

¹ Glow Energy Myanmar Company Limited changed its name from ENGIE Myanmar Company Limited in October 2018.

1.3 Shareholding Structure of GLOW Group²

Glow Energy Public Company Limited (“Glow Energy Plc.” or “the Company”), together with its subsidiaries, is one of the largest private electricity generators and provider of industrial utilities in Thailand, with operations in Thailand and the Lao People’s Democratic Republic (“Lao PDR”). We operate Independent Power Producers (“IPP”) and cogeneration facilities, most of which operate as Small Power Producers (“SPP”) under Thailand’s SPP program. Our core business is to produce and supply electricity to the Electricity Generating Authority of Thailand (“EGAT”), and to produce and supply electricity, steam, processed water and chilled water to industrial customers in the Map Ta Phut Industrial Estate (“MIE”), other industrial estates in the immediate vicinity of the MIE (together, the “MIE Area”), and Siam Eastern Industrial Park (“SEIP”) in Pluak Daeng, Rayong.

The following diagram displays our current organizational and ownership structure as of 31 December 2018:



Note:

- 1) ENGIE, formerly known as GDF SUEZ, holds its interest in Glow Energy Plc. through its two wholly-owned subsidiaries, ENGIE Holding (Thailand) Co., Ltd. (formerly “GDF SUEZ Energy (Thailand) Co., Ltd.”), which holds a 54.16 percent in Glow Energy Plc. and ENGIE Global Developments B.V. (formerly “GDF SUEZ Energy International Global Developments B.V.”), which holds a 14.95 percent in Glow Energy Plc.

Although separate companies within our corporate group own our key operating assets, we maintain a single and centralized management structure for all of our group’s companies and assets. This allows us to effectively monitor and coordinate our production facilities’ operations.

² “Glow Group” mentioned in this attachment including 1) Glow Co., Ltd., 2) Glow SPP 1 Co., Ltd., 3) Glow SPP 2 Co., Ltd., 4) Glow SPP 3 Co., Ltd., 5) Glow SPP 11 Co., Ltd., 6) Glow IPP Co., Ltd., 7) Glow IPP 2 Holding Co., Ltd., 8) Glow IPP 3 Co., Ltd., 9) Glow Hemaraj Wind Co., Ltd., 10) Eastern Seaboard Clean Energy Co., Ltd., 11) Rayong Clean Energy Co., Ltd., 12) Chonburi Clean Energy Co., Ltd., and 13) Glow Energy Myanmar Co., Ltd.

1.4 Relationships with Major Shareholders

Glow Energy Plc. is 69.11 percent held by and considered as part of ENGIE.

ENGIE is committed to take on the major challenges of the energy revolution, towards a more decarbonised, decentralised and digitized world. The Group aims to becoming the leader of this new energy world by focusing on three key activities for the future: low carbon generation in particular from natural gas and renewable energies, energy infrastructures and efficient solutions adapted to all its clients' needs (individuals, businesses, territories, etc.). The customers' satisfaction, innovation and digital are at the heart of ENGIE's development. ENGIE is active in around 70 countries, employs 150,000 people worldwide and achieved revenues of €65 billion in 2017. The Group is listed on the Paris and Brussels stock exchanges (ENGI) and is represented in the main financial indices (CAC 40, BEL 20, DJ Euro Stoxx 50, Euronext 100, FTSE Eurotop 100, MSCI Europe) and non-financial indices (DJSI World, DJSI Europe and Euronext Vigeo Eiris - World 120, Eurozone 120, Europe 120, France 20, CAC 40 Governance). To learn more : www.engie.com

The Company is the sole entity of ENGIE for investment and operation of electricity generation businesses in Thailand, Laos, Myanmar, Malaysia, Vietnam and Cambodia. Please refer to page 1-4 with respect to the ongoing transaction between ENGIE and GPSC with respect to ENGIE's stake in Glow Energy. As of end 2018, this transaction has not been closed yet, but it is expected that this transaction will close in 2019, in which case GPSC will then replace ENGIE as the reference shareholder of Glow.

2. Business Descriptions

Glow Energy Plc. and its subsidiaries are one of the largest private electricity generators and providers of industrial utilities in Thailand. We operate Independent Power Producers (“IPP”) and cogeneration facilities, most of which also operate as Small Power Producers (“SPP”) under Thailand’s SPP program. Our core business is to produce and supply electricity to EGAT, and to produce and supply electricity, steam, processed water and chilled water to industrial customers in the MIE Area and SEIP.

We have operated in Thailand since 1993. Our principal production facilities are located in the industrial eastern seaboard of Thailand in Rayong and Chonburi Provinces. We also own hydroelectric plant in Lao PDR’s Attapeu Province. As of 31 December 2018, we had a total generating capacity of 3,207 MW of electricity, 1,206 tons per hour of steam, 5,482 cubic meters per hour of processed water and 3,400 refrigerated tons per hour of chilled water.

Electricity generation and sales are the most important components of our business, accounting for 84.1 percent of total revenues in 2018. The generation and sale of steam is also a significant part of our business, accounting for 13.9 percent of total revenues in 2018. We currently own and operate eight principal production facilities. Their operating characteristics as of 31 December 2018, are:

- Glow IPP plant: Located in the WHA Chonburi Industrial Estate 1 (“WHA CIE 1”), 713 MW of electrical generating capacity;
- HHPC hydroelectric IPP plant: Located in Attapeu province, Laos PDR., 152 MW of electrical generating capacity;
- GHECO-One plant: Located in the Map Ta Put Industrial Estate (“MIE”), 660 MW of electrical generating capacity;
- Glow Energy cogeneration plants (“Phase 1&2”): Located in the Map Ta Phut Industrial Estate (“MIE”), 281 MW of electrical generating capacity; 550 tons per hour of steam; and 2,520 cubic meters per hour of processed water;
- Glow SPP 1 cogeneration plant: Located in the WHA Eastern Industrial Estate (“WHA EIE”) 124 MW of electrical generating capacity; 90 tons per hour of steam; and 190 cubic meters per hour of processed water;
- Phase 3 cogeneration plants: Located in the MIE. The complex consists of:
 - Glow SPP 2/ Glow SPP 3 plant: 513 MW of electrical generating capacity; 190 tons per hour of steam; and 150 cubic meters per hour of processed water;
 - Glow Energy Phase 4 plant: 77 MW of electrical generating capacity; 137 tons per hour of steam and 2,050 cubic meters per hour of processed water;
 - Glow Energy CFB 3 plant: 85 MW of electrical generating capacity; 79 tons per hour of steam; and

- Glow Energy Phase 5 plant: 328 MW of electrical generating capacity; 160 tons per hour of steam.
- Pluek Daeng cogeneration plants: Located in SEIP, consisting of:
 - Glow SPP11 Phase 1 plant (formerly known as Glow SPP 11 plant): 120 MW of electrical generating capacity; 2,200 refrigerated tons of chilled water;
 - Glow SPP11 Phase 2 plant (formerly known as Glow SPP 12 plant): 110 MW of electrical generating capacity; 1,200 refrigerated tons of chilled water;
 - Glow SPP11 Phase 3 plant (formerly known as Glow SPP 13 plant): 23 MW of electrical generating capacity; and
 - Glow SPP11 Phase 3 plant expansion: 19 MW of electrical generating capacity.
- Glow Energy Solar plant: Located in Asia Industrial Estate (“AIE”), 1.55 MW electrical generating capacity by photovoltaic technology (solar cells).
- Glow Energy Solar PV Rooftop: Located at Michelin’s factory in the WHA Saraburi Industrial Estate in Nong Khae, Saraburi province, 867.24 kW electrical generating capacity by polycrystalline silicon panels (Solar cells).

In 2018, we had total consolidated revenues of THB 53,913 million and a net profit of THB 8,379 million. As of 31 December 2018, we had total assets of THB 104,428 million.

(A) Revenue structure

We derive revenue primarily from sales of electricity to EGAT and sales of electricity, steam, clarified water, demineralized water and chilled water to industrial users in the MIE Area and SEIP. The following table breaks down our revenues by source for the periods indicated:

Revenue (unit: million Baht)	FY2018	FY2017	% change
Revenue from Sales of Goods and Interest Earned from Financial Lease			
Electricity			
Sales to EGAT by IPPs	14,601.1	13,408.7	8.9%
Sales to EGAT by Glow IPP	1,577.0	1,581.3	-0.3%
Sales to EGAT by GHECO-One	12,293.6	11,109.0	10.7%
Sales to EGAT by HHPC ¹	730.4	718.5	1.7%
Sales to EGAT by SPPs ²	13,924.7	13,747.7	1.3%
Sales to Industrial Customers	16,180.9	15,722.9	2.9%
Interest earned from financial lease (Glow IPP)	634.2	567.3	11.8%
Total	45,341.0	43,446.6	4.4%
Steam	7,514.3	6,984.7	7.6%
Other Products and Services	465.9	447.2	4.2%
Total	53,321.2	50,878.5	4.8%
Other Income	592.2	1,658.8	-64.3%
Total Revenue	53,913.4	52,537.3	2.6%

(B) Business strategy

Our aim is to optimize profitability through operational excellence and value-creating growth in Thailand and neighboring countries. We have crafted a business strategy that takes into account four perspectives: commercial, operational, financial and human resources.

We have balanced our short-term and long-term objectives to create a well-defined set of priorities and action plans. For our existing operations, this involves enhancements in utilization, efficiency and reliability of existing generation units and distribution networks. This will assist us in reducing overall costs and improving profit margins. We also place strong emphasis on the timely completion of new facilities within their respective budgetary frameworks, optimizing capital costs, and strengthening of internal reporting systems and procedures. To further enhance customer satisfaction and service, in 2018 we have developed and implemented EnergyLens, a platform which supports customers to monitor their power and steam consumption effectively in real time. We are also focusing additional resources on sustainable growth in the areas of renewable energy. We have been providing rooftop solutions to existing and new industrial customers. In addition, our joint venture company (CCE) is currently building a waste-to-energy power plant in Chonburi. We will continue developing a highly motivated and competent team of Thai managers and staffs to support these efforts.

(1) Commercial perspective

From a commercial perspective, we are focused on: (i) growing our core business; (ii) proactively managing client relationships; (iii) optimizing fuel costs and securing fuel supply; and (vi), maintaining and enhancing our local knowledge and relationships.

(1.1) Pursue growth of our core business

We intend to grow our core business by simultaneously increasing our capacity to meet growing industrial demand for electricity and steam, and by positioning ourselves to compete successfully for opportunities to install new generating capacity in Thailand and in neighboring markets.

We are considering opportunities to expand our power business in Thailand, Cambodia, Laos, Myanmar and Vietnam. It is also our intention to continue to grow our cogeneration business both in Thailand and other parts of South East Asia.

To achieve this, we will focus on maintaining and enhancing our operations, providing reliable and high-quality services to existing customers and new customers, meeting all obligations under the EGAT Power Purchase Agreements, and monitoring changes in regulatory environments announced by government bodies (including regulators and policy makers). It is our belief that this will put us in a favorable position to bid for new electricity generation projects in Thailand and neighboring countries in the future.

(1.2) Proactively manage industrial customer relationships

Our industrial customer base is a key component of our business. The majority of our industrial customers in MIE Area are in the petrochemical industry, which relies upon a stable supply of electricity and steam to avoid start-up costs associated with interruptions that occur during production. Our Supply and Services reliability sets us apart from our competitors, and has made us the electricity and industrial utility supplier of choice in our markets. In particular, we target steam and high-load electricity

customers who value reliability of supply. The majority of our industrial customers in SEIP are producers of automotive and motorcycle parts. With our reliability of supply and services, most factories in SEIP are our customers.

We place a high-degree of importance on strengthening relationships with existing customers, not only by providing them with a reliable supply of electricity and industrial utilities, but also by working closely with them to better understand their needs and enhance the provision of services. To do this, we use a variety of customer service based action plans designed to improve customer satisfaction. These action plans help us to understand each customer's respective needs, and improve supply reliability, communication, incident handling and problem solving. Recently, we had launched EnergyLens, a digital platform which allow customers to monitor their power and steam consumption real time through Web base and Mobile platform. We also offered solar rooftop solution to customers for energy saving.

We firmly believe that customer satisfaction is the key to retaining and expanding contracts with existing customers and also acquiring new customers.

(1.3) Optimize our fuel management by reducing fuel cost and ensuring supply availability

Our business is constantly exposed to fluctuations in the price and availability of fuel (and in particular coal). The nature of our business also requires that we have fuel supply arrangements that ensure sufficient supply at all times. We also seek to maintain prudent levels of back-up fuel supplies. Both these factors are critical to our ability to operate.

As such, we commit significant resources to fuel management. We are perpetually seeking opportunities to enhance our coal procurement arrangements to reduce coal and freight costs, which for certain parts of our business have a direct impact on our profitability. To do this, we will continue to examine our open positions on fuel costs. In accordance with our coal risk management policy and in line with our ongoing efforts to protect against fuel price fluctuations, we entered into a hedging agreement with coal suppliers, financial institutions, and other hedge providers in 2017 for part of the coal to be delivered in 2018, and we may enter into similar hedging arrangements in the future. In addition, for SPP and IPP PPAs for coal-fired units with EGAT, changes in fuel costs are substantially passed through to EGAT through the indexation of the Energy Charge.

(1.4) Maintain and enhance local knowledge and relationships

Our core business is to generate and supply electricity and steam to customers in Thailand, and our business strategies reflect our long-term commitment to the country. In this light, we focus substantial resources on identifying and training key individuals to lead our company into the future. We also place a high priority on strengthening our institutional relationship with EGAT, the government, related government authorities, and regulators.

(2) Operational perspective

From an operational perspective, our focus is on:

(2.1) Maintaining and improving reliability, availability and capacity utilization

Our plant capacity utilization can be improved through capacity enhancement measures as well as by reducing the number of unplanned outages and days required for scheduled maintenance. We

continually seek to improve our performance in all these areas through various measures, such as condition and performance monitoring, preventive and effective maintenance, and the reduction of forced outages through root cause analysis and enhanced operating procedures.

(2.2) Improving fuel consumption efficiency

As fuel is a major cost item, fuel efficiency is an important driver of our profitability. Our aim is to continually improve operational efficiency by optimizing dispatch, monitoring the performance of critical equipment and work processes, optimizing the coal mixing prior to feeding to the boilers as well and energy loss monitoring and mitigation.

(2.3) Reduce operational costs

It is our aim to minimize operational and maintenance costs without compromising plant reliability or contractual obligations to supply customers. We do this by ensuring the manner and timing at which costs are incurred is transparent and by exercising good judgment with respect to the need for those expenses. We use reliable systems and cost management procedures to ensure prudent cost management.

Since 2010, we have entered into long-term parts agreements with the original equipment manufacturers for the supply of gas turbine parts and reconditioning services to Glow IPP and Glow SPP 1 for the next three major inspections of each generating unit (approximately 8-9 years), which helps to reduce costs. In 2012, we have entered into another long-term parts and services agreement with IHI to cover the procurement of parts and inspection services scope for the three new gas turbines of Glow SPP11 Phase 2 plant. In 2017, we have entered in a new long-term service agreement for Glow Energy Phase 5 to supply both gas turbine parts and inspection services for a period of approximately the next 15 years. These long-term parts and services agreements secure availability and competitive prices of parts and services supplied by reputable gas turbine manufacturers.

(2.4) Execute projects effectively

We are, on an ongoing basis, either constructing new power plants to serve new customers' demand, implementing projects to enhance performance, and/or constructing new distribution lines to our customers. A dedicated team of employees handles these projects in an organized and prudent manner to avoid delay, poor performance and the financial consequences thereof.

(3) Financial Perspective

Maintain and improve our financial position

Our focus on excellence also includes financial management. We actively evaluate opportunities to minimize the weighted average cost of capital by optimizing our capital structure while reducing our exposure to financial risks. We seek to mitigate foreign exchange risks by matching the currency costs and debt service payments with the currency, direct or indirect linkage, of free cash flow. We have a prudent but flexible interest rate risk management system that is managed by our experienced finance team in determining the amount and timing of fixing interest rates. In addition, we also seek to maximize long term shareholder value by actively monitoring our cash balance in conjunction with our capital expenditure plans.

We also seek to improve our management reporting systems and procedures by enhancing the reliability of these systems, and continually reviewing and documenting the processes involved therein. To do this, we use our Internal Control Management methodology.

The implementation of this methodology, developed for the internal control management governance, ensures compliance with our written and approved policies/procedures, as well as with the laws and regulations of the jurisdictions in which we operate.

The aforementioned laws and regulations seek to promote corporate responsibility, increase public disclosure, and improve the quality and transparency of financial reporting and auditing. They also make company executives explicitly responsible for establishing, evaluating, and monitoring the effectiveness of the company's internal control structure.

(C) Competitive strengths

We believe that our principal competitive strengths are:

(1) Critical Scale and Reliability of Operations

We believe that we have achieved a critical scale of operations in Thailand. Glow IPP has 2 electrical generators, GHECO-One has one supercritical electrical generator, our cogeneration facilities in MIE Area and WHA EIE Area have an aggregate of 23 electrical generators and 19 steam generators, and our cogeneration facilities in SEIP have an aggregate of 12 electrical generators.

Our size is critical in particular to our competitiveness in MIE Area, as our cogeneration facilities in MIE Area are interconnected to provide a reliable supply of electricity and steam to our industrial customers. Our steam network is of a size that ensures a substantial reduction in the risk of supply interruption and pressure loss in the event that any one or more units fail.

The interconnection of our facilities provides us with a number of advantages: enabling us to dispatch our lowest-cost generating units and improve the reliability of our electricity and steam supply to customers; allowing us greater flexibility to coordinate and rotate maintenance schedules; and ensuring our customers greater flexibility when scheduling maintenance outages and in supplying peak start-up demand. Overall, these factors have together allowed our cogeneration facilities to maintain high reliability rates and reduce operating costs.

It is our assertion that, from our perspective, our competitors cannot replicate the scale of our cogeneration operations in the near term, giving us a distinct competitive advantage. The scale of our operations also allows us to capitalize on synergies between our various businesses, including but not limited to: (i) the presence of system redundancies that limit the risk of system of failure; (ii) the presence of economies of scale that improves profitability; (iii) more efficient spare parts management; (iv) improved operational expertise; (v) large-scale system automation; (vi) highly qualified, trained, and (vii) experienced personnel able to carry out tasks and procedures more effectively; and leverage with regard to suppliers.

Our size and long-term presence in the marketplace also allows us to attract a highly motivated and competent workforce that gives us key market expertise and credibility as a serious player in the Thai energy industry. We operate IPP and cogeneration facilities – most of which operate as SPPs under

Thailand's SPP program— giving us a major presence in two distinct sectors of the Thai electricity supply market.

Our business “footprint” in Thailand is diverse, which allows us to attract high-value commercial customers while simultaneously sustaining and increasing cooperation with public sector customers in Thailand. Additionally, our full or near-full ownership and sole operational control of our key assets enables us to control strategic business decisions and react quickly and in a coordinated manner to market developments. We are confident that a similar model could be replicated to develop new businesses in other countries within Glow's perimeter.

(2) Strategic location and assets

(2.1) The MIE Area¹

In addition to a critical scale of operations, the location and concentration of our assets also provides us with a key competitive advantage. We are the principal private electricity supplier and one of the largest industrial utilities suppliers in the MIE Area, the largest and most important industrial estate for petrochemical companies operating in Thailand.

We operate a centralized utility park that enables us to apply strategic resources in a focused manner reflected in operational strengths. Our presence in the MIE Area provides us with an established business presence in a key commercial area of Thailand. This has generated a number of significant opportunities to develop important business relationships with some of Thailand's largest companies.

Our facilities are located centrally within the MIE and are surrounded by several key petrochemical producers. We have a supply infrastructure that connects our facilities to clients via an underground electrical network as well as an above-ground steam pipe network.

Our assets are also diversified. We operate both gas-fired and coal-fired generating units; sell to industrial customers as well as to EGAT; sell material amounts of both electricity and steam; and operate IPP, SPP and non- SPP cogeneration facilities. Together, this diversified portfolio of products, customers and plants ensures our long-term competitiveness as a major player in the Thai energy supply market.

(2.2) The SEIP Area

The SEIP Area is located in industrial estate with a high concentration of automobile and motorcycle parts manufacturing. Our advantage is that we are the only private utilities supplier in the SEIP Area. We own generating units, power transmission lines and chilled water distribution pipeline. Any expansion of existing industrial users and/or new clients will likely choose our reliable utility supply.

(3) Established track record as a reliable supplier focusing on customer satisfaction

Having operated in Thailand since 1993, we have an established reputation as a reliable provider of electricity and steam. Reliability of supply is important to our industrial customers, especially in the petrochemical industry. As such, we focus on developing and constantly improving our supply reliability to differentiate ourselves from our competitors. For example, our generating park in the MIE Area is centralized and interconnected. We also have a dedicated transmission network. Our reliability of supply

¹ The MIE Area or Map Ta Phut Complex covers the area of MIE, AIE and WHA EIE.

to industrial customers is further enhanced through the implementation of critical redundancies and underground cabling for electricity customers.

We also pride ourselves on providing a high level of customer service to clients, as we see customer satisfaction as a key driver to retaining and increasing business with existing clients, as well as acquiring new clients. Our strong track record of solid performance, particularly with industrial customers in the MIE Area and the SEIP Area, has strengthened our reputation.

That our core business is the generation and supply of electricity and steam helps differentiate us from our competitors, many of whom have a broader scale of operations and lack our specialization. This allows us to focus management resources on business development and operational excellence in a manner that our competitors cannot.

(4) Stability of revenues and cash flows

For MIE Area, most of our electricity and steam sales are made under long-term sales contracts with durations of approximately 15 years for industrial customers, and between 21 to 25 years for sales to EGAT. Although original term contracts with industrial customers have expired or are due to expire over the next few years, we have been able to extend majority of those agreements for additional 10-15 years terms. Thus, only about 1 percent of our current MWeq sold to industrial customers in MIE Area will expire within 2019 and we are currently negotiating to extend those contracts. For electricity supply contracts with industrial customers in SEIP, we have been able to extend majority of those agreements up to 10 years. In 2018, we were able to extend the contracts with industrial customer representing about 53MW of electricity, 167 tph of steam and 289 cubic meter of treated water in MIE Area.

The EGAT Power Purchase Agreements expire gradually through 2037 for SPPs and in 2028 for Glow IPP. The EGAT Power Purchase Agreement with GHECO-One will expire in 2037. This provides our business, as a whole, an element of stability and predictability that affords us some level of insulation from competition.

In addition, and as previously noted, most of our industrial customers are in the petrochemical industry and due to the nature of petrochemical production processes, they have relatively high load factors and stable levels of demand.

2.1 Products and Production Facilities

Our core business is the generation and supply of electricity to EGAT and the Provincial Electricity Authority (“PEA”), and the generation and supply of electricity and steam, with clarified, demineralized water and chilled water as secondary products, to industrial customers within the MIE Area and nearby industrial estates and SEIP.

2.1.1 Products

Electricity

We produce electricity for sale to EGAT, PEA (for our solar plant under the VSPP program) and to industrial customers. Electricity sold to EGAT, Thailand’s single wholesale buyer of electricity, is routed into EGAT’s national transmission system. EGAT sells this electricity to both the Provincial Electricity Authority and Metropolitan Electricity Authority (“PEA” and “MEA”), which distribute it through their respective distribution networks to end users throughout Thailand.

We also own and operate an interconnected system of supply sources and transmission lines. The various companies within GLOW Group have entered into contracts to sell electricity to industrial customers in the MIE Area, SEIP and WHA Saraburi Industrial Land (“WHA SIL”). Although the contracts of Glow Energy, Glow SPP 2 and Glow SPP 3 are principally with industrial customers in the MIE, each company also has additional industrial customers in the MIE Area. Glow SPP 1 sells to industrial customers in WHA Eastern Industrial Estate (“WHA EIE”) while Glow SPP 11 sells to industrial customer in the SEIP area. Glow Energy Solar PV Rooftop sells to a customer in WHA SIL area. All electricity in MIE Area is supplied to customers through dedicated transmission lines. Our industrial customers use this electricity for a variety of industrial purposes, the majority of which are associated with petrochemical, petrochemical-related and automobile/motorcycle manufacturing and production processes.

Steam

We also supply steam to industrial customers in the MIE Area. Glow Energy, Glow SPP 2 and Glow SPP 3 sell primarily to industrial customers in the MIE and AIE, whereas Glow SPP 1 sells to industrial customers in the WHA EIE. Steam is sold to our customers at varying pressure levels and used for a multitude of industrial purposes. Due to the inherent limitations of transporting steam over long distances, most of our steam customers are located within four kilometres of steam generating facilities.

Processed water

We also sell clarified and demineralized water to industrial users in the MIE Area. Although this is not one of our group’s core businesses, it is complementary to our electricity and steam generation businesses. As such, we initially entered into the business to generate water for our own production purposes. We do, however, sell excess processed water to industrial customers.

Chilled water

Unlike in the MIE area, industries in the SEIP area do not require steam in their manufacturing processes. At the SEIP, we supply chilled water to industrial customers for cooling in their manufacturing processes. Chilled water is produced using steam generated from the SPP11 power plant through an absorption chiller.

2.1.2 Production facilities

The following table lists our production facilities' key capacity statistics as of 31 December 2018:

Plant Name	Location	Production Capacity					Power Plant Commercial Operation Date
		Electricity (MW)	Steam (tons/hr)	Chilled water (RT)	Processed Water (cu.m./hr)		
Production Facilities				Clarified	Demin		
Glow IPP	WHA CIE 1	713	-	-	-	-	Jan. 2003
GHECO-One	MIE	660	-	-	-	-	Jul. 2012
Houay Ho Power Plant	Laos ⁽¹⁾	152	-	-	-	-	Sep. 1999
Glow Energy Phase 1	MIE	-	250	-	1,110	230	Jul. 1994
Glow Energy Phase 2	MIE	281	300	-	900	280	Apr. 1996
Glow Energy Phase 4	MIE	77	137	-	1,500	550	Jan. 2005
Glow Energy Phase 5	MIE	328	160	-	-	-	Sep. 2011
Glow Energy CFB 3	MIE	85	79	-	-	-	Nov. 2010
Glow Energy Solar Plant	AIE	1.55	-	-	-	-	Aug. 2012
Glow Energy Solar PV Rooftop	WHA SIL	0.87	-	-	-	-	Nov. 2018
Glow SPP 1	WHA EIE	124	90	-	-	190 ⁽²⁾	Feb. 1998
Glow SPP 2/SPP 3 (Phase 3)	MIE	513	190	-	-	150	Mar. 1999
Glow SPP 11 Phase 1	SEIP	120	-	2,200	300 ⁽³⁾	60 ⁽³⁾	Oct. 2000
Glow SPP 11 Phase 2	SEIP	110	-	1,200	200 ⁽³⁾	12 ⁽³⁾	Dec. 2012
Glow SPP 11 Phase 3	SEIP	23	-	-	-	-	Oct. 2006
Glow SPP 11 Phase 3 expansion	SEIP	19	-	-	-	-	Apr. 2015
Total		3,207	1,206	3,400	4,010	1,472	

Source: Glow Energy

Notes:

- 1) Attapeu province, Lao People's Democratic Republic
- 2) The COD of the aforementioned processed water treatment plants may not be the same as power plant COD.
- 3) Raw material for chilled water

Although separate legal entities within our corporate group own these plants, they are centrally managed through a single, coordinated management structure. This allows us to more effectively monitor and coordinate operations of our facilities and implement policies on a group-wide basis.

Glow IPP plant

Glow IPP plant is a natural gas-fired combined cycle plant that began commercial operation in January 2003. The plant, which generates and sells electricity to EGAT, operates as an independent power producer under Thailand's IPP program. The plant had an electrical generating capacity of 713 MW.

GHECO-One plant

GHECO-One plant located at MIE Area is a supercritical coal-fired thermal plant that began commercial operation in July 2012. The plant, which generates and sells electricity to EGAT, operates as an independent power producer under Thailand's IPP program. The plant has a net electrical generating capacity of 660 MW.

Houay Ho Power plant

Houay Ho Power plant is a hydro-power plant that began commercial operation in September 1999. The plant is located in Attapeu province, southern part of the Lao People's Democratic Republic. It has a net electrical generating capacity of 152 MW. The plant, which generates and sells electricity of 126 MW to EGAT and 2 MW to EDL, operates as an Independent Power Producer under Thailand's IPP program.

Glow Energy Phase 1 plant

Glow Energy Phase 1 plant, which began commercial operation in July 1994 and is located in the MIE, consists of a natural gas-fired "D" type boiler for steam generation and a water production plant. The plant is capable of generating 250 tons per hour of steam, 1,110 cubic meters per hour of clarified water, and 230 cubic meters per hour of demineralized water. Because this facility uses relatively inefficient boilers for steam generation, we do not enter into long-term steam supply contracts with respect to this facility. Instead, it is used primarily to satisfy short-term and start-up demand, provide excess capacity, and to strengthen our overall system reliability. The processed water generated by this facility is sold to industrial customers in the MIE.

Glow Energy Phase 2 plant

Glow Energy Phase 2 plant located in the MIE is a combined cycle natural gas-fired cogeneration plant that began commercial operation in April 1996. As of 31 December 2011, the plant had an electrical generating capacity of 281 MW and a steam generating capacity of 300 tons per hour. Electricity generated by this plant is sold both to EGAT and to industrial customers in the MIE. Steam is sold to industrial customers in the MIE. The Glow Energy Phase 2 plant is also equipped with water treatment facilities capable of producing 900 cubic meters per hour of clarified water and 280 cubic meters per hour of demineralized water, which are either consumed by the Glow Energy Phase 1 plant and/or sold to industrial customers in the MIE and nearby industrial estates.

Glow Energy Phase 4 plant

Glow Energy Phase 4 plant is a natural gas-fired cogeneration plant located in the MIE that began

commercial operation in January 2005. The Glow Energy Phase 4 Plant has increased its clarified and demineralized water plant capacities since 2010 to serve additional demand in the area of MIE. Plant had an electrical generating capacity of 77 MW, steam generating capacity of 137 tons per hour, clarified water generating capacity of 1,500 cubic meters per hour, and demineralized water generating capacity of 550 cubic meters per hour. Electricity generated by this plant is wholly sold to EGAT Steam and processed water from the plant are sold to industrial customers in the MIE and nearby industrial estates.

Glow Energy Phase 5 plant

Glow Energy Phase 5 plant is located adjacent to the Glow SPP 3 plant in the MIE. The plant consists of gas turbine, heat recovery steam generator and steam turbine. It can generate electricity maximum of up to 382 MW, designed to have 328 MW of electricity and maximum of 160 tons per hours of steam. Electricity and steam produced from this unit are supplied to the existing Glow distribution networks. This unit is a relatively large cogeneration unit compared to the other cogeneration units we have in our fleet. Due to the size and its efficiency Glow Energy Phase 5 power plant is operated as a base load unit while other small cogeneration units are utilized to fulfill EGAT PPAs and balancing industrial load. The plant has been in commercial operations since September 2011.

Glow Energy CFB 3 plant

Glow Energy CFB 3 plant, which began commercial operation in November 2010, is located adjacent to the Glow SPP 3 plant in the MIE. The plant consists of coal-fired circulating fluidized bed boiler and steam turbine. The plant was designed for an electrical generating capacity of 85 MW at a steam generating capacity of 79 tons per hour or a 115 MWeq electrical generating capacity without steam extraction. Electricity and/or steam generated by Glow Energy CFB 3 plant are distributed to the current electricity and steam networks for our industrial customers in the MIE Area.

Glow Energy Solar plant

Glow Energy Solar plant is a photovoltaic solar power plant located at AIE that began commercial operation in August 2012. The plant generates and sells electricity to PEA. The plant has a net electrical generating capacity of 1.55 MW.

Glow Energy Solar PV Rooftop

Glow Energy Solar PV Rooftop is PV solar system installed on the roof of the parking area at Michelin's factory in the WHA Saraburi Industrial Estate in Nong Khae, Saraburi province. The plant began commercial operation in November 2018. The plant generates and sells electricity to Michelin Siam Co., Ltd. The plant has a net electrical generating capacity of 0.87 MW.

Glow SPP 1 plant

Glow SPP 1 plant is a natural gas-fired combined cycle cogeneration facility. The plant is located in the WHA EIE and began commercial operation in February 1998. The plant has an electrical generating capacity of 124 MW, a steam generating capacity of 90 tons per hour and a demineralized water production capacity of 70 cubic meters per hour. Electricity generated by the Glow SPP 1 plant is sold to EGAT, as well as industrial customers in the WHA EIE. Steam produced at the plant is sold to industrial customers in the WHA EIE. The Glow Demineralized Water plant is owned by Glow SPP 1 Company Limited and is located within the vicinity of the Glow SPP 1 plant in the WHA EIE. It began commercial operation in November 1999 and is capable of producing a total of 120 cubic meters per hour of

demineralized water. We sell processed water produced by the Glow Demineralized Water plant and Glow SPP 1 plant to industrial users in the WHA EIE.

Glow SPP 2/Glow SPP 3 plant (Phase 3)

Glow SPP 2/Glow SPP 3 plant is a hybrid natural gas- and coal-fired cogeneration facility located in the MIE that began commercial operation in March 1999. Although we manage the plant as a single generation facility, Glow SPP 2 owns the gas-fired generation portion of the facility and Glow SPP 3 owns the coal-fired portion.

The plant is divided into two parts: (i) two 35 MW gas turbines with two heat steam generating units; and (ii), two 222 MW hybrid cogeneration units, each comprising a steam turbine, two 35 MW gas turbines and two heat recovery units, and coal-fired circulating fluidized bed boiler. The Glow SPP 2/Glow SPP 3 plant had an electrical generating capacity of 513 MW, a steam generating capacity of 190 tons per hour and a demineralized water production capacity of 150 cubic meters per hour. Electricity generated by the Glow SPP 2/Glow SPP 3 plant is sold to EGAT and industrial customers in the MIE Area. The plant's steam and processed water are sold to industrial customers in the MIE and nearby industrial estates.

Glow SPP 11 Phase 1 plant

Glow SPP 11 Phase 1 plant is a natural gas-fired cogeneration plant located in the SEIP that began commercial operation in October 2000. The plant consists of two gas turbines, one steam turbine and an absorption chiller and electric chiller for a backup unit. The plant has electrical generating capacity of 120 MW and chilled water generating capacity of 2,200 refrigerated tons per hour. Electricity from the plant is partly sold to EGAT, while electricity and chilled water sold to industrial customers in the SEIP are transmitted via our own transmission network and chilled water pipelines, respectively.

Glow SPP 11 Phase 2 plant

Glow SPP 11 Phase 2 plant is a natural gas-fired cogeneration plant located in the SEIP that began commercial operation in December 2012. The plant consists of two gas turbines, one steam turbine, an absorption chiller and electric chiller for augmenting the gas turbines output. The plant has electrical generating capacity of 110 MW and chilled water generating capacity of 1,200 refrigerant tons per hour. Electricity from the plant is partly sold to EGAT, while electricity and chilled water sold to industrial customer in the SEIP are transmitted via our own transmission network and chilled water pipelines, respectively.

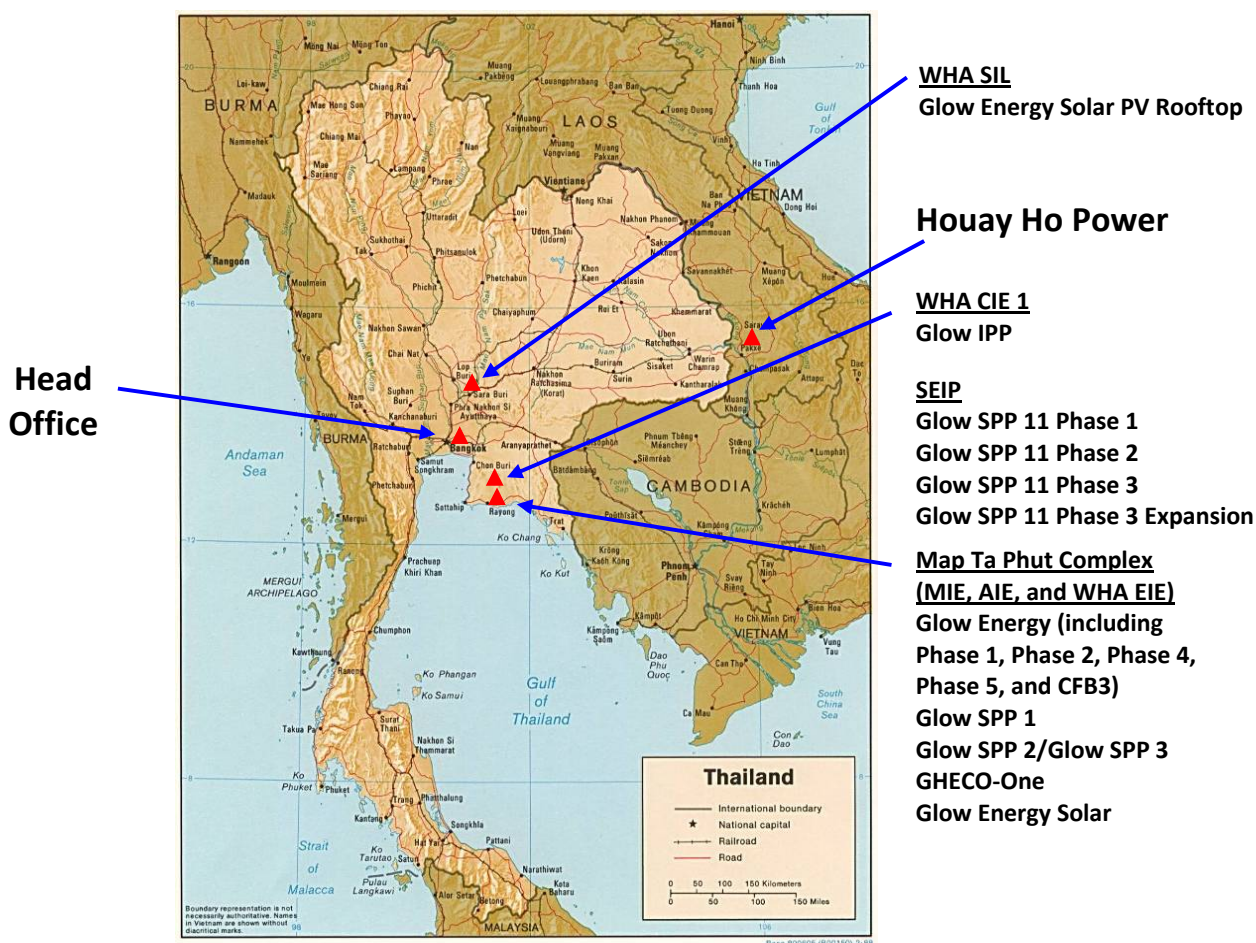
Glow SPP 11 Phase 3 plant

Glow SPP 11 Phase 3 plant consists of four electricity generating reciprocating gas-fired engines located in the vicinity of Glow SPP 11 plant, at the SEIP. The plant can generate a total output of 23 MW into the common network. All four engines were installed and commenced commercial operation in October 2006.

Glow SPP 11 Phase 3 plant expansion

Glow SPP 11 Phase 3 plant expansion consists of two electricity generating reciprocating gas-fired engines located in the vicinity of Glow SPP 11 plant, in SEIP. The plant can generate a total output of 19 MW into the common network. The two engines were installed and commenced commercial operation in April 2015.

Head Office and Plant Locations



2.1.3 Production processes

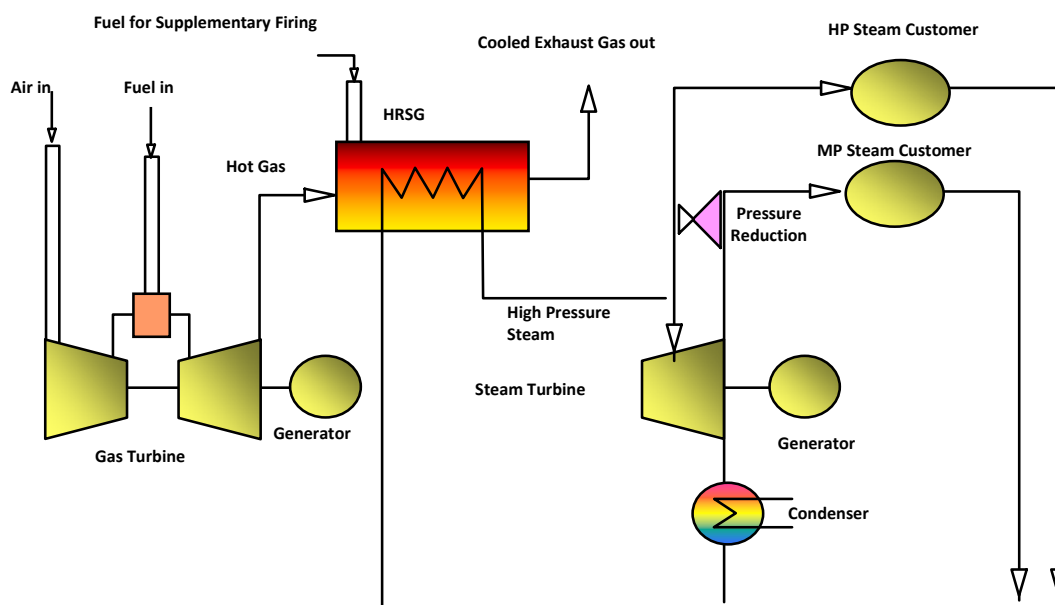
2.1.3.1 Production processes of electricity, steam and demineralized water

Production processes of electricity and steam

In the combined cycle gas turbine cogeneration process, air is compressed and combined with fuel (natural gas or diesel). This mixture is then passed into the combustion chambers of gas turbine generating units. The fuel's ignition and combustion within these chambers generates high pressure and hot gas. The hot gas expands and is passed through the gas turbine, which turns electric generators that produce an electrical current and voltage. The turbine's exhaust gases then pass through a heat recovery steam generator, where water is heated to generate steam. A portion of the steam generated by the heat recovery steam generator is supplied directly to customers requiring high-pressure steam. The remaining steam is passed through a steam turbine, driving another generator to produce electricity. Steam extracted from an intermediate stage of the steam turbine is sold to customers requiring medium pressure steam. Medium pressure steam is also supplied to customers through pressure reduction and attemperation of high-pressure steam.

The following simplified diagram illustrates the combined cycle gas turbine cogeneration process:

Combined Cycle Cogeneration Process



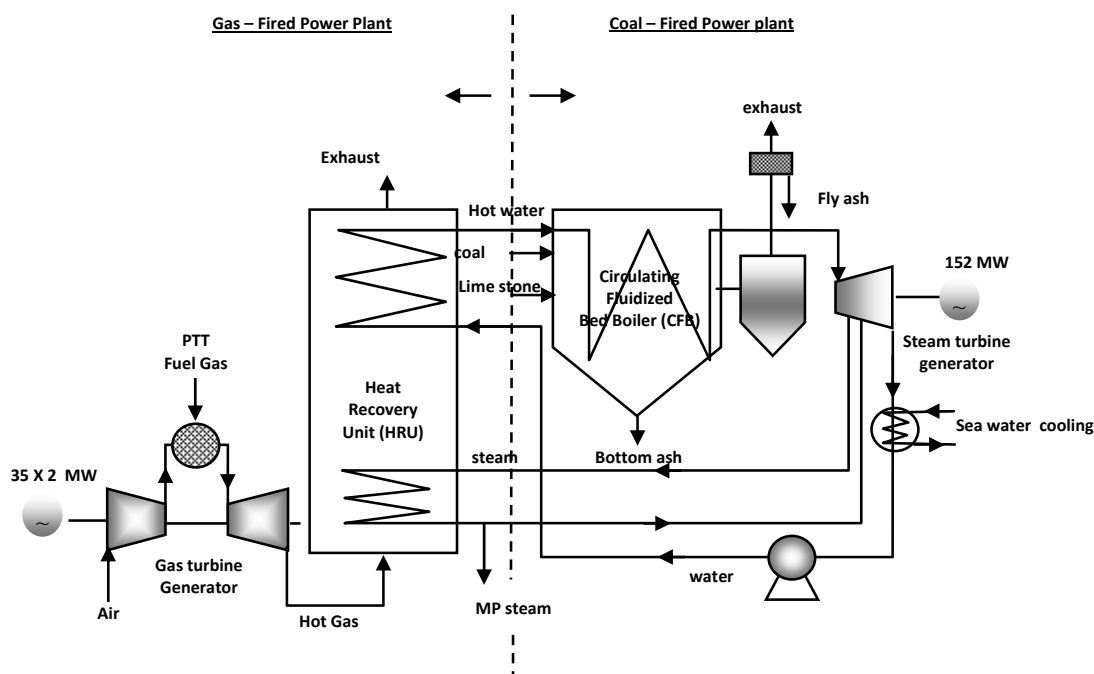
Our Glow IPP facility operates as a combined cycle electrical generating facility and produces electricity solely for EGAT.

Glow Energy and Glow SPP1 operate as combined cycle cogeneration facilities, and produce both electricity and steam. Glow SPP 2 also has two stand-alone combined cycle cogenerating units, in addition to its “hybrid” facilities discussed below.

Our Glow SPP 2/SPP 3 plant employs a hybrid cycle cogeneration process, in which both gas turbines and steam turbines generate electric power and a circulating fluidized bed boiler generates steam. In contrast to our other electricity generation plants, which rely on gas as their primary fuel source, the Glow SPP 2/SPP 3 plant is fueled by both coal and gas. While the specific cycle arrangement used in this process is not common, the equipment used is standard in the international power generation industry. We chose to install a hybrid facility in order to increase our use of coal, a lower-cost fuel, and to reduce our reliance on natural gas as a fuel source.

The following simplified diagram illustrates the Glow SPP 2/SPP 3 plant's hybrid electricity generation process:

Hybrid Cogeneration Process



Production processes of processed water

Demineralized and clarified water is produced using relatively simple processes. To produce clarified water, raw water is pumped into a clarifier and treated using a combination of coagulation, flocculation, sedimentation and filtration processes. Coagulation involves adding a coagulant to the water (such as Aluminum Chlorohydrate) that causes fine particles to form as suspended material in the raw water. A flocculant (such as anionic polymer) is then added to aggregate these fine particles together so that they will sink (or agglomerate) to the bottom of the clarifier. This forms sediment, which is removed in the form of sludge and processed for further water removal. The clarified water is then taken off the top of the clarifier with minimal suspended solids and sent to sand filters. The final stage of this process is filtration, during which the water is filtered to remove any existing small particles that were not removed in the final sedimentation process. The final clarified water is then sold to customers or used internally for the production of demineralized water, service water or fire water.

Production of demineralized water from clarified water involves a chemical process. Clarified water is introduced into a series of deionization tanks called cation, anion and mixed bed exchange vessels. Once in these vessels, the water comes into contact with hydrogen and hydroxide ions present on the resin beads layered within these vessels. Over 99 percent of all ions in the water are removed as the water passes through the series of resin vessels. This is achieved through a chemical reaction whereby the cations in the water are exchanged for the hydrogen in the cation resin vessel, and the anions in the water are exchanged for hydroxide in the anion vessel. The resulting water is then "polished" in the mixed bed vessel to remove trace ions. The final effluent from the mixed bed vessel is essentially "pure" water.

We also use a reverse osmosis membrane technology to make demineralized water. In this process, the effluent water is also “polished” using a mixed bed resin vessel to produce essentially “pure” water. Demineralized water is used for internal steam production and also sold to customers for use in their various production processes.

2.1.3.2 Operational management

All of our facilities are managed under a single management structure that optimizes our operational performance by ensuring our ability to provide a high-quality, reliable supply of electricity and industrial utilities to our customers while simultaneously increasing profit margins. Although all of our plants are managed under a single organizational structure, Glow IPP plant, Houay Ho plant and GHECO-One plant are under a separate operational structure from our cogeneration facilities. This is primarily due to the fact that these plants are under the IPP program and sell entire electrical generation to EGAT directly through EGAT transmission network. The IPP plants are independently operated from dedicated control rooms.

Effective management of our facilities and operations is fundamental to our success. Our ability to increase revenue from existing customers is limited, as the revenue structure of most contracts fluctuates over the life of the contract due to the built-in adjustment mechanisms contained therein. The price structure of our long-term contracts does, however, allow us to capitalize on increases in efficiency that reduces operating costs.

As fuel is our major cost item, increases in operational efficiency (i.e. the quantity of fuel needed to supply a given amount of energy to our customers) contribute significantly to our profitability. We are therefore constantly seeking to improve operational efficiency by optimizing dispatch procedures, monitoring critical equipments, streamlining work processes, maximizing utilization of coal fired units and Glow Energy Phase 5 plant at MIE, and monitoring and mitigating energy loss.

Our key operational strategies are:

- **Improve reliability, capacity utilization and performance:** The reliability of electricity and steam generating units and their corresponding distribution networks is of critical importance to our industrial customers. In 2016, we have launched different technical, managerial and procedural activities to further improve our network reliability;
- **Operational cost reduction:** We seek to minimize operational and maintenance costs by ensuring the manner and timing at which costs are incurred are transparent and by exercising good judgment with respect to the need for those expenses. We also focus on improving cost management through reliable systems and cost control procedures; and
- **Project execution:** We are perpetually constructing new power plants and distribution lines to serve new customers and improving performance of existing plants and distribution systems for the benefit of existing customers. A dedicated team of employees handle these projects in an organized and prudent manner that is designed to avoid delays, ensure high performance and limit the financial consequences thereof.

2.1.3.3 Performance of our electrical generating facilities

Our ability to market and sell electricity hinges upon the effectiveness of our generating facilities operation. This requires us to focus on operational elements that include but are not limited to: the fuel

efficiency of electricity generation processes; the percentage of time that our facilities are available to produce electricity; and the amount of time and number of unplanned outages experienced. For example, under the terms of our EGAT power purchase and power supply agreements, we are penalized for any failure to make our generation facilities available for dispatch and/or to supply electricity at certain times of the day at the contracted rates. Our EGAT power purchase agreements also contain contracted heat rates that penalize poor fuel efficiency and reward high fuel efficiency.

We measure the fuel efficiency of generating facilities by calculating their “heat rates”. Heat rates measures the amount of fuel required to produce one kWh of energy, and are converted at a standard rate for different types of fuel (i.e. natural gas, coal and diesel oil) into British thermal units (“BTUs”). A lower heat rate is indicative of a more efficient production process. The heat rates at our electricity generating units vary due to differences in equipment and design, and in part due to the varying generating capacities of the different fuel sources used. Generally, coal-fired plants have higher heat rates than natural gas-fired plants, and larger generating facilities produce electricity more efficiently, which results in lower heat rates.

We use the following measurements to gauge operational performance:

- **Availability Factor (“AF”):** the percentage of hours in a given period for which a unit was available for service, whether or not it was actually operated;
- **Planned Outage Factor (“POF”):** the percentage of hours in a given period for which a unit experienced planned outages. A planned outage is an outage, scheduled well in advance, incurred to perform testing, inspection or overhaul work. Planned outages typically occur once or twice per year;
- **Maintenance Outage Factor (“MOF”):** the percentage of hours in a given period for which a unit experienced maintenance outages. A maintenance outage is defined as a maintenance related outage that can be deferred for a period extending beyond the next weekend, but requires the unit to be removed from service prior to the next planned outage; and
- **Forced Outage Factor (“FOF”):** the percentage of hours in a given period for which the unit was in a forced outage. A forced outage is an outage that requires that the unit to be removed from service (a trip or a shutdown) before the end of the next weekend. A forced outage also results when an attempt to bring a unit into service is unsuccessful, which is also referred to as a starting failure.

The availability and outage factors for plants consisting of more than one turbine generator are based on the arithmetic average of the availability and outage factors of those generators. A high availability factor generally indicates that the facility is capable of generating during a large portion of the period measured, while a low unplanned outage factor, consisting of maintenance outages and forced outages, generally indicates that our facilities are well maintained and reliable.

The table below summarizes our electricity generating facilities' Availability Factor (AF) for the periods indicated.

Availability Factor	Year ended 31 December,		
	2016	2017	2018
Glow IPP plant	93.16	100.00	99.16
GHECO-One plant	91.52	86.76	96.71
Glow Energy plant ⁽¹⁾	96.66	96.67	97.79
Glow SPP 2 plant	97.89	98.72	95.66
Glow SPP 3 plant	89.55	88.72	93.78
Glow SPP 1 plant	96.97	94.37	90.96
Houay Ho Power Plant	80.68	86.42	91.20
Glow SPP 11 Phase 1 Plant	96.38	97.75	92.01
Glow SPP 11 Phase 2 Plant	98.22	98.10	90.45
Glow SPP 11 Phase 3 Plant	91.43	97.18	97.98
Glow SPP11 Phase 3 Plant Expansion	84.09	84.25	85.47

Source: Glow Energy

Notes:

- 1) Excludes Glow Energy Phase 1, which operates relatively inefficient boilers, is principally used for short-term and back-up supply purposes and includes Glow Energy Phase 5 plant.

We believe that our system-wide performance is enhanced significantly by the interconnection of our cogeneration facilities, which allows us to back up individual facilities with multiple other facilities, greatly reducing the risk of supply interruptions to customers.

Our power and steam supply agreements with industrial customers typically contain conditional liquidated damages provisions that generally require us to compensate customers for service interruptions.

We have entered into back-up power purchase agreements with EGAT pursuant to which EGAT will supply us with electricity during periods in which we are unable to supply electricity to our industrial customers during outages. Pricing under these agreements is based on the standard PEA electricity tariff for large-scale electricity purchasers. As this is typically higher than the price at which we sell electricity to our industrial customers, we lose money when we are required to rely on these arrangements. In the past, we have not been required to rely on these back-up arrangements for any material length of time.

2.1.3.4 Utilization of production facilities

In addition to the performance indicators set out above, a key determinant of operating performance is the level at which generating facilities are operated. Generally, the closer a facility is to operate at full capacity, the more quickly we are able to recover investment costs and operate from a position of profitability.

A capacity factor is another measurement used to determine a facilities operating performance. A capacity factor, which is expressed as a percentage represents the net actual energy produced compared to nominal capacity in a given period.

The table below displays the capacity factor information for our electricity and steam production facilities:

Capacity Factor ¹	Year ended 31 December,		
	2016	2017	2018
Glow IPP plant ²			
Electricity	4.58	0.56	0.61
GHECO-One plant			
Electricity	90.27	86.84	95.20
Glow Energy (Phase 2) plant			
Electricity	63.55	53.44	44.48
Steam	103.29	114.85	112.74
Glow Energy (Phase 4) plant			
Electricity	77.73	78.62	76.71
Steam	87.27	89.06	86.42
Glow Energy (Phase 5) plant			
Electricity	86.38	84.54	89.76
Steam	67.66	68.68	81.43
Glow Energy (CFB 3) plant			
Electricity	96.10	113.94	107.77
Steam	64.42	51.28	48.68
Glow SPP 1 plant			
Electricity	73.11	71.64	70.38
Steam	51.07	51.46	46.47

Capacity Factor ¹	Year ended 31 December,		
	2016	2017	2018
Glow SPP 2 plant			
Electricity	58.26	63.42	61.73
Steam	37.23	48.10	49.35
Glow SPP 3 plant			
Electricity	67.00	68.19	70.41
Steam	293.01	263.84	276.35
Houay Ho Power plant			
Electricity	29.22	30.45	32.13
Steam	-	-	-
Glow SPP 11 Phase 1 plant			
Electricity	76.75	77.00	75.89
Steam	-	-	-
Glow SPP 11 Phase 2 plant			
Electricity	86.58	85.44	78.82
Steam	-	-	-
Glow SPP 11 Phase 3 plant			
Electricity	9.99	11.18	8.56
Steam	-	-	-
Glow SPP 11 Phase 3 Plant Expansion			
Electricity	27.54	25.83	29.91
Steam	-	-	-

Source: Glow Energy

Notes:

- 1) Excludes Glow Energy Phase 1, Glow Energy Solar and Glow Energy Solar PV Rooftop.
- 2) In 2016, 2017 and 2018, EGAT minimally dispatch GIPP, due to high reserve margin of the whole system.

As noted above, one of our key competitive strengths is our system reliability, as reflected in our ability to offer industrial customers a secure and constant supply of industrial utilities.

The tables below display our cogeneration facilities' supply reliability data for the periods indicated:

MIE facilities' supply reliability data for our operation:

Average reliability ^{1,2} , %	Year ended 31 December,		
	2016	2017	2018
Electricity			
Glow Energy, Glow SPP 2, Glow SPP 3			
22 kV supply	99.96	99.99	100.00
115 kV supply	99.96	100.00	100.00
Glow SPP 1			
22 kV supply	99.75	99.98	99.99
115 kV supply	100.00	100.00	100.00
Steam			
Glow Energy, Glow SPP 2, Glow SPP 3			
High pressure supply	99.75	99.97	100.00
Medium pressure supply	100.00	99.99	100.00
Glow SPP 1			
Medium and low pressure supply	100.00	100.00	99.99

Notes:

- 1) Reliability factor is a measurement of Glow's ability to perform its utility supply obligations under the conditions specified in its agreements with its customers during each contract year. Reliability factor in respect of each customer is generally calculated by taking the sum of the actual number of hours that Glow's utility is made available to that customer and equivalent partial available hours (calculated over partial restriction of utility supply) that Glow utility has made available to its customer during the period, divided by the total number of hours in such contract year (excluding force majeure events and schedule maintenance). Average reliability for each product is calculated by taking a mathematical average of the reliability factors in respect of each customer.
- 2) In 2016, the reliability of our networks was not up to Glow standards. An action plan has been developed and followed up. Some of the activities will continue in 2019. An asset management program specially for the network is being developed. Managerial activities are primary directed to the improvement of the network reliability.

SEIP facilities supply reliability data for our operation:

Average reliability, %	Year ended 31 December,		
	2016	2017	2018
Electricity			
Glow SPP11			
22 kV supply	99.76	99.88	99.89

2.2 Market and Competition

2.2.1 Marketing and Sales

Our marketing and sales function is central to our business, as it allows us to maintain and strengthen our relationships with our existing customer base and acquire new customers for the growth of our business.

EGAT is our largest and most important customer. We strive to strengthen our relationship with EGAT by fully complying with the terms of our EGAT power purchase agreements and wherever possible working closely with EGAT to resolve differences or disagreements. We market our products to industrial customers on the basis of our ability to provide superior reliability. As noted earlier, this is of critical importance to industrial customers, particularly those in the petrochemical industry. It is our firm belief that our supply reliability is superior to that of our competitors.

Generally, we seek customers with high and stable load requirements for electricity, steam and chilled water. This enhances our ability to predict and manage load requirements while simultaneously allowing us to capitalize on our cogeneration facilities to achieve maximize efficiency. We price electricity, steam and chilled water sales to industrial customers using both an “avoided-cost model” and a “cost plus margin model” that allow us to more effectively price products and optimize profit margins.

We have a dedicated industrial sales department to identify potential business, both from new and existing customers. The department is also responsible for preparing and negotiating new sales agreements.

For MIE Area, we operate primarily under long-term contracts with a relatively small group of key, repetitive electricity, steam and water products customers. For SEIP Area, contracts term is shorter (2-10 years term); however, these customers have been repeated electricity and chilled water products customers similar to MIE Area. As such, we employ a dedicated account manager in our industrial customer relations department to manage relationships with existing customers. We maintain positive and professional working relationships by cooperating closely with customers. In addition, we strive to develop complementary services and products that we expect will benefit our customers in the future.

It is our philosophy that the quality of our products and services is directly related to our ability to understand and meet each customer’s unique needs. With this aim in mind, our marketing department works closely with our industrial sales and customer relations departments to prepare individualized customer action plans. Our customer relations department also handles contract management as well as technical and commercial complaints and incidents.

Together, these unique organizational characteristics help us to maintain a level of operational excellence and deliver high quality products and services consistently and reliably.

2.2.2 Customers

Our customer base is composed of both private and public sector clients that include EGAT and industrial customers.

2.2.2.1 EGAT

We sell a significant portion of the total electricity generated at our plants to EGAT, a state enterprise created under, and subject to, the Electricity Generating Authority of Thailand Act. EGAT is the dominant participant in the Thai electricity market. It owns and manages the majority of Thailand's electricity generating capacity, as well as the nation's transmission network. EGAT is also Thailand's largest electricity generator, with a total generating capacity of 15,789.6 MW as of 31 December 2018.

To date, we have not experienced any material problems with EGAT regarding payments for capacity made available and electricity delivered under existing EGAT power purchase agreements.

Sales to EGAT by Glow IPP and GHECO-One

General

We sell electricity to EGAT under long-term power purchase agreements. The contracts for EGAT power purchase agreements are different for IPPs ("IPP power purchase agreements") and SPPs ("SPP power purchase agreements"). Our IPP power purchase agreements have a term of 25 years from the IPPs' commercial operation date. The agreements stipulate that IPPs are responsible for financing, constructing and commissioning power plant facilities in compliance with agreed technical characteristics. The agreements also stipulate that IPPs are responsible for operating and maintaining these facilities upon their successful commission. EGAT has the exclusive right to dispatch the generation of electricity from our IPPs and GHECO-One into the transmission network (subject to certain minor limitations).

Payments

Under the IPP power purchase agreement we receive two principal types of payment from EGAT:

- **"Availability Payments,"** which EGAT is required to make if IPP plants are available to generate electricity with the agreed characteristics at agreed levels in response to dispatch instructions from EGAT, regardless of whether or a dispatch instruction is issued. These payments ensure a return on our investment in the facility and cover fixed operating and maintenance costs; and
- **"Energy Payments,"** which EGAT makes for electricity supplied to EGAT in response to dispatch instructions. These payments are designed to cover fuel, fuel transportation and variable operation and maintenance costs incurred by IPPs in the production of electricity supplied to EGAT.

We also earn an "added facility charge" from EGAT for Glow IPP, which is a payment used to reimburse Glow IPP for amounts advanced to EGAT to build new transmission facilities and cover other access costs incurred on behalf of EGAT to connect Glow IPP plant to EGAT's transmission grid.

Costs and pass-through

Under the IPP power purchase agreement, EGAT compensates IPPs for changes in fuel and fuel transportation costs in form of higher or lower energy payments. Although EGAT's payments to IPPs under the IPP power purchase agreement are denominated in THB, the portion of availability payments

with regard to our fixed capital investment, fixed operation and maintenance costs are indexed to THB per USD exchange rates and Consumer Price Index.

EGAT bears cost from increases in taxes (except for income taxes) or other changes in law that increase operating costs at IPP plants. Any reduction in taxes (except for income taxes) or other costs due to changes in law is also passed through to EGAT.

Force majeure

Our IPP power purchase agreement also contains extensive *force majeure* provisions constituting nine separate types of events, including:

- severe weather;
- plague;
- war;
- strikes;
- changes in law;
- failure to obtain government approvals (other than due to Glow IPP's failure or omission);
- accident, earthquake, sabotage, fire or explosion;
- expropriation; and
- a *force majeure* affecting the performance of any person that is party to a material maintenance, fuel supply, service or other contracts.

A separate term, "governmental *force majeure*", is defined to apply *force majeure* events of war, changes in law, failures to obtain government approvals and expropriation in which the action or inaction of the government is the controlling and/or contributing force.

Our IPP power purchase agreements provide that: (i) if IPPs are unable to make its generating facilities available due to a *force majeure* event that is not a governmental force majeure, EGAT is only required to make availability payments to IPPs to the extent IPPs' facilities are actually available; (ii) if EGAT is unable to perform its obligations due to a *force majeure* event that is not a governmental *force majeure*, it must for the first six months of the *force majeure* event, pay to IPPs their debt service costs and, after six months, it must, make full availability payments to IPPs (including for payments not made during the initial six months); and (iii) if a governmental *force majeure* prevents either IPPs or EGAT from performing the obligations under the agreement, EGAT is still required to make its availability payments to IPPs (subject to certain modifications in their calculation to reflect the fact that a *force majeure* may render the original calculation formula inapposite).

Force majeure can also give rise to termination rights under the IPP power purchase agreements. Either party may terminate the agreement if a *force majeure* event other than a

governmental *force majeure* event affects IPPs for a period exceeding one year. EGAT may terminate the agreement if a governmental *force majeure* affects either party for a period exceeding one year.

Certain termination provisions require EGAT to purchase IPPs' generating plant if EGAT terminates the agreement due to a *force majeure* event. This is the case for a non-governmental *force majeure* event that affects EGAT for more than one year and a governmental *force majeure* event affecting either party that continues for more than one year. The agreement contains a basic framework for the compensation to be paid in this situation.

Events of default

Our IPP power purchase agreements contain provisions for a number of events that could potentially lead to termination pursuant to an event of default or the occurrence and continuation of a *force majeure* event. The termination provisions for events of default provide both IPP and EGAT with the right to terminate the agreement after applicable cure periods in respect of the other party's event of default having expired.

Events of termination that entitle EGAT to terminate the agreement include: a payment default by IPPs; severe damage to IPPs' plants (as specified in the IPP power purchase agreement); the occurrence of specified insolvency-related events relating to IPPs; certain material deadlines being missed; certain changes in control of IPPs; and the consistent failure to achieve expected availability (to the degree specified in the IPP power purchase agreements). Events of termination that entitle IPP to terminate the agreement include: EGAT's payment default; EGAT's breach of a material provision of the IPP power purchase agreements; and certain insolvency events relating to EGAT.

Our IPP power purchase agreements contain specific provisions that ensure IPPs are paid a certain amount in the event that the agreement is terminated for reasons of *force majeure*. If any *force majeure* event (other than a governmental *force majeure*) affects IPPs and continues for more than one year, either IPPs or EGAT may terminate the agreement without any payment requirements.

If a *force majeure* event (other than a governmental *force majeure*) affects EGAT, continues for more than one year, and results in EGAT's termination of the agreement, EGAT is required to pay IPPs an amount equal to the sum of: (i) all amounts outstanding under IPPs' financing documents; (ii) IPPs' paid-up share capital and share premiums; and (iii) IPPs' retained earnings, less the amount of any related insurance proceeds received.

If a governmental *force majeure* event that affects either IPPs or EGAT continues for more than one year and results in EGAT's termination of the agreement, EGAT is required to pay an amount that: (i) is not less than all amounts outstanding under IPPs' financing documents; and (ii) takes into account the condition and historical performance of the plant, its remaining useful life, the economic value of the plant's generating capacity, the depreciated cost of the plant, IPPs' historical returns, and the nature and ability to cure the *force majeure* event.

Technical and other provisions

The IPP power purchase agreement sets forth pertinent terms such as: scheduled commercial operation dates and other critical milestones (all of which have been met); detailed operating characteristics the plant must achieve; damages in the event of delays in completion; testing protocols; step-in rights; and environmental requirements.

The Glow IPP power purchase agreement requires Glow IPP to maintain sufficient supplies of backup fuel. All IPP power purchase agreements require EGAT to provide standby electricity to IPP. The agreement also sets out specific liquidated damages for either party's failure to perform its obligations.

In addition, the IPP power purchase agreements also require that following any privatization, the privatized entity remains government owned or controlled, or, if neither, that it remains capable of performing the obligations of its predecessor.

Sales to EGAT by our SPPs

General

We also sell electricity to EGAT under a total of 11 SPP power purchase agreements. Our SPP power purchase agreements generally carry original terms of 21 to 25 years, under which we are responsible for financing the construction and commissioning of power plant facilities in compliance with the agreed technical characteristics set out in the SPP power purchase agreement and, thereafter, for operating and maintaining these facilities.

SPP power purchases are standard-form agreements with uniform substantive terms that apply to all SPPs. There was no opportunity for us to negotiate these agreements.

Payments

Under our SPP power purchase agreements, EGAT is obligated to make minimum monthly capacity payments (subject to monthly foreign exchange rate adjustments), which generally allow us to recover fixed capital expenditures and fixed operating costs. In contrast to IPP Power purchase agreements, under which our capacity and energy payments are calculated with regard to specific operating circumstances, capacity and energy payments for our SPPs are determined by the SPP program's specific guidelines without reference to our specific SPPs.

EGAT is required to purchase a minimum amount of energy from our SPPs. EGAT also pays us separately for the electricity that we actually generate on its behalf and that which is sold. EGAT has make-up rights that permit it to demand delivery of any electricity it pays for but does not use for a period of two years following any year in which it uses less electricity than its minimum purchase obligation.

Under the terms of the SPP power purchase agreements, our SPPs are entitled to reduce EGAT's minimum entitlement to facilitate sales to third parties. In the case of such a reduction, EGAT's fixed payment obligations are reduced by a corresponding amount and EGAT is entitled to a refund of any payments made (plus interest on such payments) for electricity not supplied.

Conversely, in most of our SPPs power purchase agreements, any failure by our SPPs to meet capacity requirements for a period of 18 months could lead to termination of the power purchase agreement by EGAT, but only with respect to the amount of capacity that we have failed to deliver, and require us to refund capacity payments in respect of the shortfall amount. For Glow Energy Phase 4 and Glow SPP 11 Phase 2, the condition set forth under the power purchase agreements for such failure of the SPPs to meet capacity requirement will be calculated based on the capacity which unable to meet for a period of 18 months during the past 24-month cycle ending on the present month.

Our SPPs are also required to generate and sell a certain amount of steam to meet certain condition set forth under the power purchase agreement. In most of our SPPs contracts, the condition will be based on the “thermal ratios”, which measure the ratio of thermal energy to electricity energy produced and “efficiency” requirements, which measure the ratio of energy output and fuel input. Any failure to generate the prescribed amounts of steam or power and steam to meet the thermal ratios or efficiency set forth in the power purchase agreement results in a reduction in payments to us. However, for Glow Energy Phase 4 and Glow SPP 11 Phase 2, the Agreements require SPPs to undertake the inspection of indicator used to measure capability of primary energy utilization in combined heat and power generation system (Primary Energy Saving - PES) and EGAT shall pay for Fuel Saving payment if SPPs can meet such requirement.

Costs and pass-through

Energy payments are subject to adjustments that reflect changes in natural gas and coal prices. These adjustments are uniform and applicable to all SPPs in Thailand rather than to our SPPs specifically, and therefore may not accurately reflect changes in our actual fuel costs. There is currently no material open position with respect to purchases of natural gas. There is, however, a significant coal pricing risk. The pass-through mechanisms do not incorporate the freight costs of coal shipments.

Force majeure

Under our SPP power purchase agreements, either party may claim *force majeure*. The occurrence of a force majeure can excuse a party’s non-performance under the agreement and can, under certain circumstances, result in the extension of the agreement to make up the *force majeure* period.

Force majeure includes:

- acts of government such as a change in energy policy;
- blockades or acts of enemies in warlike situations;
- riots, insurrections, sabotage, strikes, evictions, accidents, earthquakes, storms, fires, floods, plagues and explosions;
- a failure of the SPP to renew permits;
- expropriation; and
- any event constituting a *force majeure* under the SPP’s gas supply agreement with PTT.

The term governmental *force majeure* is defined to mean acts of government, blockades or acts of enemies in warlike situations, a failure of the SPP to renew permits and expropriation where the *force majeure* event has been caused by the government. Equipment breakdown is specifically stated not to constitute a *force majeure* event.

Under our SPP power purchase agreements, EGAT must continue making capacity payments to us in the case that it is affected by a *force majeure* event. In the case of any *force majeure* event affecting EGAT, or any governmental *force majeure* event affecting our ability to perform under the agreement

(other than a *force majeure* event relating to PTT), EGAT will continue making the capacity payments at the six months average of the previous capacity payment to us for a period not exceeding six months.

The agreements contain no further adjustments to payment provisions in the event of *force majeure*, meaning that we are not entitled compensation for our failure to supply electricity to EGAT in any other circumstances arising from a *force majeure* event. Where EGAT continues to make capacity payments during periods of *force majeure*, the relevant SPP power purchase agreement may be extended for a period equal to the *force majeure* period. During an extension period resulting from such circumstances, EGAT is only required to pay the energy payment for the purchase of electricity and not capacity.

Events of default

Under the SPP power purchase agreements, events of default include: payment default by either party; the SPP's inability to deliver electricity for more than 15 consecutive days (excluding permitted exceptions or circumstances for which EGAT is directly responsible); the SPP's non-compliance with material conditions as stipulated in the agreement; and the SPP's failure to meet stipulated standards of electricity to be delivered.

Technical and other provisions

To ensure that we meet our contracted capacity requirements, the SPP power purchase agreements impose financial penalties and disincentives for our failure to meet said capacity requirements. EGAT is also entitled to request additional electricity, which our SPPs are not obligated to provide and for which EGAT is required to pay relatively high rates.

The SPP power purchase agreements also contain change in law provisions which provide that, if there is a change in law which requires material changes to be made to the facility or has a material impact on expense or revenues, the details of such change shall be submitted to the appropriate regulatory body for a consideration on whether and how to amend the arrangements under the power purchase agreement appropriately.

Sales to EGAT by HHPC

General

We sell electricity to EGAT under a long-term power purchase agreement with a term of 30 years from the Commercial Operations Date ("COD") (the "Term"). The COD occurred on 3 September 1999.

Payments

Under the power purchase agreement, EGAT shall pay Energy Charges for each kWh of Net Electricity Output, which is dispatched and delivered from the facility during such period at the delivery point as measured by the Revenue Metering Equipment, with relevant assumptions to calculate and deduct the loss of delivery to the border of Thailand.

Costs and pass-through

There is no major fuel cost related to the operation of this hydro-power plant.

Force majeure

Under the power purchase agreement of HHPC, *force majeure* is broadly defined. It includes, but is not limited to, the following circumstances:

- war;
- sabotage and revolution;
- widespread strikes;
- radioactive explosion;
- fire, explosion, lightning, earthquake, storms, hurricane, flood, landslide or act of god;
- epidemic;
- closing borders and any transports; and
- changes in Law by Thai or Lao Governmental Authority.

Both EGAT and HHPC have the right to terminate this agreement in the event of: (i) Thai Political *Force Majeure* event or Lao Political *Force Majeure* and the effects of such *Force Majeure* event continue unremedied for more than 18 months; or (ii) any other *Force Majeure* event and the effects of such other *Force Majeure* event continue un-remedied for more than 36 months.

Events of default

HHPC power purchase agreement contains provisions for a number of events that could potentially lead to termination pursuant to an event of default or the occurrence and continuation of a *force majeure* event. The termination provisions for events of default provide both HHPC and EGAT with the right to terminate the agreement after applicable cure periods in respect of the other party's event of default having expired.

Events of termination that entitle EGAT to terminate the agreement include: a payment default by HHPC; HHPC's failure to achieve at least 300 GWh Available Output being not more than four years; HHPC's failure to deliver any bank guarantee in the form required; and HHPC's breach of a material provision resulting in a Material Adverse Effect. On the other hand, events of termination that entitle HHPC to terminate the agreement includes: a payment default by EGAT; and EGAT's breach of a material provision resulting in a Material Adverse Effect.

2.2.2.2 Industrial customers

In the MIE Area, our industrial customers are mostly large-scale industrial companies, comprised of mainly upstream and downstream petrochemical producers. Our industrial customers generally have strong business backgrounds and many of them are subsidiaries or affiliates of international corporations. In the SEIP Area, our industrial customers are mostly medium-scale industrial companies, consisting mainly of producers of (i) food packing; and (ii) automotive/motorcycle parts and related products. Sales to our industrial customers accounted for 44.8 percent of our total revenues in 2018.

Sales of electricity to our industrial customers accounted for 30.0 percent of our total revenues in 2018, while sales of steam and water together accounted for 14.8 percent. See “Risk Factors—We are highly dependent on a small number of industrial customers”.

In the MIE Area, we typically enter into contract terms of 15 years with industrial customers, although we can also accommodate shorter and longer contract periods. In the SEIP Area, we typically enter into contract terms of 2-10 years with industrial customers. This helps us stabilize cash flow and reduces future off-take risks. For electricity sales, most of the contracts are priced with reference to the PEA tariff, which contains adjustment mechanisms to account for changes in prevailing fuel costs (other than coal). Note that PEA tariff structure is periodically reviewed by ERC (and that one such review has been under study since 2017). The announcement of the new PEA tariff structure has been delayed and may be announced in 2019, that possibly have a material adverse effect on our business. For steam and chilled water sales, contracts are priced with reference to the customer’s avoided costs or Glow’s cost plus margin.

As of 31 December 2018, we were supplying: 737 MW of electricity to industrial customers under an aggregate of 85 power supply agreements; 1,179 tons per hour of steam to industrial customers under an aggregate of 34 steam supply agreements; 2,050 RT of chilled water to industrial customers under an aggregate of two chilled water supply agreements; and a total of 1,659 cubic meters per hour of clarified and demineralized water to industrial customers under an aggregate of 16 water supply agreements. In 2018, we start supplying 0.72 MW of solar rooftop to industrial customer under 1 power supply agreement.

Our ten largest industrial customers for combined sales of all industrial utilities are:

- AGC Chemicals (Thailand) Company Limited;
- Covestro (Thailand) Company Limited;
- DOW Chemical Thailand Limited;
- JSR BST Elastomer Company Limited;
- PTT Global Chemical Public Company Limited;
- Siam Styrene Monomer Company Limited;
- Thai Polyacetal Company Limited;
- Thai Polycarbonate Company Limited;
- Thai Polyethylene Company Limited; and
- Vinythai Public Company Limited

Electricity

Electricity sales to our ten largest industrial customers accounted for 21.2 percent of our total revenues in 2018. Our largest industrial electricity customers in 2018 included:

- AGC Chemicals (Thailand) Company Limited;
- Covestro (Thailand) Company Limited;
- DOW Chemical Thailand Limited;
- Linde (Thailand) Public Company Limited;
- Map Ta Phut Olefins Company Limited;
- PTT Global Chemical Public Company Limited;
- Rayong Olefins Company Limited;
- Thai Polycarbonate Company Limited;
- Thai Polyethylene Company Limited; and
- Vinythai Public Company Limited

Power supply agreements with industrial customers are generally negotiated on a customer-specific basis, although most of the agreement use a similar form.

We typically price our sales of electricity to industrial customers by referencing to the prevailing retail tariff charged by PEA for industrial users and may include discount and transmission charge. The PEA tariff includes a base charge and a fuel transfer charge, or Ft. The current Ft structure is intended to cover fluctuations in the costs to EGAT of purchasing fuel to produce and purchase electricity, as well as, to a certain extent, transmission and distribution costs and other fluctuations including foreign exchange rate changes and inflation.

The price of electricity sold to most industrial customers usually includes a capacity and energy charge, the latter of which is adjusted in accordance with the Ft. The capacity charge is payable on a monthly basis and expressed as a fixed THB amount per kilowatt for peak demand. It represents a small portion of the overall electricity tariff and does not cover capital, fixed operation or maintenance costs.

The energy charge, which is also payable monthly, is expressed in THB per kWh and adjusted with reference to the PEA tariff. Discounts to the capacity charge, energy charge, or both are applied on a customer-specific basis depending on the load factor, contracted capacity, minimum take obligation, interconnection costs and other factors.

In the MIE Area, most of the contract term for power supply agreements are for a period of 15 years from the commercial operation date of the customer. Although a number of our original agreements have already expired or are to expire over the next few years, most of agreements were extended for additional 10-15 years term. We have also secured several contracts with new industrial customers and for new projects of existing customers

Subject to the specific terms and conditions of the power supply agreements, we are required to supply up to the total contracted capacity and industrial customers are obliged to purchase minimum specified amounts of electricity (which mostly are expressed as a percentage of contracted capacity). In

practice and normal situation, most of our industrial customers purchase electricity in amounts well in excess of their minimum take obligations.

We are liable under the terms of certain power supply agreements to pay liquidated damages for any failure to meet customer supply obligations. We entered into a back-up supply agreement with EGAT to meet supply obligations to industrial customers during planned and unplanned outages pursuant to which EGAT is required, in certain prescribed circumstances, to supply electricity to us.

For the electricity supply contract with industrial customers in the SEIP Area, most agreements were extended for period of 2-10 years. No liquidated damages are applied for power supply contracts with industrial customers in SEIP Area at the moment. In addition, half of the power supply contracts with industrial customer in SEIP do not have minimum take obligation.

Steam and chilled water

Steam and chilled water sale to our ten largest industrial customers (listed below) accounted for 14.0 percent of total revenues in 2018. Our largest industrial steam and chilled water customers in 2018 included:

- Bangkok Synthetics Company Limited;
- Covestro (Thailand) Company Limited;
- DOW Chemical Thailand Limited;
- JSR BST Elastomer Company Limited;
- PTT Global Chemical Public Company Limited;
- Siam Styrene Monomer Company Limited;
- Thai MMA Company Limited;
- Thai Polyacetal Company Limited;
- Thai Polycarbonate Company Limited; and
- Vinythai Public Company Limited

Steam supply agreements are generally negotiated on a customer-specific basis. In most cases, steam supply agreements are valid for a period of 15 years from the customer's commercial operation date. A number of our original agreements that have already expired or are to be expired over the next few years were mostly extended for additional 10-15 years term. We have also secured several contracts with new industrial customers.

Similar to power supply agreements, steam supply agreements ensure customers that they will be provided with certain quantities of steam. We are liable under the terms of certain steam supply agreements to pay liquidated damages for any failure to meet contractually agreed upon steam supply obligations.

Industrial customers generally pay for steam that is delivered; for the capacity of the steam supply generated that is made available to them; for unreturned condensate; and for steam transmission. Often, these separate and unique but related components are expressed as a single “bundled” price. In some instances, the pricing structure of the steam supply agreement calculates each of these components separately. The steam price will typically be adjusted to reflect changes in certain indices, including the gas price and the Thai consumer price index.

Sales of chilled water to industrial customers are priced on an “avoided costs” basis. Chilled water supply agreements are structured so that industrial customers are charged based on equivalent refrigeration ton usage. The price of chilled water is mainly linked to electricity price and adjusted with reference to the PEA tariff.

Neither minimum take obligations nor liquidated damages are applied for chilled water supply agreements at the moment.

Processed water

Our major customers of clarified and demineralized water in 2018 included:

- AGC Chemicals (Thailand) Company Limited;
- Mitsubishi Electric Thai Auto Parts Company Limited;
- Polyplex (Thailand) Public Company Limited;
- PTT Global Chemical Public Company Limited;
- Siam Styrene Monomer Company Limited;
- Thai Plastic and Chemicals Public Company Limited;
- Thai Polyacetal Company Limited; and
- Thai Polycarbonate Company Limited

As with electricity and steam sales, water supply agreements are negotiated on a customer specific basis and carry a validity period of 15 years from the commercial operation date of the customer. In some cases, the water supply agreements are included as part of an overall utility agreement covering sales of both steam and water. Water supply agreements are structured similarly to electricity and steam supply agreements.

Sales of processed water to industrial customers are priced on a “cost plus margin” or “avoided costs” basis. Water supply agreements are typically structured so that industrial customers are charged for water delivered, for the capacity of water supply made available to them, and for transportation. These components are sometimes expressed as a single “bundled” price, and in other circumstances priced separately. The contracted price of water is mainly adjusted to reflect changes in the Thai consumer price index and raw water costs.

2.2.3 Contracted capacity

Our contracted capacity provides an indication of our generating facilities' utilization levels. The following table includes the installed and contracted capacity of our generating facilities as of 31 December 2018:

As of 31 December, 2018	Installed Capacity (MW)		Contracted Capacity (MW)		No. of Contracts
Cogeneration facilities					
Electricity	1,680		EGAT:	784	11
			Indust. Cust:	737	85
Steam ¹	1,206			1,179	34
Chilled Water	3,400			2,050	2
Processed Water	5,270			1,659	16
IPP facilities					
Electricity	Glow IPP:	713	EGAT-GIPP:	713	1
	GHECO-One:	660	EGAT-GHECO-One:	660	1
	HHPC:	152	EGAT-HHPC:	126	1
			EdL-HHPC:	1.5	1
Glow Energy Solar					
Electricity	1.55		PEA:	1.55	1
			Indust. Cust	0.72	1

Note:

- 1) Contracted capacity for steam is significantly lower than total installed capacity, as 250 tons per hour of the overall steam capacity is generated using Glow Energy Phase 1's relatively inefficient package boilers, which are used principally for short-term and back-up supply purposes as opposed to long-term sales.

2.2.4 Competition

We do not currently face any competition with regard to electricity sales to EGAT, as these are contracted under long-term EGAT power purchase agreements. We do, however, expect increased levels of competition for future electricity generation projects when they arise. Our ability to compete effectively with other major global and Thai energy companies with regard to future projects will be a function of our ability to meet the projects' technical requirements and our previous performance under EGAT power purchase agreements.

For new industrial customers, our principal competitors are the PEA both in SEIP and MIE Area. However, in MIE Area, in addition to PEA, we are competing with Global Power Synergy Company Limited (“GPSC”) and PTT Global Chemical utility division, both of which are affiliates of PTT. We do not compete with PEA for sales of steam and water, as it only provides supply of electricity. To a certain extent, we also compete with our industrial clients themselves, many of whom already have steam and water production facilities installed or have the ability to install the facilities in the future.

There are three other groups operating electricity and steam co-generation plants in the MIE Area in addition to the two already mentioned above. These groups include: (i) Bangkok Cogeneration (“BCG”); (ii) Indorama Group; and (iii) Star Petroleum Refining Company.

We are relatively insulated from direct competition for our existing customers for the following reasons: (i) we have long-term sales contracts with nearly all existing customers; (ii) we own the electrical transmission cables connecting directly to each of our customers’ facilities and re-connection costs are high; (iii) our transmission and distribution system provides a reliable supply of power to each of our customers; and (iv) our proximity to customers purchasing steam coupled with the heat loss that occurs when steam is transported over long distances. We believe that certain of our competitors are also insulated from competition to a certain degree for some of these same reasons. We do, however, compete for new customers, the acquisition of which is important for the growth of our business.

Global Power Synergy Company Limited (“GPSC”) is located in the vicinity of the MIE and generates electricity and steam. GPSC is aimed at supporting the future growth of the petrochemical business of the PTT group of companies, and also serving the utilities needs of nearby factories in the Map Ta Phut Industrial Estate. Currently, PTT has planned a number of projects in Map Ta Phut Industrial Estate. Some of them are under construction. GPSC will certainly have the advantage of selling utilities for those projects.

We believe that the presence of GPSC will significantly increase the level of competition we face for sales of electricity and steam to industrial customers in the MIE Area. See “Risk Factors—We face significant competition”.

2.2.5 The electricity supply industry in Thailand

Certain of the information contained in this section has been extracted from sources which we generally believe to be reliable, including information made public by Thai government and private sector participants. Neither we nor the initial purchasers nor any of our or their respective affiliates or advisors have independently verified this information. Information contained in this section may not be consistent with other information compiled within or outside Thailand.

2.2.5.1 Overview

EGAT and private power producers are the principal generators of electricity for commercial sale in Thailand. EGAT sells all of the power that it generates independently, as well as that which it purchases from private power producers and from neighboring countries, to two state enterprises: the Metropolitan Electricity Authority (“MEA”) and the Provincial Electricity Authority (“PEA”). The MEA and PEA distribute power to retail, commercial and industrial consumers throughout Thailand and own the electricity distribution networks in their respective regions of operation.

Although EGAT is the sole wholesale purchaser of electricity in Thailand, private power producers also produce and sell electricity directly to industrial users. As the national system operator, EGAT owns, operates, maintains and develops Thailand's national wholesale electricity transmission network – the national electricity grid.

Private power producers in Thailand fall into three general categories: (i) producers that participate in, and sell electricity to EGAT under Thailand's Independent Power Producer program ("IPPs"); (ii) producers that participate in, and sell electricity to EGAT under Thailand's Small Power Producer program ("SPPs"); and (iii), producers that generate and sell electricity to industrial customers. While IPPs sell electricity exclusively to EGAT, private power producers participating in Thailand's SPP program typically sell a portion of their generated electricity to industrial customers. There are also companies in Thailand that produce electricity for their own internal consumption; however, for the purposes of discussion, these companies will not be considered as "private power producers". According to information published by the Electricity Generating Authority of Thailand ("EGAT"), as of December 2018, Thailand's total electricity generation capacity was 43,372.5 MW compared to 42,433 MW in December 2017 (these figures only include electricity generated by private power producers sold to EGAT under the IPP or SPP programs). Of that amount, approximately 15,789.6 MW, or 36.4 percent, represents EGAT's capacity; approximately 14,949 MW, or 35 percent, represented IPP generating capacity; approximately 8,757 MW, or 20.2 percent, represented SPP generating capacity; and 3,878 MW, or 9 percent, was available to be imported from Laos and Malaysia.

In 2018, the total amount of electricity generated in Thailand was approximately 190,444 GWh. Of that amount, approximately 61,070 GWh, or 32 percent was generated by EGAT; approximately 54,494 GWh, or 29 percent, was generated by IPPs; and approximately 48,534 GWh, or 25 percent, was generated by SPPs. Additionally, a combined total of approximately 26,347 GWh of electricity was imported from Laos and Malaysia for sale within Thailand in 2018.

According to information made available by the EGAT, as of December 2018, the total electricity generating capacity of SPPs in Thailand supplying to the grid was 12,871 MW (9,530 MW "firm" and 6,450 MW "non-firm"). Of this, SPPs sold a total of production capacity 8,757 MW of electricity to EGAT (6,450 MW "firm" and 2,307 MW "non-firm"). Based on Glow Energy's capacity as of 31 December 2018, Glow Energy's SPP facilities represented approximately 6.09 percent of total SPP capacity and approximately 12.15 percent of sales under firm contracts by SPPs to EGAT.

2.2.5.2 Market dynamics

Between 2008 and 2018, peak power demand in Thailand increased at a compound annual growth rate of 1.64 percent, from approximately 22,568 MW in 2008 to approximately 28,338 MW in 2018, or at 0.7 times the compound annual growth rate of real Gross Domestic Product ("GDP") at 2.34 percent from 2008 to 2018.

The following table displays statistics regarding Thailand's Gross Domestic Product-Chain Volume Measures ("GDP-CVM"), as related to the country's total generation capacity, annual electricity production, and peak demand for electricity for the fiscal years indicated.

Year ⁽¹⁾	Installed Capacity	Change ⁽²⁾	Peak Electricit Demand	Change ⁽²⁾	Electricity Production	Change ⁽²⁾	Real CVM ⁽³⁾	Change ⁽²⁾
	(MW)	(%)	(MW)	(%)	(Gwh)	(%)	(THB billions)	(%)
2008	29,891	4.8	22,568	-0.1	148,221	0.8	7,710.3	1.7
2009	29,212	-2.3	22,045	-2.3	148,364	0.1	7,657.1	-0.7
2010	30,920	5.8	24,010	8.9	160,138	7.9	8,232.4	7.5
2011	31,447	1.7	23,900	-0.5	158,900	-0.8	8,301.6	0.8
2012	32,600	3.7	26,121	9.3	175,085	10.2	8,902.8	7.2
2013	33,681	3.3	26,598	1.8	173,142	0.01	9,142.1	2.7
2014	34,668	2.9	26,492	1.3	177,199	2.3	9,232.1	1.0
2015	38,815	12.0	27,346	3.2	183,075	3.2	9,521.4	3.1
2016	41,556	7.1	29,619	8.3	186,152	1.7	9,841.0	3.4
2017	42,433	2.1	28,578	-3.5	188,067	-0.1	10,237.0	4.0
2018	43,372	2.2	28,338	-0.8	190,444	1.3	10,659.7	4.1

Sources: PDP EGAT, Energy Policy and Planning Office ("EPPO") and National Economic and Social Development Board ("NESDB")

Notes:

- 1) Figures after 2006 are based on calendar year basis.
- 2) Year on year
- 3) Change basis from Real GDP to GDP(CVM) in year 2015

Demand for electrical power in Thailand experiences fairly predictable seasonal cycles. Annual peak demand generally occurs during the summer months (March through May) when yearly temperatures are highest. The lowest loads are generally experienced during the winter months (December and January), when temperatures are cool. In 2018, the peak demand on EGAT system, which occurred in April 2018, was 28,338 MW.

Monthly Peak Generation in Thailand	2014	2015	2016	2017	2018
	(MW)	(MW)	(MW)	(MW)	(MW)
January	22,557	23,713	25,312	25,390	25,677
February	23,659	24,630	25,104	26,240	26,352
March	26,106	26,072	27,242	27,326	27,314
April	26,942	27,139	29,404	27,708	28,338
May	26,473	27,198	29,619	28,578	27,331
June	26,253	27,346	26,471	26,747	26,928
July	25,017	26,050	25,475	26,130	26,201
August	24,624	26,028	26,329	26,975	26,492
September	24,785	25,677	25,791	27,500	27,430
October	24,181	25,045	26,015	26,075	26,836
November	24,962	25,957	26,145	26,749	27,221
December	24,493	25,772	25,272	26,554	26,672
Annual Peak	26,942	27,346	29,619	28,578	28,338
Annual Average	25,004	25,881	26,515	26,831	26,899
Annual Low	22,557	23,713	25,104	25,390	25,677

Sources: EPPO and EGAT as of December 2018

The table below displays the power consumption breakdown for different categories of end users for the periods indicated.

Year	Residential (GWh)	% of Total	Commercial (GWh)	% of Total	Industrial (GWh)	% of Total
Electricity Consumption by Category						
2008	28,691.22	21.2	34,781.60	25.7	64,147.63	47.3
2009	30,256.50	22.4	35,683.54	26.4	60,873.53	45.0
2010	33,216.49	22.2	38,590.38	25.8	67,952.49	45.5
2011	32,799.46	23.5	39,077.39	27.9	67,784.91	48.5
2012	36,447.12	22.5	44,097.94	27.3	72,295.57	44.7
2013	37,657.38	22.9	48,797.09	29.7	72,535.61	44.1
2014	38,993.17	23.1	50,169.05	29.8	73,782.30	43.8
2015	41,285.78	23.6	52,986.77	30.3	74,772.63	42.8
2016	43,931.92	24.0	55,681.92	30.5	77,203.09	42.2
2017	44,373.96	24.0	45,100.02	24.4	87,771.98	47.4
2018	45,204.88	24.1	46,763.60	24.9	87,828.98	46.8

Source: EPPO

Note: The information in the above table excludes power consumed by “direct customers”, end users in the agricultural sector and others.

2.2.5.3 Structure of the electricity supply industry of Thailand

Thailand’s electrical supply industry is divided into three general segments, each with its own respective participants:

Industry Segment	Key Participants
Generation	EGAT, IPPs, SPPs, Generators
Transmission	EGAT
Distribution	MEA, PEA

In December 2003, the Cabinet approved a long-term plan to reform Thailand's electricity supply industry by adopting the "Enhanced Single Buyer" ("ESB") model, under which EGAT became Thailand's sole wholesale purchaser of electricity. Under this model, EGAT retained its generation and transmission responsibilities as Thailand's sole wholesale vendor and transporter of electricity (excluding certain industrial consumers in designated industrial estates possessing power purchase agreements with private power producers). The MEA and PEA also retained their respective roles as the sole distributors of electricity in the Bangkok metropolitan area and provincial areas, (excluding a limited number of large volume customers that are connected directly into EGAT's electricity grid).

The Ministry of Energy ("MoE") also remained the key decision-maker with regard to all energy sector matters. To improve transparency within the MoE, responsibility for all policy-making functions were transferred to the Energy Policy and Planning Office ("EPPO"). Additionally, EGAT's system operation function, which before 2003 was managed and monitored independently by EGAT, was brought under the monitoring authority of the MoE. Regulatory functions have been placed under the authority of the Energy Regulatory Commission ("ERC") – a new regulatory body established on 1 February, 2008. As a caveat, the ESB model also requires that a process of competitive bidding be used for the allocation of all new electricity generating capacity.

Electricity Generating Authority of Thailand ("EGAT")

The adoption of the ESB model has not resulted in any significant changes to EGAT's business operations. Under the ESB model, EGAT continues to generate electricity from its generating facilities, which, in 2018, accounted for approximately 32 percent of the total electricity generated in Thailand. EGAT remains the sole purchaser of electricity from IPPs, subsidiaries of its associated IPP companies – namely Ratchaburi Holdings ("RATCH") and Electricity Generation Company ("EGCO") – and neighboring countries. Additionally, EGAT continues to own and operate the national grid network and retains the sole right to sell electricity to the MEA and PEA on a wholesale basis.

Independent Power Producers ("IPP")

In 1994, the Thai government introduced an independent power producer ("IPP") program to commission the construction, ownership and operation of power plants by private sector participants, with EGAT agreeing to purchase the output of these plants once their construction had been completed. The program was designed to promote increased private sector participation in the power generation industry. Various government bodies including the National Energy Policy Office (or "NEPO", which is the predecessor to EPPO), and the National Economic and Social Development Board ("NESDB") were at that time given responsibility to review proposals from approximately 50 interested private sector producers.

In 2007, the Thai government opened a new round of IPP competitive bidding with an initial plan to purchase up to 3,200 MW of electrical generating capacity from private sector producers. After having received all the bids, a total of 4,400 MW was awarded to four bidders. This included 1,200 MW of capacity from coal-fired plants and 3,200 MW of capacity from natural gas fired plants, all with originally scheduled commercial operations ("SCOD") between 2011 and 2015. Until now, capacity from coal-fired plant of 540 MW could not be signed yet.

In 2012, government opened third round of competitive bidding with a plan to purchase 5,400 MW natural gas fired power generating capacity from private sector producers, with scheduled commercial operating dates between 2021 and 2026. The bidding resulted into the award of new IPP

contracts for 5,000 MW to one single bidder. Power purchase agreements for this capacity were signed in 2014 with SCOD scheduled in the period March 2021 to March 2023.

As of 2018, EGAT had signed power purchase agreements with 18 IPPs with a total projected contracted capacity of 19,949 MW which individual contracted capacities ranging from 350 MW to 2,500 MW. The table below lists the names, sizes, sponsors, and status of each of the IPP projects in Thailand.

Project	Installed Capacity (MW)	Primary Fuel Type	Investors/ Shareholders ¹	Commercial Operation Date
1. Ratchaburi Electricity Generating Co., Ltd.	720	Natural gas	Ratchaburi Electricity Generating Holding Plc.	2000
2. Ratchaburi Electricity Generating Co., Ltd.	720	Natural gas	Ratchaburi Electricity Generating Holding Plc.	2000
3. Ratchaburi Electricity Generating Co., Ltd.	685	Natural gas	Ratchaburi Electricity Generating Holding Plc.	2002
4. Ratchaburi Electricity Generating Co., Ltd.	675	Natural gas	Ratchaburi Electricity Generating Holding Plc.	2002
5. Ratchaburi Electricity Generating Co., Ltd.	681	Natural gas	Ratchaburi Electricity Generating Holding Plc.	2002
6. Khanom Electricity Generating Co., Ltd.	930	Natural gas	The Electricity Generating Plc.	June 2016
IPP Program Participants (1st Round)				
7. Ratchaburi Electricity Generating Co., Ltd. (formerly known as TECO)	700	Natural gas	Ratchaburi Electricity Generating Holding Plc.	July 2000
8. Global Power Synergy Co., Ltd. (formerly known as IPT)	700	Natural gas	Thai Oil Power ² PTT Global Chemical Plc. PTT Plc.	August 2000
9. Glow IPP Company Limited	713	Natural gas	Glow Co. Ltd. WHA	January 2003

Project	Installed Capacity (MW)	Primary Fuel Type	Investors/ Shareholders ¹	Commercial Operation Date
10. Eastern Power and Electric Company Limited	350	Natural gas	GMS Power Plc Marubeni Corp. TOTAL Gas and Power Thailand China Development Industrial SG Bangbor Power Holding	March 2003
11. BLCP Power Company Limited	1,347	Coal	Banpu Coal Power Electricity Generating Plc.	October 2006 for first unit, February 2007 for second unit
12. Ratchaburi Power (Union Power Development Co., Ltd.)	1,400	Natural gas	Pai International Power (Mauritius) Ltd. Ratchaburi Alliances Co.,Ltd. Global Power Synergy Plc. Chubu Electric Power Company International B.V. Toyota Tsusho Corp. Saha-Union Plc.	March 2008 for first unit, June 2008 for second unit
13. Gulf Power Generation Company Limited ³	1,468	Natural gas	Gulf Electric Public Company Limited	May 2007 for first unit, March 2008 for second unit
IPP Program Participants (2nd Round)				
14. GHECO-One	660	Coal	Glow Energy Plc. WHA	July 2012
15. Gulf JP UT Co., Ltd. (formerly known as Siam Energy)	1,600	Natural gas	Gulf JP	June 2015 for first unit, December 2015 for second unit
16. Gulf JP NS Co., Ltd. (formerly known as Power Generation Supply)	1,600	Natural gas	Gulf JP	June 2014 for first unit, December 2014 for second unit

Project	Installed Capacity (MW)	Primary Fuel Type	Investors/ Shareholders ¹	Commercial Operation Date
IPP Program Participants (3rd Round)				
17. Gulf PD Co., Ltd.	2,500	Natural gas	Independent Power Development	March 2023 for first unit
18. Gulf SRC Co.,Ltd.	2,500	Natural gas	Independent Power Development	March 2021 for first unit

Source: ERC

Notes:

- 1) Principal investors/ shareholders as of December 2018.
- 2) Thai Oil Power shareholders include Thai Oil Plc 74 percent and PTT Plc 26 percent
- 3) Gulf Electric Public Company Limited's shareholders include Electricity Generating Plc. 50% and J-Power 49%

Small Power Producers ("SPP")

In 1992, under a policy to promote greater participation by the private sector in the power generation industry, the Government introduced the SPP program under which EGAT was authorized to purchase power from privately held producers that either operate generating facilities powered by renewable sources, such as wind, solar, geothermal or agricultural residue, or that operate cogeneration plants.

Under the program, EGAT was originally authorized to purchase a maximum of 60 megawatts per SPP. These limits were later revised to an aggregate of 3,200 megawatts and a maximum of 90 megawatts per SPP. SPPs are not exclusive suppliers of EGAT and are also allowed to sell electricity to industrial customers.

In 2007, Thai government opened up a 2nd round of bidding to increase the total volume of electricity purchases from SPPs from the level of approximately 2,000 MW to 4,000 MW. Originally, the electricity supply from these new SPPs was expected to come online gradually between 2009 and 2016. The government decided to move forward the SPP SCODs following the delay of three IPP units' SCODs to be between 2015 and 2017. In addition, in 2010, 3rd round of bidding for new SPP licenses have been opened for combined output of another 3,500 MW.

According to information made publicly available by the EPPO and EGAT, there were a total of 142 SPP projects supplying power to EGAT's transmission grid as of December 2018. Of that total 91 SPP projects held 'firm contracts', which implies: (i) a firm obligation to sell and purchase electricity; (ii) a specified contracted capacity; and (iii), a total electricity production supplied of no less than 7,008 hours per year. For electricity generated using renewable energy, the annual hours must be no less than 4,672 hours per year.

According to information made publicly available by the EPPO and EGAT, as of December 2018, EGAT had agreed under firm contracts with 91 SPPs to purchase annually 6,450 MW and had also entered into non-firm agreements with 51 SPPs to purchase 2,307 MW.

As of 31 December 2018, Glow Energy's SPP facilities represented approximately 8.95 percent of total SPP capacity supplying power to EGAT's transmission grid and approximately 12.15 percent of sales under firm contracts by SPPs to EGAT.

Distributors

Electricity in Thailand is distributed by two state enterprises, the MEA and the PEA, which together accounted for approximately 99 percent of EGAT's sales in the year ending 31 December 2018. EGAT also transmits and sells electricity directly to various large volume customers, principally industrial users, as well as to electricity distributors in neighboring countries. Private generators often have their own distribution networks to supply industrial customers directly.

Metropolitan Electricity Authority ("MEA")

Established in 1958, the MEA is the state enterprise responsible for distributing electricity to retail and industrial consumers in the Bangkok metropolitan area and its two neighboring provinces (Nonthaburi and Samutprakarn). It provides services to approximately 28 percent of Thailand's population. The MEA purchases all of its electricity directly from EGAT.

Provincial Electricity Authority ("PEA")

Established in 1960, the PEA is the state enterprise responsible for distributing electricity to retail and industrial consumers in the 74 provinces not serviced by the MEA. It provides services to approximately 71 percent of Thailand's population. The PEA purchases all of its electricity from EGAT.

2.2.5.4 Regulatory framework

Since 1992, the NEPC and its secretariat, the NEPO (now the EPPO), have been the principal Government bodies responsible for formulating and implementing energy policy and regulating the power industry in Thailand. The principal duties of the NEPC consist of recommending national energy policies as well as national energy management and development plans to the Cabinet, and establishing the tariff structure for energy sales in Thailand. The NEPC is overseen by the Prime Minister, several ministers, and other senior government officials. The NEPO was originally the secretariat to the NEPC, but was renamed the Energy Policy and Planning Office ("EPPO") in 2002 and transferred to be under the authority of the Ministry of Energy.

The Ministry of Energy was created in 2002 pursuant to the Act for Reorganizing Government Ministries, at which point the NEPO was replaced by EPPO, which thereafter became a MoE department. The MoE, in consultation with the NEPC, is responsible for setting energy policy and regulating the energy sector through the EPPO. The MoE consists of two Offices (the Office of the Minister and the Office of the Permanent Secretary) and four departments (the EPPO, the Department of Mineral Fuels, the Department of Energy Business, and the Department of Alternative Energy Development and Efficiency). The MoE is authorized to formulate, make recommendations on, and oversee the implementation of, policies related to the country's present and future energy requirements. These policies include the management of the country's indigenous resources through the granting of

concessions to explore and produce natural gas in the Gulf of Thailand. In addition, the MoE is also responsible for the Government's restructuring of the energy industry (electricity and oil & gas).

Pursuant to the 9 December, 2003 Cabinet resolution, the government approved the establishment of a new regulatory body to be responsible for: (i) monitoring industry participants' operational and financial performance; (ii) regulating electricity tariffs; and (iii), monitoring and planning the country's energy requirements within the context of the nation's energy security and predicted economic growth. The National Energy Policy Council ("NEPC") was appointed the interim regulator pending the establishment of the such a new regulatory body.

On 24 August, 2004, the Cabinet passed a resolution approving the NEPC's recommendation to appoint the Energy Regulatory Commission ("ERC") as the interim regulatory body responsible for overseeing electricity industry operations as well as the NEPC. The Office of the Prime Minister issued a notification on 7 March, 2005 expanding the ERC authority and responsibilities to include: (i) regulating the tariffs of electricity industry operators; (ii) encouraging competition and preventing abusive monopolistic practices; (iii) inspecting the operations of the power network system operator; (iv) establishing the bidding and monitoring processes for the construction of new power plants; (v) regulating the operations of electricity providers; and (vi), performing any other necessary tasks related to the electricity industry's regulation.

On 22 November, 2005, the cabinet passed a resolution approving the NEPC's recommendation to appoint an interim regulatory body to oversee the electricity industry operations pending the establishment of the ERC. The interim regulators later resigned on 18 October, 2006, and their responsibilities were transferred to the EPPO pending the official establishment of an energy regulatory body.

The Energy Industry Act was promulgated on 10 December, 2007, paving the way for the establishment of a new independent regulatory body. The Energy Regulatory Commission ("ERC") was subsequently established on 1 February, 2008. This agency's key responsibility includes:

- Regulating the electricity and the gas supply industries;
- Regulating tariffs, standards and service quality;
- Ensuring competition and preventing abusive monopolistic practices;
- Protecting consumers and managing consumer complaints;
- Making recommendations to the NEPC regarding energy procurement policies, policies on the diversification of fuel sources, and best types of power generation to simultaneously ensure efficiency and energy security; and
- Consider the power development plan, investment in the electricity industry, natural gas procurement, and energy network system expansion.

2.2.5.5 Electricity tariff

The tariff structure for electricity sales in Thailand is determined by the ERC and subject to Cabinet approval. Tariff rates have historically been revised at three to five-year intervals. The current tariff structure consists of both a fixed and a variable component. The fixed, or base, component generally remains in effect for the duration of tariff structure, while the variable component is subject to adjustment every four months. There are also different tariff rates: a wholesale rate that EGAT charges to the MEA and the PEA, and a series of retail tariffs charged by the MEA and the PEA to end users.

Existing tariffs are based on a number of factors including but not limited to: forecast demand for electricity; fuel prices; EGAT; the MEA and PEA's expected operating expenses and capital expenditures; and a variety of other factors. The current tariff structure was designed, and tariff prices set at levels intended to permit EGAT, the MEA and the PEA to achieve certain financial ratios. Since 1990, the tariff structure in Thailand has consisted of base wholesale and retail tariffs that are fixed, and a variable component that is added to the wholesale and retail tariffs.

The tariff structure consists of:

- A wholesale, or "bulk supply" tariff that EGAT charges to the two state-owned electricity distributors - namely the MEA and PEA;
- A series of retail tariffs charged by the MEA and PEA to end users nationwide, and by EGAT to direct purchasers; and
- An FT adjustment, or surcharge, added to base tariffs.

The fixed or base components generally remain in effect for the duration of the tariff structure. The variable component or F_T is subject to adjustment every four months pursuant to an adjustment mechanism intended to adjust aggregate tariff levels to reflect: changes in the price of fuel; payments made by EGAT to IPPs; the impact of exchange rate fluctuations on EGAT, the MEA and PEA; inflation; and other relevant factors. The F_T adjustment is added into the base tariffs for a future four-month period and designed to provide consumers with reasonable tariff stability.

With effects from November 2015 onwards, ERC decided to incorporate the F_t of 0.4961 THB per kWh (F_t of May 2015) into the base tariff. Further changes were made to reflect (i) an adjustment of the Return On Invested Capital ("ROIC"); (ii) a "Claw-back" of unused investment budget amounts; (iii) a revision of the subsidy to household users; and (iv) a change in the distribution between peak and off peak tariffs. Since November 2018, ERC has decided to remove the subsidy to household users by halting 0.0258 THB/kWh. This will effect to current base tariff on energy charge.

The following table displays FT adjustments for the periods indicated:

		Unit: THB per KWh
	Total F _T	Increase / decrease in F _T amount
Ft adjustment since July 2011 Period		
July 2011 – August 2011	-0.0600	
September 2011 – December 2011	-0.0600	0.0000
January 2012 – May 2012	0.0000	+0.0600
June 2012 – August 2012	0.3000	+0.3000
September 2012 – December 2012	0.4800	+0.1800
January 2013 – April 2013	0.5204	+0.0404
May 2013 – August 2013	0.4692	-0.0512
September 2013 – December 2013	0.5400	+0.0708
January 2014 – April 2014	0.5900	+0.0500
May 2014 – August 2014	0.6900	+0.1000
September 2014 – December 2014	0.6900	0.0000
January 2015 – April 2015	0.5896	-0.1004
May 2015 – August 2015	0.4961	0.0935
September – October 2015	0.4638	-0.0323
New tariff structure was applied since November 2015		
November – December 2015	-0.0323	-0.0323
January 2016 – April 2016	-0.0480	
May 2016 – August 2016	-0.3329	-0.2849
September 2016 – December 2016	-0.3329	-0.0000
January 2017 – April 2017	-0.3729	-0.0400
May 2017 – August 2017	-0.2477	+0.1252

	Total F _T	Increase / decrease in F _T amount
September 2017 – December 2017	-0.1590	+0.0887
January 2018 – April 2018	-0.1590	0.0000
May 2018 – August 2018	-0.1590	0.0000
September 2018 – December 2018	-0.1590	0.0000
January 2019 – April 2019	-0.1160	+0.0430

The average electricity price as of 31 December 2018 for 115 kV and 22 kV is shown below:

Type of structure		THB per kWh
Schedule 4: Large General Service	TOU ¹ 115 kV	3.1123
	TOU 22 kV	3.2349
	TOD ² 115 kV	3.2797
	TOD 22 kV	3.4004
Schedule 3: Medium General Service	Normal 22 kV	3.2787

Notes:

- 1) TOU: Time of Use
- 2) TOD: Time of Day

2.2.5.6 Energy dispatch

As the operator of Thailand's electrical system, EGAT is responsible for determining the volume of electricity respectively supplied by each individual generating facility to the national transmission network. EGAT selects generating units based primarily on each facility's marginal variable cost of generations, however, a number of other factors including environmental laws and standards as well as the stability and reliability of the electricity system are also taken into account.

2.2.5.7 Power Development Plan

Throughout 2018, the Minister of Energy had been working on revising the new Power Purchase Development Plan (PDP2018). This PDP2018 covers the period from 2018-2037. This PDP incorporates the guidelines from the 20-Year National Strategic Plan on Energy and also takes into consideration the Energy Efficiency and the Renewable Energy Development Plan. Public Hearings were organized in 5 regions, including Northern, North-eastern, Southern, Eastern, and Central regions.

The Ministry of Energy is expected to finalize and submit for cabinet approval of the PDP2018 in the first quarter of 2019.

2.2.6 Tariffs

Electricity sales tariffs vary for IPPs and SPPs, and in the case of SPPs, whether sales are being made to EGAT or industrial customers. While our IPPs' and SPPs' power purchase agreements contain specific pricing mechanisms related to electricity sales tariffs, our electricity sales to industrial customers are mostly based on the PEA retail tariff.

2.2.6.1 Electricity pricing for EGAT under Glow IPP's power purchase agreement

The price at which we sell electricity to EGAT under our IPPs power purchase agreement is comprised of the three components: availability payments; energy payments and an added facility charge.

Availability payment

The availability payment under IPP's power purchase agreement for any given period of time is calculated by multiplying IPP's base availability credit (expressed in THB per MWh) and Glow IPP's dependable contracted capacity (which is the maximum continuous net generating capacity measured in MW, up to the contracted capacity). The availability payment is subject to downward adjustments for reduced availability, short notice of reduced capability and dispatch failure. Additional availability payments are earned for temporary increases in capacity made available pursuant to a request by EGAT.

Energy payment

The energy payment consists of a fuel charge and a variable operation and maintenance charge. Under the Glow IPP's power purchase agreement, fuel charges vary depending on whether the facility is operated using a primary fuel (natural gas) or secondary fuel (diesel). The "primary fuel rate" and "secondary fuel rate" are determined in part by reference to our fuel procurement arrangements.

The primary fuel rate based on Higher Heating Value ("HHV") (agreed additional energy required to produce one additional MW of net electrical energy) applicable for each month, *m*, is determined in accordance with the PTT gas supply agreement and is equal to the generator unit's actual price of fuel (in THB per million Btu) under such gas supply agreement (less any applicable fixed tariff charge).

The secondary fuel rate for Glow IPP based on HHV applicable for each month *m* is determined on the basis of invoices relating to secondary fuel purchased by the electricity generator during such month *m* to replace the secondary fuel that was used during or prior to such month *m* for which the generator has not yet been compensated for the cost of fuel, and is equal to the generator's actual price of fuel (in THB per million Btu) under the diesel fuel supply agreements (and include up to a 37-day carrying charge levied by the diesel fuel supplier).

Added Facility Charge

The Glow IPP power purchase agreement also includes an added facility charge through which we are reimbursed for loans made to EGAT to cover certain access-related payments. This charge is composed of costs associated with the construction of new transmission facilities to connect Glow IPP facilities to the EGAT transmission grid (including costs of procuring relevant access rights and right of way costs). It is reimbursed on a monthly basis over the term of the power purchase agreement.

2.2.6.2 Electricity pricing for EGAT under GHECO-One's power purchase agreement

The price at which we sell electricity to EGAT under our IPPs power purchase agreement is comprised of two components: availability payments and energy payments.

Availability payment

The availability payment under GHECO-One's power purchase agreement for any given period of time is calculated based on the payment for the availability and Contracted Operating Characteristics of the Generating Unit, and is derived by multiplying base availability credit (expressed in THB per MWh) and dependable contracted capacity. The availability payment is subject to downward adjustments for reduced availability, short notice of reduced capability and dispatch failure. Additional availability payments are earned for temporary increases in capacity made available pursuant to a request by EGAT.

Energy payment

The energy payment consists of a fuel charge and a variable operation and maintenance charge.

2.2.6.3 Electricity pricing for EGAT under our SPP power purchase agreements

The price at which we sell electricity to EGAT under our SPP power purchase agreements is comprised of two components: capacity payments and energy payments. For Glow Energy Phase 4 and Glow SPP 11 Phase 2, there is an additional component to the electricity payment, fuel saving payment.

Capacity payment

The capacity payment is a fixed charge payable regardless of usage and is set at: THB 302 per kW per month (excluding value-added tax) for electricity produced by our gas-fired units except Glow Energy Phase 4 and Glow SPP 11 Phase 2; and THB 422 per kW per month (excluding value-added tax) for electricity produced by our coal-fired units. In each case, the capacity payment is adjusted monthly to reflect changes in the THB per USD exchange rate, with 80 percent indexation for electricity produced by our gas-fired units and a 70 percent indexation for electricity produced by our coal-fired unit.

For Glow Energy Phase 4 and Glow SPP 11 Phase 2, the capacity payment is set at THB 383.66 per kW per month (excluding value-added tax). The capacity payment is also adjusted monthly to reflect changes in the THB per USD exchange rate, with 50 percent indexation.

As the Power Purchase Agreements for Glow Energy Phase 2 have expired, we have agreed with EGAT to extend our contracts for another three years. However, during such extension period, we do not receive capacity payment.

Energy payment

The energy payment is a fixed charge in THB per kilowatt hour regardless of usage and is currently set at: THB 0.85 per kWh for electricity generated by gas-fired units except Glow Energy Phase 4 and Glow SPP 11 Phase 2; and THB 0.62 per kWh for electricity generated by coal-fired units.

For Glow Energy Phase 4 and Glow SPP 11 Phase 2, the fixed energy payment is THB 1.70 per kWh.

The energy payment is subject to periodic adjustment, calculations for which differ slightly for gas and coal fired units. For gas-fired units, this adjustment is calculated based on the net energy delivered during the applicable period multiplied by increases in the cost of natural gas. For coal-fired units, this adjustment is calculated based on the net energy delivered during the applicable period multiplied by increases in the cost of coal. In both cases, the increases in fuel prices for natural gas and coal are calculated using base prices set in August 1995, while the Glow Energy Phase 4 and Glow SPP 11 Phase 2 are calculated using the gas base prices set in December 2006.

For Glow Energy Phase 2, the energy payment during three years extension period is based on the actual cost of natural gas in any month calculated based upon an agreed average plant heat rate.

Fuel Saving payment for Glow Energy Phase 4 and Glow SPP 11 Phase 2

The fuel saving payment is a fixed charge in THB per kilowatt hour regardless of usage and is currently set at: THB 0.36 per kWh, in case PES has value more than or equal to ten percent (10%).

2.2.6.4 Electricity pricing for EGAT under HHPC power purchase agreement

The price at which we sell electricity to EGAT under HHPC power purchase agreement consists of an energy payment only.

Energy payment

The energy payment accrues for each kWh of Net Electrical Output and is comprised of a USD component and a THB component.

2.2.6.5 Electricity pricing for industrial customers

Sales of electricity to industrial customers are generally priced with reference to the retail tariffs charged by the PEA. The tariff structure in Thailand has since 1990 consisted of base wholesale and retail tariffs, both of which are fixed, and a variable component that is added to the wholesale and retail tariffs.

Base tariff

The ERC announces the base tariff periodically. The current base tariff has been in place since November 2015. The rate varies for different types of end users. We price our power sales agreements in MIE and SEIP Area by referencing the rate charged for “medium and large general services”. The applicable base tariff rates for this category of users are either charged a “time of use”, “time of day” or “normal” tariff. Since November 2018, ERC has decided to remove the subsidy to household users by halting 0.0258 THB/kWh. This will effect to current base tariff on energy charge, all of which are summarized in the tables below.

Time of Use Tariff

	Demand Charge (THB per kW)	Energy Charge (THB per kWh)		Service Charge (THB per month)
	1*	1*	2*	
69 kV and over	74.14	4.1025	2.5849	312.24
22 – 33 kV	132.93	4.1839	2.6037	312.24
Below 22 kV	210.00	4.3297	2.6369	312.24

Notes:

- 1* On Peak: Monday – Friday from 09.00 am to 10.00 pm; and
 2* Off Peak Monday – Friday from 10.00 pm to 09.00 am
 Saturday – Sunday and normal public holiday (excluding substitution holiday).

Time of Day Tariff

	Demand Charge (THB per kW)			Energy Charge (THB per kWh)	Service Charge (THB per month)
	1*	2*	3*		
69 kV and over	224.30	29.91	0	3.1097	312.24
22 – 33 kV	285.05	58.88	0	3.1471	312.24
Below 22 kV	332.71	68.22	0	3.1751	312.24

- 1* On Peak: Every day from 06.30 pm to 09.30 pm;
 2* Partial Peak: Every day from 08.00 am to 06.30 pm (only the amount of maximum demand that is out of the On Peak period will be charged at this rate); and
 3* Off Peak: Every day from 09.30 pm to 08.00 am.

Normal Tariff

	Demand Charge (THB per kW)	Energy Charge (THB per kWh)	Service Charge (THB per month)
69 kV and over	175.70	3.1097	312.24
22 – 33 kV	196.26	3.1471	312.24
Below 22 kV	221.50	3.1751	312.24

Billing demand is defined as the maximum 15-minute integrated demand during an on-peak and partial-peak period over the monthly billing period that is measured to the nearest full kilowatt discarding the fraction of 0.5 kW. A monthly minimum charge of any billing period shall not be less than 70 percent of the maximum billing demand charge for the preceding 12 months.

2.3 Service and Raw Material Supply

2.3.1 Fuel supply

Excluding hydropower plant in Laos and our Solar Power Plant in MIE Area, our principal raw materials are natural gas and coal, both of which are used as fuel to generate electricity and steam. Majority our electricity generating facilities in Thailand use natural gas as their principal fuel source, with the exception of our Glow SPP 2/Glow SPP 3 plant which uses both natural gas and coal, and our CFB 3 of Glow Energy and GHECO-One which use coal. Purchases of natural gas and coal together accounted for 76.8 percent of our total costs of goods sold, or 75.1 percent of our total expenses in 2018. Several of our gas-fired facilities are also designed to run on diesel fuel (alternative fuel), but diesel is much more expensive fuel.

2.3.1.1 Natural gas

Purchases of natural gas accounted for 54.5% percent of our total cost of goods sold in 2018. To date, we have not experienced any material disruptions of natural gas supplied by PTT, with which we have entered into ten separate gas supply agreements.

PTT enters into four principal types of gas supply agreements:

- IPPs gas supply agreements;
- SPPs gas supply agreements;
- cogeneration gas supply agreements; and
- industrial gas supply agreements.

The average price of natural gas for Glow IPP is calculated based on total payment (including Demand Charge and Delivery Charge) divided by total consumption, in terms of THB per mmBTU (excluding VAT), the average prices were 646.0 in 2016, 3,815.2 in 2017, and 3,413.5 in 2018. The high average prices are mainly due to minimal EGAT dispatch order resulting in low natural gas consumption (variable cost) while we were still subjected to the Demand Charge (fixed cost). However, if calculated based on total payment (excluding Demand Charge but including only Delivery Charge) divided by total consumption charge, in terms of THB per mmBTU (excluding VAT), the average prices were 203.1 in 2016, 204.4 in 2017, and 207.43 in 2018.

The average effective price before VAT of natural gas for our other generating facilities, expressed in terms of THB per mmBTU (excluding VAT), were 246.6 in 2016, 240.6 in 2017, and 263.3 in 2018.

The terms and pricing of these agreements differ significantly. Generally, gas prices for IPPs are the lowest, followed by SPPs, cogeneration facilities, and industrial gas supply (which is the highest gas price). Note that our IPP price (when including Demand Charge) as indicate above is higher than the other gas prices due to the high Demand Charge per unit while the consumption was low.

IPP gas supply agreement

PTT has a standard form gas supply agreement for sales of natural gas to all IPPs (the “IPP gas supply agreement”). Glow IPP’s gas supply agreement is a requirements-based contract with a 25-year term that follows this form. Under the terms of this agreement, Glow IPP is not subject to any minimum take obligations. PTT is, however, subject to a “reasonable endeavours” obligation to supply requested quantities of natural gas to Glow IPP.

Because all IPPs operating in Thailand sell all of their generated electricity to EGAT, (and EGAT controls when and to what extent such generation facilities are dispatched and consequently how much gas they consume), EGAT has entered into a master gas supply agreement with PTT. EGAT therefore assumes the take-or-pay obligation with respect to the gas supply agreements of Glow IPP and other IPPs. PTT’s “reasonable endeavours” obligation requires that it supply natural gas sufficient to meet each respective IPPs’ contractual delivery capacity (“CDC”), which may be changed by Glow IPP providing advance notice to PTT.

Pricing under the IPP gas supply agreement is standard for all IPPs and is fully passed through to EGAT as part of the energy charge under the EGAT power purchase agreements on the basis of a contracted heat rate. If PTT is not able to supply adequate quantities of gas, we are reimbursed (principally by EGAT) for our increased fuel costs. The technical specifications of the natural gas that PTT is required to deliver are set out in the IPP gas supply agreement.

SPP gas supply agreement

PTT has a standard form gas supply agreement that it uses for sales of natural gas to SPPs (the “SPP gas supply agreement”). The gas supply agreements between PTT and Glow Energy Phase 2, Glow Energy Phase 4, Glow SPP 1, Glow SPP 2, Glow SPP 11 Phase 1 and Glow SPP 11 Phase 2 follow this form. Our SPP gas supply agreements have original terms of 21 years for Glow Energy Phase 2, Glow SPP1, Glow SPP 2 and Glow SPP 11 Phase 1 and original terms of 25 years for Glow Energy Phase 4 and Glow SPP 11 Phase 2, and require PTT to make available gas in the amount equal to the contractually stipulated daily contracted quantity (“DCQ”). Each year, we have the option to increase or decrease the DCQ by a maximum of 15 percent of the prior year’s DCQ, subject to a maximum DCQ stipulated in each contract. The terms of these agreements require that our respective SPPs purchase no less than 85 percent of the DCQ submitted to PTT each year.

The net annual contracted quantity (“Net ACQ”) is calculated by first establishing the Annual Contract Quantity (“ACQ”), which is the sum of each month’s Monthly Contract Quantity (“MCQ”) for a given year, from which is subtracted: (i) the volume of gas that PTT was unable to supply in accordance with the DCQ; (ii) the volume of gas we were unable to take due to *force majeure*; and (iii) the volume of gas we refused to accept due to quality or pressure shortfalls.

Even if we do not take all of our minimum required Net ACQ (85 percent) thereof, we are required to pay for it. We have a two-year make-up right in respect to any quantities paid for but not taken, which matches EGAT’s make-up rights in respect of its take-or-pay obligations under the EGAT power purchase agreements for our SPPs. Pricing under the SPP gas supply agreements is standard for all SPPs.

The SPP gas supply agreements require PTT to compensate us if it is unable to deliver natural gas at agreed levels provided that PTT was at fault for delivery failure, but only to the extent that this affects

our generation of electricity for sales to EGAT. Although subject to certain ceilings, compensation amounts are calculated to equal the difference between the price of natural gas under the SPP gas supply agreement and the price of diesel fuel. (As noted earlier, our facilities use diesel as a substitute fuel when unable to procure sufficient quantities of natural gas.) The technical specifications of the natural gas that PTT is required to deliver are set out in the SPP gas supply agreements.

Cogeneration gas supply agreement

PTT has a standard form gas supply agreement used for sales of natural gas to non-SPP cogeneration facilities (the “Cogeneration gas supply agreement”). The gas supply agreements between PTT and Glow Energy Phase 5 and Glow SPP 11 Phase 3 follow this form and have terms of 10 years and 15 years, respectively. Under these terms, PTT is required to make gas available in the amount equal to a specified mean daily contract quantity (“MDCQ”). For agreement with Glow Energy Phase 5, the MDCQ is subject to adjustment based upon the actual daily contract quantity (“ADQ”) over the preceding six-month period. The six-month average of the ADQ is then applied as the new MDCQ. There are no minimum take obligations under the Cogeneration gas supply agreements of Glow Energy Phase 5. However, for the agreement with Glow SPP 11 Phase 3, there is no automatic adjustment over the preceding six-month period as mentioned above. The DCQ is depending on the figure that we submit to PTT each year, which we have the option to increase or decrease the DCQ by a maximum of 15 percent of the submitted figure. There are monthly minimum take obligations under the Cogeneration gas supply agreements of Glow SPP 11 Phase 3 at the level of 100 percent. However, they also have 12-month period make-up account from the date of deposit under the agreement for us to utilize the quantities that we paid for but not taken. We also have one time right to adjust the DCQ by maximum of 15 percent of the DCQ for such year if we are subject to minimum take for three consecutive months.

Pricing is based on standard gas prices for cogeneration facilities, which is higher than prices paid by SPPs and those in the industrial power sector. In the case of any future decisions to re-enact industrial power sector gas pricing policies (or any gas pricing structure with prices lower than the current price for cogeneration facilities), PTT has agreed to allow gas sales for Glow Energy Phase 5 unit to fall under this new pricing structure. Additionally, if Glow Energy Phase 5 unit is contracted to sell electricity to EGAT under the SPP program, both parties have agreed to amend related agreements to reflect standard SPP gas supply agreements.

Industrial gas supply agreement

PTT has a standard form gas supply agreement for sales of natural gas to industrial customers (“Industrial gas supply agreements”). The gas supply agreements between PTT and Glow Energy follow this form. In early 2015, PTT introduced a new pricing structure (to replace the existing one) for the new industrial gas supply agreement. However, at the end of 2018, no agreement had been reached yet between PTT and industrial users on such new pricing structure.

Under this industrial gas supply agreement, PTT is required to make available quantities of natural gas equal to a specified mean daily contract quantity (“MDCQ”), which is subject to adjustments based upon the actual daily contract quantity (“ADQ”) over the preceding six-month period. The six-month average of the ADQ is then applied as the new MDCQ. There are no minimum take obligations under the Industrial gas supply agreements. Pricing is based on standard industry gas prices and incorporates a volume discount.

2.3.1.2 Coal

Purchases of coal accounted for 22.3 percent of our total cost of goods sold in 2018. We consume coal at the CFB 1&2 at Glow SPP 3 plant, CFB 3 at Glow Energy, and GHECO-One. In 2016, 2017, and 2018 our coal purchase (measured by mass) was approximately 3,725,366 tons, 3,480,346 tons, and 3,410,079 tons respectively. In 2018, for our CFBs, we purchased all of our coal consumption under a medium-term contracts with international and Thai coal suppliers/traders. We purchased all of GHECO-One's coal consumption under medium-term contracts with two international coal suppliers.

Under each coal supply agreements, coal supplier is responsible for guaranteeing the quality of coal, by means of a Loading Port Certificate issued by an authorized surveyor, in accordance with the specifications set out in the coal supply agreement. If the quality standards are not met, we can either accept the non-conforming coal and make deductions from payments on terms specified in the coal supply agreement, or require such to replace the non-conforming coal.

Coal suppliers are also required to supply specific quantities of coal as set out in the coal supply agreement. If there is any shortfall in the quantity of coal supplied due to default by coal suppliers, they must compensate us for any additional cost incurred in acquiring the shortfall amount from another source. If necessary, we acquire the balance of our coal requirements through spot purchases from commodity traders or coal suppliers in the open market.

The prices of coal under coal supply agreements are expressed in USD per ton, and include both the FOB coal price and freight costs. For GHECO-One, the coal procurement cost is, in simplified terms, passed-through to EGAT at a pre-determined heat rate. However, for our cogeneration business, as the sale price of our products is not fully hedged for changes in coal prices, such changes directly impact our profitability. It is also important to note that freight prices are not pass-through costs under the terms of our SPP electricity sales agreements with EGAT, and are therefore absorbed entirely by us.

2.3.1.3 Diesel

Diesel oil is the back-up fuel for the natural gas turbines supplying electricity under our Glow IPP's electricity sales contracts. The close proximity of our facilities to the Rayong Refinery and Star Refinery, which are both located in the MIE Area, as well as the PTT oil depot in Sriracha district, Chonburi province, provides us with relatively convenient access to diesel oil.

Under the terms of its IPP power purchase agreement, Glow IPP is required to maintain backup supplies of diesel oil sufficient to generate contracted electricity amounts for three days. Note that for our GHECO-One facility, we use diesel oil for start-up purpose only and no requirement to maintain backup supplies of diesel oil as per Glow IPP's power purchase agreement. To date, we have not experienced any material disruptions in our natural gas supply and as such, have not been required to operate facilities using diesel oil, except under limited circumstances, and principally for testing.

2.3.1.4 Raw water and other public utilities

Our GHECO-One, Glow Energy and Glow SPP 2/SPP 3 plants are located within the MIE, which is owned and administered by the Industrial Estate Authority of Thailand ("IEAT"), a state enterprise operating under the supervision of the Ministry of Industry. The IEAT was established under the Industrial Estate Authority of Thailand Act of 1979. The Act also established that the government, through the IEAT, must provide infrastructure and public utilities (raw water, waste treatment, etc.) to

operators within its estates. IEAT is therefore responsible for providing our production facilities with water and other public utilities.

Sea-water, which is used as cooling water, is delivered through underground pipes from the harbour to our condensers and returned to the sea via a discharge canal. We produce the clarified and demineralised water used in operations at our own water treatment facilities.

Our Glow IPP and Glow SPP 1 facilities are located in industrial estates owned and administered by WHA. WHA provides basic utilities for operations located in their industrial estates, including raw and potable water, waste treatment, telephone connections and common utilities. In addition to payments for basic utilities, WHA charges an adjustable monthly fee for the management and maintenance of common utilities and facilities within its industrial estates.

Our Glow SPP 11 Phase 1, Glow SPP 11 Phase 2 and Glow SPP 11 Phase 3 facilities are located in SEIP. SEIP provides waste water treatment and other public utilities. East Water provides raw water.

2.3.1.5 Other raw materials

We use small amount of limestone sourced from Thailand in connection with our coal-fired facilities as well as various other chemicals to produce clarified and demineralised water. These chemicals include aluminium sulphate, sodium hydroxide, sodium hydrochlorite, hydrochloric acid and trisodium phosphate, all of which are primarily sourced and supplied in Thailand.

2.3.2 Maintenance

The maintenance of production facilities is a critical aspect of our business. Proper maintenance not only allows us to operate more efficiently, and thereby generate more electricity and steam using less fuel, but is also important to protect our facilities against major breakdowns and failures. Following fuel costs, maintenance costs are the most significant component of our operating expenses.

We manage plant maintenance with the primary aim of minimizing business disruptions. This includes coordinating maintenance outages with customers, as well as planning and scheduling maintenance activities to achieve maximum efficiency. We also strive to work within the parameters of our EGAT power purchase agreements, which provide allowances for scheduled maintenance.

We and other electricity generators typically enter into long-term service agreements with respect to certain components of our facilities. Although there is some variation in the terms of these long-term service agreements, they typically involve the use of a third party contractor to maintain, service, and supply spare parts for these components. The major material and long-term service agreements we have entered into include:

- **Glow Energy Phase 2:** Long-term maintenance services for Glow Energy's gas turbines and related equipment, components and parts are provided by EthosEnergy (Thailand) Limited, ("EthosEnergy" formerly known as "Wood Group"). Our long-term service agreement with EthosEnergy took effect on 1 January 2005 and expires after 192,000 plant operating hours, or the completion of four maintenance cycles;

- **Glow SPP 2 and Glow Energy Phase 4:** The long-term maintenance arrangements for the natural gas-fired portion of our Glow SPP 2/SPP 3 plant and Glow Energy Phase 4 are substantively the same as those outlined above for Glow Energy;
- **Glow Energy and Glow SPP 3:** Have a maintenance contract with EGAT for 115 kV and 230 kV overhead transmission lines and a maintenance support agreement with MEA for all underground 115 kV and 22 kV transmission lines;
- **Glow IPP:** In 2010, we have entered into a long term Alstom GT26 gas turbine parts supply and reconditioning services agreement with Alstom (Switzerland). The agreement covers the period over the next three major inspections (approximately over 8-9 years) for each generating unit;
- **Glow SPP 1:** In 2010, we have entered into a long term Alstom GT8C gas turbine parts supply and reconditioning services agreement with Alstom Power (Thailand). The agreement covers the period over the next three major inspections (approximately over 8-9 years) for each generating unit;
- **Glow Energy Phase 5:** In 2017, we have entered into a new long term maintenance services and parts supply agreement for the gas turbine Siemens 4000F model of the Phase 5 project with Ansaldo Energia S.p.A. and Ansaldo Energia Switzerland Limited Branch of Thailand. The agreement covers 141,000 Equivalent Operating Hours (approximately 15 years);
- **Glow SPP 11 Phase 1:** In early 2012, we have re-negotiated with EthosEnergy the existing long-term parts supply and maintenance services for the Glow Group's Frame 6B gas turbines (14 engines) by including the two Frame 6B gas turbines of Glow SPP 11 into the existing package (total of 16 engines). This agreement covers two major inspections per gas turbine (approximately 12 years) for Glow SPP 11;
- **Glow SPP 11 Phase 2:** In 2012, we have entered into a long term maintenance services and parts supply agreement for the gas turbine General Electric LM6000 gas turbines of the Glow SPP12 power plant with IHI Corporations. The agreement covers three gas turbines for the term of 50,000 Operating Hours per gas turbine (approximately over 9-10 years); and
- **Glow SPP 11 Phase 3:** In 2015, we have entered into a long term maintenance services and parts supply agreement for the Wärtsilä W20V34SG gas engines of Glow SPP 11 Phase 3 (Expansion) with Wärtsilä Singapore. The agreement covers two gas engines for the term of 38,376 Running Hours per each unit (approximately 9 years).

Any other maintenance is contracted on a project-specific basis. It should be noted that we often contract with the original equipment manufacturer for maintenance needs outside of those covered by existing long term maintenance arrangements, as the machinery and equipment we use is highly specialized.

2.3.3 Insurance

We currently have the following principal insurance policies:

All of our operational generating units are insured under one collective property damage and business interruption insurance policy. We have extended the current long-term agreement policy to 31 May 2020. The current policy covers all of the plants and relates to major machinery, plants and plant equipment and is placed jointly with some other ENGIE Energy International entities.

Our property damage insurance covers, on an all-risks basis, any physical loss or damage to our property and any property which is in our care, custody and control, including machinery, plant, equipment, turbines, generators, boilers, electronic data processing equipment and property in transit. This policy contains standard exclusions that are customary in the international insurance market. The property damage insurance also covers the estimated new replacement value of insured assets.

Our business interruption insurance covers certain financial losses, including the loss of gross profit (as well as the loss of BOI tax privileges) and increased operating costs, (such as additional expenditures for the sole purpose of preventing or minimizing the loss of gross profit), incurred as a result of an interference or interruption to our business caused by damage to the insured property. The policy includes deductibles, waiting periods, exclusions and coverage extensions that are customary in the international insurance market.

Our business interruption insurance is based on an indemnity period of 12 months, except in the case of Glow SPP 3, Glow Energy CFB 3, Glow Energy Phase 5 and Glow IPP, which have indemnity period of 18 months and GHECO-One, which have indemnity period for 24 months. The policy has a combined property damage and business interruption insurance limit of USD 750 million per event. In addition, we have procured additional limit of indemnity (currently up to 31 May, 2019) for a combined property damage and business insurance of USD 820 million per event in excess of USD 750 million per event, for the plants located in the same area in Map Ta Phut comprising of Glow SPP2/SPP3 (Phase 3), Glow Energy CFB 3, Glow Energy Phase 4, Glow Energy Phase 5, and GHECO-One.

Glow also has partial terrorism coverage jointly with other ENGIE assets.

We also have an annual group-wide third-party liability insurance policy that is procured and held jointly with other companies within the ENGIE Energy International group ENGIE. This policy indemnifies the respective entities within Glow Group, as the insured party, against legal liability for: (i) bodily injury to any person; and/or (ii) damage to property, subject to a limit of USD 50 million per occurrence, and in aggregate with respect to product liability. Additionally, the USD 50 million limit is subject to Glow's group-wide application for the occurrence of a single event (in the case that a single event results in a claim to more than one covered entity). This policy contains standard exclusions that are customary in the international insurance market. The policy period is from 1 March 2018 until 28 February 2019, after which a new policy will be in place from 1 March 2019 until 28 February 2020.

We also have employer's liability insurance and property all-risk insurance for our head office facility, insurance policies relating to marine cargo and motor vehicle liability and a stand-alone operational insurance and third party liability for solar rooftop business for each project.

In addition to the insurance policies for operational generating units, there is also the insurance for the construction of the Industrial-Waste-to-Energy power plant of Chonburi Clean Energy Co., Ltd.

("CCE"), which is a joint venture company established by WHA Energy Co. Ltd., Glow IPP 3 Co., Ltd. and SUEZ (South East Asia) Limited. The insurance for CCE project is a combined insurance program to cover any physical loss or damage to property, financial loss and/or the loss of gross profit based on an indemnity period of 18 months, and legal liability to any third party with the limit of liability set at USD 25 million.

The insurance placement of CCE project consists of two phases as follows:

1. Insurance during the construction period. The construction period is about 26 months from 1 November 2017 to 31 December 2019; and
2. Insurance for the first year operation estimated from 1 January 2020 to 31 December 2020.

2.3.4 Environmental, health and safety management

Glow performs our business by implementing environmentally and socially responsible projects and commits to develop no more coal-fired units. To ensure legal compliance, it is also our commitment to control emission levels to meet, and, where possible, exceed all requirements of applicable standards at all times, to fully comply with all mitigation measures and monitoring programs required by the Environmental Impact Assessment (EIA) and the Environmental Health Impact Assessment (EHIA), and to meet the requirements of all standards established by the environmental regulations, site permits and corporate objectives. The environmental, health and safety management system (EHSMS) has maintained and continually improved to ensure safe and healthy workplaces of all Glow's premises. We are also liable for breaches of environmental laws and responsible for making any improvements and/or modifications to our facilities to ensure continued compliance with environmental laws.

Environmental aspect has always been among Glow's top priorities as a key player in the power utility industry. As the nature of the business, it is undeniable that our operations has the proportional impact on both local and global communities due to the consumption of natural resources as well as the air emissions, including Greenhouse Gases (GHG). Apart from being highly regulated by the national regulators in term of environmental and emission management, the seriousness and urgency of the climate change issue that has just been brought to light in this decade also drives our customers' demand towards low-carbon alternatives. We work continuously to supervise, control and improve our processes to ensure that regulated emissions from our operations are within and/or below stipulated maximum levels. We use Continuous Emission Monitoring Systems ("CEMS") to monitor emissions resulting from the combustion processes of our plants. We also monitor ambient air quality at several locations within the vicinity of our plants as required by EIA mitigation and monitoring programs. For each combustion process, we monitor and control oxides of nitrogen and sulphur and particulate matter. The temperature and the fuel/air ratio are controlled during the combustion process in order to maintain emissions within applicable limits.

Minimizing the environmental impacts of our coal-fired facilities is important to us. We use coal dust suppression systems and employ clean coal combustion technology and fabric filters to reduce emissions from coal-fired facilities. We periodically monitor the quality of effluent discharge and compare it to the EIA's mitigation and monitoring programs to ensure compliance with regulatory standards.

We are one of the first companies in the MIE to install environmental display board that report actual emissions to the public and IEAT. This is to demonstrate that our environmental reporting systems are transparent. For most of our emissions and discharge, we are well within regulatory requirements. We also participate in the “Environmental Good Governance Project”, which is a program organized by Map Ta Phut Industrial Estate to reduce air emissions and industrial waste.

At the national level, all of our power plants in Map Ta Phut have all been operated in compliance and were certified by the Federation of Thai Industries (FTI) since 2016 as “Eco-Factory”. In addition, all Glow Group power plants, including Glow SPP 11 in Pluakdaeng, Rayong Province and Glow IPP in Sriracha, Chonburi Province had received the Green Industry Awards from the Ministry of Industry. To meet “Green Industry” requirements means we have strong commitment towards operating our business in an environmentally friendly way to achieve sustainability goals by developing and improving continuously on production process and environmental management including corporate social responsibility, both internally and externally, throughout the supply chain.

We have implemented various improvement projects to our facilities that are directly reducing greenhouse gas emissions (e.g. boiler efficiency improvement). We use state-of-the-art and environmentally friendly technology such as Supercritical Pulverized Coal Boiler Technology, a high-efficiency boiler system that consumes less fuel than conventional boilers, which results in lower emissions and lower energy use. Our replacement of conventional lighting fixtures to LED in our power plants received the formal recognition of reduced greenhouse gas (GHG) under Low Emission Support Scheme (LESS), the scheme of Thailand Greenhouse Gas Management (Public Organization) (TGO - Thailand’s Designated National Authority for the Clean Development Mechanism).

Glow’s power plants in Thailand had obtained the Carbon Footprint for Organization (CFO) certifications of our carbon footprint, which is an indicator for the quantity of GHG emitted (in tons of carbon dioxide equivalent) from all activities of the operations; such as fuel combustion, electricity use, waste management, and transportation. Moreover, we are taking steps beyond Carbon Footprint of Product (CFP) certification by obtaining the Carbon Footprint Reduction (CFR) label-the label given to a product that contributes less GHG than Glow’s local competitors (i.e. baseline emissions). Glow’s electricity, steam, clarified water, and demineralized water production from Glow Energy Phase 2 are CFR-certified as the first of each kind in Thailand.

In addition, Glow Energy Phase 1&2 had accredited its energy efficiency improvement project of changing from conventional lightings to LED under the Thailand Voluntary Emission Reduction Program (T-VER) program. The reforestation project of GHECO-One had received the Community Green Community Support Program awards from TGO.

Glow has the Waste Management Procedure established to provide guidelines of the operational control for all relevant parties with regards to permitting, collection, storage, transportation for treatment and disposal of managing industrial waste, including wastewater sludge, fly ash, bottom ash, and by-products to prevent environmental impacts. We prepare regular reports for government agencies on the disposal of our hazardous and non-hazardous waste, to ensure compliance with government regulations.

For the occupational health and safety management and policy, we committed to continue striving to reduce, and ultimately eliminate hazards and minimize the occupational health and safety risks by taking effective preventive and protective measures to provide safe and healthy workplace, achieving the best possible health and safety performance and developing correct safety behaviors. The occupational health and safety management is a key ingredient of our core values and is critical to all involved people who may be affected from our operations, including employees and contractors.

We consistently seek to identify significant workplace hazards and risks at all Glow's premises, appropriately apply safe control measures, provide safe and healthy workplace, and implement safe work processes to protect employees and contractors from inherent dangers.

The 5-year safety culture roadmap (2014-2018) had been launched and carried out various activities, including promotion of behavioural-based safety activities; contractor safety evaluation; stop work authority (SWA); and managing rule-breaking (MRB) tool for root cause analysis of occupational accidents and incidents at work.

2.4 Expansions and Potential Expansions

2.4.1 Industrial Waste to Energy

In partnership with Suez and WHA, Glow was awarded, in October 2016, a non-hazardous waste to energy project with a gross generating power capacity of 8.6 MW. Each of the three sponsors will hold an equal equity stake. The project is located in the WHA Chonburi Industrial Estate 1 and will sell all its output to the Provincial Electricity Authority (“PEA”) under a 20-year Power Purchase Agreement (“PPA”). PEA will purchase the power generated by the project at a tariff of THB 6.08 per kWh (of which THB 2.69 is annually adjusted to inflation) with an additional premium of THB 0.7 per kWh during the first 8 years of operation. The total investment cost is estimated at approximately THB 1,800 million. The plant must enter into commercial operation by the end of 2019.

As of 31 December 2018, this project is under construction.

2.4.2 SPP Replacement

In May 2016, the National Energy Policy Committee (“NEPC”) approved the policy that, under certain conditions, owners of cogeneration plants under the SPP scheme will be allowed to apply for replacement PPA’s with EGAT which must enter into effect after the expiry date of the existing PPA’s. The sales to EGAT under a replacement PPA are limited to the higher of 30 MW and 30 percent of the total power and steam generation capacity of the plant. The replacement PPA’s will have a duration of 25 years. Glow has at least seven cogeneration units that are eligible under the SPP replacement scheme (at least six in Map Ta Phut and one in Pluak Daeng).

During 2018, Glow has made significant progress on a detailed feasibility study with respect to the construction of SPP replacement cogeneration units which could supply power to EGAT under the replacement PPA’s, if the SPP replacement scheme as outlined above were to be confirmed (the NEPC has, in January 2019, reconfirmed the SPP replacement scheme).

3. Risk Factors

We are exposed to fluctuations in fuel prices.

Fuel is our most significant operating cost, accounting for 75.1 percent of our total expenses in 2018. Whether and to what extent we can pass fuel price fluctuations through to our electricity and steam customers depends on the specific terms of our sales agreements.

- Under the terms of Glow IPP's and GHECO-One's power purchase agreement with Electricity Generating Authority of Thailand ("EGAT"), which accounted for 26.9 percent of our total revenues in 2018, our fuel costs are passed through to EGAT at contracted heat rates.
- Under the terms of our SPP power purchase agreements with EGAT relating to our gas-fired facilities, which together accounted for 21.0 percent of our total revenues in 2018, our fuel costs are passed through to EGAT at contracted heat rates.
- Under the terms of our SPP power purchase agreements with EGAT relating to two of our coal-fired facilities (90 MW contracted capacity each), which together accounted for 4.8 percent of our total revenues in 2018, our fuel costs are only partially passed through to EGAT at contracted heat rates and at a certain coal price benchmark, as relating to our purchase of coal. The freight charges, which are an important component of fuel costs, are not passed through to EGAT. Increase in overall coal costs, including freight costs, may have an adverse effect on our profit margins.
- Under the terms of our power supply agreements with industrial customers, which together accounted for 30.0 percent of our total revenues in 2018, we mainly sell electricity at prices that are based on the retail electricity tariff charged by the Provincial Electricity Authority of Thailand ("PEA"), the state-owned electricity distribution authority for the areas of Thailand in which we operate. Although the PEA tariff is designed to reflect fluctuations in fuel prices through a fuel transfer charge ("Ft"), it does so by reference to a fuel index, which is not designed to and may not necessarily reflect our actual fuel costs since it only factors in the costs of coal (which we also use to generate up to 186 MW of electricity that we supply to our industrial customers to a very limited extent). In addition, the Ft does not always function as designed. See "—We price a portion of our electricity sales by reference to the PEA tariff, which does not reflect our actual costs and may not be adjusted as designed to reflect fluctuations in, among other things, fuel costs and inflation".
- Under the terms of our steam supply agreements with industrial customers, which together accounted for 13.9 percent of our total revenues in 2018, we sell steam based on prices that are indexed to fluctuations in the price of natural gas, but not coal (which we also use to produce the steam that we sell).

Because we cannot pass through all of the changes in our fuel costs to our customers, we are exposed to fluctuation in the prices of fuel (and in particular coal). If there are material increases in our cost of fuel and we are unable to pass these increases through to our customers, this will directly reduce our profit margins and could have a material adverse effect on our business, results of operations, financial condition and prospects.

We price a portion of our electricity sales by reference to the PEA tariff, which does not reflect our actual costs and may not be adjusted as designed to reflect fluctuations in, among other things, fuel costs and inflation.

Under the terms of our electricity supply agreements with our industrial customers, which together accounted for 30.0 percent of our total revenues in 2018, we mostly sell electricity at prices that are based on the retail tariff charged by the PEA. The PEA's tariffs are regulated by the Energy Regulatory Commission ("ERC") and take into account the electricity generation, purchase, transmission and distribution costs of the PEA, the Metropolitan Electricity Authority of Thailand ("MEA") and EGAT. Since our cost structure is different, the PEA tariff rates, and consequently the prices at which we sell electricity to our industrial customers, do not necessarily reflect our actual costs of producing and supplying this electricity.

The PEA tariff is designed to reflect fluctuations in fuel prices, inflation, foreign exchange rates and other factors by application of the Ft. However, the most significant component of the Ft, the fuel cost component, refers to a general fuel index that does not necessarily reflect our actual fuel costs and only factors in the cost of coal, which we also use to generate electricity that we supply to our industrial customers, to a limited extent. In addition, the Ft, which is normally adjusted only every four months, does not always function as designed. When the Ft adjustment is not applied or not fully applied to the PEA tariff in a rising fuel cost environment, the prices at which we sell electricity to our customers are not increased to reflect higher prevailing fuel prices, and consequently, our profit margins are reduced, and vice versa. For the foregoing reasons, our reliance on the PEA tariff could have a material adverse effect on our business, results of operations, financial condition and prospects.

We are highly dependent on EGAT.

EGAT is our largest and most important customer and is committed to purchasing electricity from us under our EGAT power purchase agreements, which are long-term contracts with durations from 21 to 25 years. The EGAT power purchase agreements are material to our business, accounting for 54.1 percent of our revenues in 2018. EGAT is the dominant participant in the Thai electricity market. In addition to being the single wholesale buyer and controlling all of the wholesale transmission of electricity in Thailand, EGAT is also Thailand's largest electricity generator. A number of our important contracts contain unclear terms which have led to disagreements with EGAT regarding the operation of our business, as discussed below in "—We have had a number of significant disputes with EGAT in the past" and which could result in further disputes in the future. Any material disputes or disagreements that we have with EGAT could have a material adverse effect on our business, results of operations, financial condition and prospects.

We are highly dependent on a small number of industrial customers concentrated in the petrochemical sector.

In addition to EGAT, we are also highly dependent on a small number of industrial customers. Our 10 largest industrial customers (which, for the avoidance of doubt, exclude EGAT) accounted for 30.9 percent of our total revenues in 2018 or 69.0 percent of total sales to industrial customers, whereas total sales to industrial customers accounted for 44.8 percent of our total revenue in 2018. A disruption of our relationship with one or more of our industrial customers could have a material adverse effect on our business, results of operations, financial condition and prospects. Further, our industrial customers are highly concentrated both geographically and in terms of industrial classification. Most of our industrial customers are located in the Map Ta Phut Industrial Estate ("MIE") or elsewhere within the MIE Area, accounting for 94.7 percent of our total sales to industrial customers. This exposes us to increased risk of regulatory changes in respect of

operation in MIE, an accident, natural disaster, infrastructure or other failure or breakdown disrupting the facilities of the MIE, the other industrial estates in which our industrial customers are located or the MIE Area generally.

In addition to their geographic concentration, many of our industrial customers are companies operating in petrochemical or petrochemical-related industries. This exposes them, and indirectly us, to the performance of the petrochemical sector. Many petrochemical products are commodities and the petrochemical industry is highly competitive. In addition, significant price fluctuations and business cyclicalities are common in many petrochemical-related industries. These factors may affect our ability to conclude new agreements with these customers or negatively affect our demand and load factor, customer creditworthiness, the timing of our customers' expansions and thereby the terms on which we are able to reach any such new agreements and may, for these reasons or otherwise, have a material adverse effect on our business, results of operations, financial position and prospects.

Although we have successfully extended many of the long term contracts with industrial customers for which the initial term has expired or is due to expire, we cannot assure that we will be able to retain all contracts which are expiring in the medium term, or to find new customers to replace them on commercially reasonable terms. In addition, it is important to our business to maintain minimum levels of steam and chilled water sales in order to meet applicable generating efficiency requirements (and failure to do so could result in termination of certain of our SPP power purchase agreements with EGAT). If we are unable to retain our customers or to find new customers to replace them on commercially reasonable terms and along the product lines that we require, this could have a material adverse effect on our business, results of operations, financial position and prospects.

Under our power supply and steam supply agreements with industrial customers, our companies may be subject to liquidated damages liability in an event of interruption in the supply of power and/or steam and/or a failure to meet an annual guarantee of availability of power or steam, subject to the conditions indicated in each agreement, which may vary from one to another. We cannot predict whether liabilities will be incurred or not, and what the materiality of the potential liabilities, if any, would be.

We face significant competition.

We face significant competition, particularly in respect to our supply of electricity and steam from our cogeneration facilities to industrial customers in the MIE Area and in the Siam Eastern Industrial Park ("SEIP"). In the MIE Area, although our customers are party to long-term agreements with us, we compete with PEA, and Global Power Synergy Public Company Limited ("GPSC"). GPSC and PEA have certain competitive advantages over us. GPSC is affiliated with PTT, the principal natural gas supplier in Thailand and, through this relationship, with a number of companies in the MIE Area (including many of our important customers). PTT also has an equity interest in a number of our industrial customers (most significantly PTTGC). Sales to PTTGC accounted for 8.3 percent of our total revenue from electricity sold to industrial customers, 21.4 percent of our total revenue from sales of steam and 5.8 percent of our total revenues in 2018. PEA, on the other hand, does not typically require its customers to enter into long-term contracts. In SEIP, we compete with only PEA.

We are subject to significant contractual risks under our SPP power purchase agreements.

EGAT is our largest and most important customer, and sales to EGAT from our SPPs

accounted for 25.8 percent of our total revenues in 2018 (see “— We are highly dependent on EGAT”). EGAT is the sole purchaser of wholesale electricity in Thailand. Due in part to the foregoing, our SPP power purchase agreements with EGAT are standard form contracts that we were not given an opportunity to negotiate. This means that these contracts are not tailored to our specific operating circumstances and contain a number of ambiguous provisions. Certain of the terms of our SPP power purchase agreements from the first round of SPP contracts (COD before 2012) that we believe present risks to our business are as follows:

- A power purchase agreement may be terminated before the end of its term due to the default of either party and our only remedy may be to bring a claim in arbitration and prove damages;
- Although the power purchase agreements do not include liquidated damages provisions, penalties are imposed in the form of reduced capacity or energy payments from EGAT or refunds by us where (i) we supply less than the contracted capacity, (ii) we provide electricity for less than 7,008 hours in a year, (iii) the cogeneration efficiency is less than 45 percent or (iv) thermal energy accounts for less than 10 percent of our total energy sold;
- If a force majeure event affecting EGAT or a governmental force majeure event (as defined in the power purchase agreement) prevents us from supplying electricity to EGAT, EGAT will continue to make its capacity payment (the payment that is designed to allow us to recover our fixed costs for constructing and operating the power generating facility over the life of the contract) to us for only up to six months. In addition, failure by PTT to deliver gas to us is not considered to be a governmental force majeure event for these purposes, so in the event of a PTT supply failure, EGAT will only pay us for capacity actually made available and energy actually delivered; and
- Our SPP power purchase agreements with EGAT contain only a general commitment for both parties to negotiate in good faith to amend to our contractual arrangement in response to any adverse change in law, including changes in environmental standards, which provide us with only limited change-in-law protection. This is particularly relevant if new laws were to impose more stringent environmental conditions on our existing facilities, which could require significant operational and capital expenditure.

We also have operational SPP power purchase agreements with EGAT from the second round of SPPs. In 2009, we have entered into a 74 MW power purchase agreement (for Glow Energy Phase 4), which became operational in June 2012 and a 90 MW agreement (for Glow SPP 11 Phase 2), which became operational in December 2012. These agreements have some different terms, in addition to the general provisions described above, and certain new provisions, such as:

- The SPP requirement for thermal energy production and efficiency will be tested and reviewed once a year by a third party; and
- In case we do not meet the thermal energy production and/or efficiency requirement mentioned above, there is no penalty but we will not receive the fuel saving payment, which was introduced in the tariff.

These contractual risks could have a material adverse effect on our business, results of operations, financial condition and prospects.

We are subject to certain risks with respect to the expiry of our SPP power purchase agreements.

We sell to EGAT under 11 SPP power purchase agreements (including 2 SPP power purchase agreements which have been extended; see below). The total capacity so contracted currently amounts to 784 MW. These power purchase agreements will expire in the period up to 2037 (latest expiry). At or before the relevant expiry dates, we may or may not enter into extension and/or replacement power purchase agreements with EGAT. If we do not enter into extension and/or a replacement power purchase agreements, or if the capacity contracted under such extension and/or a replacement power purchase agreements is significantly different from the capacity currently contracted, then this may result (in addition to the direct effect i.e. the reduction in revenues from sales under SPP power purchase agreements) in a less efficient running regime (and hence higher fuel costs) for one or more units in our Cogeneration fleet and, potentially, in an inability to balance our electricity and steam load.

The National Energy Policy Committee (“NEPC”) announced, in May 2016, the main parameters of a “replacement scheme” which would apply, under certain conditions, to gas-fired SPP power purchase agreements expiring in the period up to 2025 (which could, if confirmed, apply to at least 7 out of the 11 SPP power purchase agreements under which we currently sell to EGAT). The proposed capacity to be contracted under such replacement power purchase agreements is lower than the capacity contracted under the current agreements.

As of 31 December 2018, we have not yet entered into any replacement power purchase agreements under the schemes defined under the NEPC resolution of May 2016. We have, however, entered into agreements which extend the term of the SPP power purchase agreements for Glow Energy Phase 2 for a period of 3 years since 2017, at a reduced (lower) tariff. In the process leading up to the extension of those agreements, a dispute has arisen with EGAT with respect to the end date under the original SPP power purchase agreements and such dispute has been submitted to the Thai Arbitral Institution. Please refer to section 5.1 for the current status of this dispute. Any unfavorable outcome with respect to the extension and/or replacements of our SPP power purchase agreements (at the time of expiry) could have a material effect on our business, results of operations, financial conditions and prospects.

We operate in a highly regulated industry that is subject to change.

The regulatory framework applicable to electricity generating companies in Thailand has undergone significant structural changes in the past and may undergo significant changes in the future. In addition, there have been a variety of proposals for reform of the Thai electricity industry in the past which, once made, have subsequently been delayed, cancelled, or significantly modified prior to their implementation.

Thailand has been considering deregulation of the electricity industry for a number of years. The EGAT power purchase agreements for our SPPs do not contain any provisions dealing with the potential future privatization of EGAT or the restructuring of the electricity sector. We are unable to predict what impact deregulation or privatization would have on our contractual arrangements and on the electricity sector in Thailand in general. If such deregulation were to for example have the impact of abolishing the PEA tariff which is the reference price that we use to price our electricity sales to most of our industrial customers, we would likely have to renegotiate the pricing structure with our industrial customers, which we may not be able to do on reasonable commercial terms or at all.

As we operate a number of SPPs (and our companies account for a material portion of all SPP electricity sold to EGAT), which are higher-cost wholesale electricity generators compared to IPPs and many of EGAT's generating facilities, we are exposed to regulatory changes that seek to increase generating efficiency or to penalize high-cost generating facilities. This could take the form of changes in law and many of our key sales contracts do not contain specific mechanisms for compensating us in the event of adverse changes in law.

These or other regulatory or structural changes affecting the Thai electricity industry could require us to significantly change the way that we operate our business and could have a material adverse effect on our business, results of operations, financial condition and prospects.

We have had significant disputes with EGAT in the past.

In the past, we have been involved in discussions with EGAT regarding important aspects of our business. Although we do not characterize these as material disputes, we believe that, because of the structure of the Thai electricity supply industry and the nature of our power purchase agreements, we will likely continue to maintain an ongoing dialogue with EGAT to resolve these and similar types of issues in order to continue to clarify certain aspects of our contractual relationship. There is the potential for disputes to arise in connection with any such issues or points of discussion. As EGAT is our most important customer and disputes with EGAT may involve some of our most important contracts, any disputes that we may have with EGAT in the future may require us to materially change the way in which we operate our business and could have a material adverse effect on our business, results of operations, financial condition and prospects.

Our business operations are dependent on the availability of fuel.

Our business is dependent on the availability of fuel, in particular natural gas and coal. In 2018, purchases of natural gas accounted for 54.5 percent of our cost of goods sold and purchases of coal accounted for 22.3 percent of our total cost of goods sold. Shortages in natural gas or coal, or an inability of our suppliers to provide these fuels to us, could prevent some or all of our facilities from being able to generate electricity and steam, which could prevent us from fulfilling our contractual obligations.

We have entered into long-term natural gas supply agreements with PTT. Due to the structure of the Thai fuel supply industry (and notwithstanding the fact that some progress has been made towards the implementation of third party access for gas pipelines and LNG terminal infrastructure), PTT is currently still the only entity that is able to supply us with natural gas to allow us to operate our business. In the event that PTT fails to supply us with adequate quantities of natural gas under our gas supply agreements, we could face significant disruptions to our business. Although there is a compensation provision in the gas supply agreements between our SPPs and PTT which requires PTT to compensate us for its inability to deliver contracted quantities of natural gas to us, this compensation only extends to natural gas that we use to produce electricity to sell to EGAT and not to our industrial customers. Most of our gas-fired facilities are designed to be able to run on diesel fuel as an alternative fuel source, but we could incur significant costs and operating inefficiencies in switching to and operating by using diesel fuel. Moreover, our cogeneration facilities may not be able to operate on diesel fuel for sustained periods of time, as, when operating on diesel fuel, we consume diesel fuel faster than we are able to re-fill our diesel fuel storage tanks.

There is a risk of natural gas supply disruption resulting from defects in or the requirement for maintenance of the pipeline including the change in the quality of natural gas supply, over which we have no control. The current limitations on the supply of natural gas to the areas in which we operate, or any disruption in the supply of natural gas, or change in the quality of natural gas supply

could have a material adverse effect on our business, results of operations, financial condition and prospects.

We have entered into medium term coal supply agreements with a number of international and Thai coal suppliers/traders to satisfy our coal requirements for our three CFBs and GHECO-One. Our coal risk management policy for our CFBs is to diversify our procurement to certain number of contracts with different expiry years, subject to market condition.

There is a risk of coal supply disruption resulting from various circumstances, including a situation where our medium-term coal supplier could not fulfill its obligations and we could not arrange substitute supply from our other suppliers or from the spot market. In such a situation, we also cannot be certain that the cost of substitute supply would be commercially competitive.

We are highly dependent on PTT.

As discussed under “—Our business operations are dependent on the availability of fuel”, we rely heavily on PTT for the supply of natural gas to our operating facilities. Purchases of natural gas, which were almost entirely purchased from PTT, accounted for approximately 54.5 percent of our total cost of goods sold in 2018. In addition to being a key supplier, PTT has an equity interest in GPSC, our principal competitor in our Cogeneration business line in Map Ta Phut (as discussed above under “—We face significant competition”). PTT also has an equity interest in a number of our industrial customers (most significantly PTTGC). See “—We face significant competition”.

If the fact that we compete with a subsidiary of PTT in our Cogeneration business line, or any other reason, were to adversely affect PTT’s willingness to, or the terms on which it will, enter into new agreements to supply natural gas to us (including at the time of expiry and potential extension and/or replacement of our SPP power purchase agreements), or if our relationship with PTT deteriorates for any other reason, this could have a material adverse effect on our business, results of operations, financial condition and prospects.

We are subject to significant contractual risks under our SPP gas supply agreements with PTT.

PTT is our largest and most important fuel supplier (see “— We are highly dependent on PTT”). PTT is majority-owned by the government and currently has an effective monopoly with respect to supply of natural gas in Thailand. Due in part to the foregoing, our gas supply agreements with PTT are standard form contracts that we were not given an opportunity to negotiate. This means that, among other things, our gas supply agreements with PTT are not tailored to our specific operating circumstances and contain a number of ambiguous provisions. Although the terms of our PTT gas supply agreements vary from each other, certain terms contained in at least some of our PTT gas supply agreements that we believe present risks to our business are as follows:

- A gas supply agreement may be terminated before the end of its term due to the default of either party and our only remedy may be to bring a claim in arbitration and prove damages (rather than allowing us to require PTT to continue to supply gas to us pending resolution of the dispute);
- PTT only undertakes to use its “best efforts” to deliver the specified daily quantity and is not under an absolute obligation to deliver gas to us;
- The terms relating to PTT’s requirement to compensate us if PTT fails to deliver gas at contractually-designated specifications are unclear and, in any case, the amount of any compensation that it would pay to us is capped;

- Non-compliance with any term in a gas supply agreement by either party that is not remedied within 60 days of a notice of default thereof constitutes an event of default and enables the non-defaulting party to terminate the gas supply agreement; and
- Even though we design our units to be able to operate throughout the (wide) range of acceptable gas specifications, we cannot ensure that we would be able to operate if there were to be a change in the range of acceptable specifications, or that we would be fully compensated for modifications required in such a case.

These contractual risks could have a material adverse effect on our business, results of operations, financial condition and prospects.

We face risks with respect to opposition to further expansions in Map Ta Phut, the declaration of Map Ta Phut as a Pollution Control Zone, and the Administrative Court ruling in this respect.

In March 2009, the Rayong Administrative Court declared Map Ta Phut a “Pollution Control Zone”. This was later confirmed by the National Environmental Board. In June 2009 certain individuals together with some NGOs filed a petition to Central Administrative Court (“CAC”), claiming that certain permits issued after revision of the Thai constitution in 2007 were issued illegally, and requested that such permits be revoked. In addition, the claimants requested the CAC to provide temporary protection by suspending 76 projects in MIE Area. CAC’s ruling to order an injunction was enforced by the Supreme Administrative Court while reducing the number of suspended projects to 65. Although our operations have all necessary permits and are not included in the suspended projects, some of our existing and/or potential customers may have been affected by the court orders.

In June 2010, we learned from the Industrial Estate Authority of Thailand (“IEAT”) that The Stop Global Warming Association (“Plaintiff”) had filed a complaint with the CAC, and that GHECO-One’s and Glow SPP 3’s are in the list attached to the complaint (the “Second NGO Complaint”). Even though we are not named as a defendant, the complaint involved, among other things, a motion to suspend the projects named in the complaint.

In addition to the above cases, Stop Global Warming Association has filed a statement of claim to the Rayong Administrative Court against the competent authorities, namely Energy Regulatory Commission (“ERC”), Industrial Estate Authority of Thailand (“IEAT”), National Environment Board (“NEB”), Secretary of Office of Natural Resources and Environmental Policy and Planning (“ONEP”), alleging that such authorities unlawfully approved and granted permits to GHECO-One for operating a thermal plant in a pollution control area. The statement of claim also requests the court to order the relevant authorities to revoke any permits granted to GHECO-One and suspend any activities of GHECO-One. The court eventually ordered to include GHECO-One as a co-defendant of the case, since it is the owner of the power plant and could be affected by any court order and on verdict. Please refer to 5.2 for the current status of this dispute.

We are exposed to foreign exchange risk.

We are exposed to foreign exchange risk in a number of aspects. Many of our operating costs are denominated in (or, for instance in the case of our gas costs, partially indexed to) USD and other currencies. Most of our USD-denominated operating costs can be serviced by USD-linked income. However, our coal and coal freight costs are USD-based and we cannot fully pass the fluctuations in these costs (including as a result of currency fluctuations) through to our customers. Further, while our revenues are partially linked to the USD, a significant amount of our indebtedness is THB-denominated. We have typically had a substantial degree of USD content or linkage in cash

flows (and thus normalized net earnings) available to distribute to shareholders and, if this continues to be the case, any appreciation of the THB compared to the USD would reduce the THB amount of dividend payments to our shareholders. For these reasons, significant fluctuations in exchange rates could have a material adverse effect on our business, results of operations, financial condition and prospects.

Our insurance coverage may not adequately protect us against possible risk of loss.

Our operations are subject to operating and other risks typically associated with electricity generation. Insurance markets are cyclical. As a result, we may at times be unable to obtain appropriate insurance on commercially reasonable terms or at all, which may subject us to potentially significant financial loss upon the occurrence of a large uninsurable event.

We have all-risk and business interruption, third party liability, terrorism and other insurance coverage. Our principal insurance covers loss arising out of physical loss or damage to our plants and generating machinery as well as financial loss resulting there from, but contains certain customary exclusions and deductibles. If we suffer a large uninsured or excluded loss or any insured loss suffered by us significantly exceeds our insurance coverage, our business, financial condition and results of operations may be materially adversely affected.

The operation of one of our subsidiaries is exposed to hydrology risk.

Houay Ho Power Company Limited (“HHPC”) is operator of a 152 MW hydro power plant in Attapeau province, Lao PDR., while Houay Ho Thai Company Limited (“HHTC”) is a holding company holding 25 percent stake of HHPC. Currently, we effectively hold 67.25 percent stake in HHPC, through both direct holding in HHPC and indirect holding through HHTC.

As for any hydro plant, HHPC’s operations are highly dependent on the amount of rainfall in any given year. In addition, the power purchase agreement with EGAT requires HHPC to sell a minimum amount of electricity per annum (although it does foresee the calling of a limited number of “drought years”), and not meeting this requirement may lead, among others, to a requirement to pay liquidated damages. For these and other reasons adverse rainfall conditions could materially affect the operations and results of HHPC.

We are exposed to (fresh water) drought risks in the Eastern Seaboard Areas (Chonburi and Rayong).

Power generation requires large volumes of fresh water for cooling of equipment and production of clarified water and demineralized water for internal usage and industrial consumptions. Lack of fresh water supply could lead to a shutdown of our power generation units. In recent years, low rainfall has been observed in a number of cases (2004, 2012 and, to a lesser extent, 2014 and 2015). Over the years, several meetings have taken place with all parties and multiple initiatives have been rolled out. Notwithstanding this, there is a residual risk of drought and reservoir levels need to be monitored on an ongoing basis.

4. Assets Used in Business Operations
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4.1 Main fixed assets of the Company and its subsidiaries

As at 31 December 2018, the Company and its subsidiaries had main fixed assets used in business operations with net book value of THB 73,894,974,440 detailed as follows:

Unit: THB

Category	2018	2017
Land	711,551,304	711,551,304
Power and water plants	124,860,423,030	124,493,883,156
Machinery, tools and equipment	680,459,121	662,170,256
Building and Leasehold improvement	527,150,800	502,123,552
Furniture, fixture, office equipment and motor vehicles	392,098,968	398,230,924
Construction in progress	507,200,003	191,438,745
Total	127,678,883,226	126,959,397,937
<u>Less</u> Accumulated depreciation	(53,783,908,786)	(49,831,715,839)
Total net book value	73,894,974,440	77,127,682,098

4.1.1 Land

Category	Ownership	Net book value (THB)	
		2018	2017
<u>The Company</u>			
1.1 Land – no commitment	Owned	81,250,000	81,250,000
1.2 Land - mortgaged	Lease	-	-
Total		81,250,000	81,250,000
<u>Subsidiaries</u>			
1.3 Land – no commitment	Owned/Lease	630,301,304 ⁽¹⁾	408,149,832
1.4 Land - mortgaged	Owned	-	222,151,472 ⁽¹⁾
Total		630,301,304	630,301,304
Grand total		711,551,304	711,551,304

4.1.2 Power and water plants

Category	Ownership	Net book value (THB)	
		2018	2017
<u>The company</u>			
2.1 Plant and water plants – no commitment	Owned	22,192,672,831	23,546,361,722
2.2 Plant and water plants – mortgaged	Owned	-	-
Total		22,192,672,831	23,546,361,722
<u>Subsidiaries</u>			
2.3 Plant and water plants – no commitment	Owned	17,783,498,816	18,939,713,089
2.4 Plant and water plants – mortgaged	Owned	32,235,011,723 ⁽¹⁾	33,268,559,154 ⁽¹⁾
Total		50,018,510,539	52,208,272,243
Grand total		72,211,183,370	75,754,633,965

Note:

- 1) All of the land, construction, machinery and equipment of the power plants of Glow IPP Company Limited, Houay Ho Power Company Limited and GHECO-One Company Limited have been mortgaged and pledged to secure their credit facilities obtained from financial institutions. On December 15, 2016, Glow IPP Company Limited prepaid all outstanding loans. On March 28, 2017, Glow IPP Company Limited entered into the Deed of Release with financial institutions to release all collateral that were mortgaged and pledged with them. The registration of release of land and machinery mortgage was completed on June 28, 2018 and June 29, 2018, respectively.

4.1.3 Building and leasehold improvement

Category	Ownership	Net book value (THB)	
		2018	2017
<u>The company</u>			
3.1 Building and leasehold improvement – no commitment	Owned	176,821,287	193,367,738
3.2 Building and leasehold improvement – mortgaged	Owned	-	-
Total		176,821,287	193,367,738
<u>Subsidiaries</u>			
3.3 Building and leasehold improvement – no commitment	Owned	85,502,393	67,809,753
3.4 Building and leasehold improvement – mortgaged	Owned	-	-
Total		85,502,393	67,809,753
Grand total		262,323,680	261,177,491

4.1.4 Machinery, tools and equipment

Category	Ownership	Net book value (THB)	
		2018	2017
<u>The company</u>			
4.1 Machinery, tools and equipment – no commitment	Owned	19,719,276	14,676,141
4.2 Machinery, tools and equipment - mortgaged	Owned	-	-
Total		19,719,276	16,676,141
<u>Subsidiaries</u>			
4.3 Machinery, tools and equipment – no commitment	Owned	134,364,060	144,905,960
4.4 Machinery, tools and equipment – mortgaged	Owned	-	-
Total		134,364,060	144,905,960
Grand total		154,083,336	159,582,101

4.1.5 Furniture, fixture, office equipment and motor vehicles

Category	Ownership	Net book value (THB)	
		2018	2017
<u>The company</u>			
5.1 Furniture, fixture, office equipment and motor vehicles – no commitment	Owned	7,149,570	9,269,455
5.2 Furniture, fixture, office equipment and motor vehicles – mortgaged	Owned	-	-
Total		7,149,570	9,269,455
<u>Subsidiaries</u>			
5.3 Furniture, fixture, office equipment and motor vehicles – no commitment	Owned	41,483,177	40,029,037
5.4 Furniture, fixture, office equipment and motor vehicles – mortgaged	Owned	-	-
Total		41,483,177	40,029,037
Grand total		48,632,747	49,298,492

4.1.6 Construction in progress

Category	Ownership	Net book value (THB)	
		2018	2017
<u>The company</u>			
6.1 Construction in progress – no commitment	Owned	60,757,859	53,400,976
6.2 Construction in progress – mortgaged	Owned	-	-
Total		60,757,859	53,400,976
<u>Subsidiaries</u>			
6.3 Construction in progress – no commitment	Owned	191,615,355	135,469,830
6.4 Construction in progress – mortgaged	Owned	254,826,789 ⁽¹⁾	2,567,939 ⁽¹⁾
Total		446,442,144	138,037,769
Grand total		507,200,003	191,438,745

Note:

1) See detail in respect of commitment in No. 4.1.2

4.2 Intangible Assets

As at 31 December 2018, the Company and its subsidiaries have intangible assets for their business operations at net book value of THB 732,514,483 detailed as follows

Main Category	Net book value (THB)	
	2018	2017
Deferred right to use grid system	43,691,134	54,599,017
Deferred right to use transmission line	165,159,473	175,533,472
Deferred land leasehold right	150,641,278	162,696,601
Deferred right to use pipe rack	7,551,391	8,941,433
Deferred right of way	95,211,086	110,607,592
Deferred right to use gas pipeline	40,280,282	44,232,325
Deferred right to use dedicated berth	168,732,847	183,271,914
Computer software	61,246,992	68,029,528
Total net book value	732,514,483	807,911,882

4.2.1 Deferred right to use grid system

Deferred right to use grid system represents right to use grid system of Glow SPP 2 Company Limited ("GSPP2") and Glow SPP 3 Company Limited ("GSPP3"), whereby on 27 September 2000, both subsidiaries handed over and transferred the ownership of certain parts of the grid system to EGAT to comply with the power purchase agreement, under the regulation of purchasing electricity from small power producers.

4.2.2 Deferred right to use transmission line

Deferred right to use transmission line represents the costs paid by Glow IPP Company Limited ("GIPP") for construction of transmission line in order to comply with the power purchase agreement, under the regulation of purchasing electricity from independent power producers. The ownership of the transmission line belongs to EGAT and GIPP has the right to use the transmission line over the period of the power purchase agreement of 25 years.

4.2.3 Deferred land leasehold right

Deferred land leasehold right represents fees paid by the Company, GSPP2, GSPP3 and GHECO-One Company Limited in relation to the leasehold right of land under the land lease agreements made with Industrial Estate Authority of Thailand ("IEAT").

4.2.4 Deferred right to use pipe rack

Deferred right to use pipe rack mainly represents the fee paid by the Company for the right to lay the Company's pipelines within Asia Industrial Estate under the Piperack Agreement dated 31 August 2009 and the fee paid for the right to lay the Company's pipelines in GSPP3's area under the Piperack Agreement dated 1 September 2012 and Amendment dated 11 December 2012.

4.2.5 Deferred right of way

Deferred right of way mainly represents the right under the Memorandum of Understanding dated 13 May 1998 and Amendment dated 11 May 2005 of Glow SPP 11 Company Limited ("GSPP11") to use easement and right of way within the Siam Eastern Industrial Park ("SEIP") for the construction, operation and maintenance of gas pipeline and network for the distribution of electricity, steam and other services over the period GSPP11 own land in SEIP.

4.2.6 Deferred right to use gas pipeline

Deferred right to use gas pipeline represents the costs of gas pipeline and all related facilities that was transferred to PTT Public Company Limited ("PTT") by GSPP2 and GSPP11 in exchange for the right to use such assets throughout the term of the gas supply agreements.

4.2.7 Deferred right to use dedicated berth

Deferred right to use dedicated berth represents the costs of the dedicated berth that was transferred to IEAT by GSPP3 according to the condition as stipulated in the joint operation agreement and GSPP3 has the right to use the dedicated berth over the remaining term of the agreement for the period of 14 years.

4.2.8 Concession for undertaking electricity business

The Company received licenses for electricity generating, distribution system, and electricity sales as per following details:

On 11 June 2009, the ERC approved the electricity generation license for Glow IPP Co., Ltd. for the period of 18 years.

On 25 December 2009, the ERC approved the licenses for Glow SPP 1 Co., Ltd., Glow SPP 2 Co., Ltd. Glow SPP 3 Co., Ltd. and Glow Energy Plc. (Phase 2, Phase 4.1, Phase 4.2, and CFB3) to operate the business of electricity generation, distribution system, and electricity sales for the period of 12 years, 15 years, 15 years and 16 years respectively.

On 18 February 2010, the ERC approved the licenses for Glow SPP 11 Co., Ltd. Phase 1, to operate the business of electricity generation, distribution system, and electricity sales for the period of 16 years.

On 18 February 2010, the ERC approved the electricity generation license for Glow SPP 11 Co., Ltd. Phase 3 for a period of 25 years. ERC approved the expansion of Glow SPP 11 (with the additional gas engines) on 18 February 2015.

On 23 March 2011, the ERC approved the electricity generation license for Glow Energy Plc. (Phase 5) for a period of 13 years.

On 27 June 2012, the ERC approved the electricity generation license for Glow Energy Plc. (Solar) for a period of 10 years.

On 5 April 2012, the ERC approved the electricity generation license for GHECO-One Co., Ltd., for a period of 25 years.

On 18 September and 3 December 2012, the ERC approved the electricity generation license, and electricity sales license for Glow SPP 11 Co., Ltd. Phase 2, for a period of 25 years and five years, respectively.

4.2.9 Promotional privileges

The Company and its subsidiaries have been granted various promotional privileges under the Investment Promotional Act, B.E. 2520 by the Board of Investment for the generation and distribution of electricity, steam and water for industrial use.

Subject to certain imposed conditions, the privileges include the following:

- a) Permission to own land in order to carry on the promoted activities as the Board may deem appropriate.
- b) Exemption of import duty on machinery, materials and supplies imported for production for domestic sales as approved by the Board.
- c) Exemption of corporate income tax on net profit for a period of eight years commencing from the date of earning operating income. In cases where the business incurs a loss during that period of exemption, the loss incurred in such period can be taken as a deduction from net profit of the years after the period of exemption, not exceeding five years.
- d) Exemption of income tax on dividends paid from the profit of the promoted operation over the above corporate income tax exemption period.
- e) An allowance of fifty percent of the normal rate of corporate income tax on net profit for a period of five years after the expiry date of the corporate income tax exemption period as described in c) above.
- f) Permission to deduct double the cost of transportation, electricity and water supply for corporate income tax purpose for a period of ten years commencing from the date of earning operating income.
- g) Permission to deduct the cost of installation or construction of public utilities at the rate of 25 percent in addition to normal depreciation charges.

Glow IPP Company Limited has been granted all the above privileges, except e)- g).

The privileges related to corporate income tax of the Company and its subsidiaries are summarized as follows:

	Certificates Date	Expiry Date of Corporate Income Tax Exemption Period	Expiry Date of Corporate Income Tax Allowance Period
The Plants obtained promotional privileges			
Glow IPP Co., Ltd.	Nov 1999	Jan 2011	N/A
Glow Energy Plc.			
Stage 1	Jul 1994	Apr 2003	Apr 2008
Stage 2	Jun 1995	Dec 2003	Dec 2008
Expansion project stage 1	Mar 2004	Jun 2012	Jun 2017
Expansion project stage 2	Aug 2004	Sep 2013	Sep 2018
CFB 3	Jun 2007	Dec 2017	Dec 2022
Phase 1 Water plant	Nov 2007	-	-
Phase 5	Feb 2009	Feb 2019	Feb 2024
Solar	Aug 2012	Jul 2020	Jul 2025
Solar Rooftop	May 2018	Nov 2026	Nov 2031
Glow SPP 1 Co., Ltd			
Stage 1	Jan 1996	Aug 2005	Aug 2010
Stage 2	Jul 1996	Jun 2006	Jun 2011
Stage 1 Water Plant	Nov 2009	May 2007	May 2012
Stage 2 Water Plant	Nov 2009	Jul 2014	Jul 2019
Glow SPP 2 Co., Ltd.	Nov 1996	Jul 2005	Jul 2010
Glow SPP 3 Co., Ltd	Aug 1997	Jul 2007	Jul 2012
GHECO-One Co., Ltd	Jul 2008	Oct 2019	Oct 2024

	Certificates Date	Expiry Date of Corporate Income Tax Exemption Period	Expiry Date of Corporate Income Tax Allowance Period
The Plants obtained promotional privileges			
Glow SPP 11 Co., Ltd Phase 1	Mar 1999	Aug 2008	Aug 2013
Glow SPP 11 Co., Ltd Phase 2	Jul 2013	Nov 2020	Nov 2025
Glow SPP 11 Co., Ltd Phase 3	Jul 2013	Oct 2014	Oct 2019
Glow SPP 11 Co., Ltd (Phase 3 Expansion)	Sep 2014	Mar 2023	Apr 2028

4.2.10 Rights under land lease agreement

Description	Lessor	Lease Period	Objectives
Glow Energy Plc.			
1. Partial Land Lease Agreement in Map Ta Phut Industrial Estate (Port) Dated 6 December 1996, Memorandum Dated 11 July 2003 – Phase 3 (No. 4/2539-NorPor)	Industrial Estate Authority of Thailand (“IEAT”)	28 years	For installation of plant building and undertaking industrial business on generating power, steam and industrial water
2. Land Lease Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 4 April 1994 – Phase 2 (No.2/2537-NorPor)	IEAT	26 years and can be extended for another 20 years	For installation of plant building and undertaking industrial business on generating power, steam and industrial water
3. Land Lease Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 5 June 2007 – Phase 1 (No.1/2550-NorPor)	IEAT	13 Years	For installation of plant building and undertaking industrial business on generating power, steam and industrial water
4. Partial Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 23 January 2007 – Underground cable (No.2/2550-NorPor)	IEAT	28 Years and can be extended for another 20 years	For installation of Underground Transmission Line
5. Land Lease Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 28 June 2017 Car Park (No.1/2560-NorPor)	IEAT	2 Years extendable	For car parking
6. Partial Land Lease Agreement in Map Ta Phut Industrial Estate Dated 19 December 2007 – Coal Stock Yard (No.2/2550-NorPor)	IEAT	30 Years and can be extended for another 20 years	For installation of coal stock yard

Description	Lessor	Lease Period	Objectives
7. Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 17 March 2008– Underground cable to RIL (No. 4/2551-NorPor)	IEAT	16 Years	For installation of underground cable
8. Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 8 December 2008 – Underground cable to RIL (No. 9/2551-NorPor)	IEAT	16 Years	For installation of underground cable
9. Partial Agreement of servitude Dated 7 October 2009 - Underground cable in AIE	AIE	15 Years	For installation of underground cable
10. Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 4 October 2017 - Pipe Bridge (No. 17/2560-NorPor)	IEAT	2 Years extendable	For installation of pipe bridge at I-6 road
11. Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 15 December 2014– Pipe Rack (No. 12/2557-NorPor)	IEAT	14 Years	For installation of pipe rack at I-2 road
12. Partial Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 23 September 2011 – Underground Cable (No. 3/2554-NorPor)	IEAT	13 Years	For installation of underground cable (115 kv bundle)
13. Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 15 December 2014– Pipe Bridge (No. 13/2557-NorPor)	IEAT	14 Years	For installation of pipe bridge (for customer – Vinythai)

Description	Lessor	Lease Period	Objectives
14. Partial Right of Way Agreement for industrial Purpose Map Ta Phut Industrial Estate Dated 8 March 2013 – Underground Cable (No. 3/2556-NorPor)	IEAT	11 Years	For installation of underground cable (for customer – BST)
15. Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 15 June 2017 – Underground Raw Water Pipeline (No. 11/2556-NorPor)	IEAT	2 Years extendable	For installation of Underground Raw Water Pipeline
16. Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 22 September 2014– Underground Cable (No. 6/2557-NorPor)	IEAT	10 Years	For installation of underground cable (for customer – Solvay)
17. Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 26 March 2015 - Pipe Bridge (No. 4/2558-NorPor)	IEAT	30 Years	For installation of pipe bridge (for customer – Solvay)
Glow SPP 1 Co., Ltd.			
1. Right of Way Agreement Dated 1 January 2017– Underground transmission system (No.EIE001/2560)	EIE	19 Years extendable	For installation of the underground transmission system
2. Right of Way Agreement Dated 1 January 2017 – Underground Piping System (No.EIE002/2560)	EIE	7 Years extendable	For installation of the Underground Piping System

Description	Lessor	Lease Period	Objectives
Glow SPP 2 Co., Ltd.			
1. Partial Land Lease Agreement in Map Ta Phut Industrial Estate (Port) Dated 6 December 1996 – Phase 3(No. 4/2539-NorPor)	IEAT	28 Years	For installation of plant building and undertaking industrial business on generating power, steam and industrial water
2. Land Lease Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 13 August 1998 – Sub Station near Thasco Plant (No.1/2541-NorPor)	IEAT	28 Years	For installation of substation
3. Partial Land Lease Agreement in Map Ta Phut Industrial Estate Dated 19 December 2007 – Coal Stock Yard (No.2/2550-NorPor)	IEAT	30 Years and can be extended for another 20 years	For installation of coal stock yard
4. Right of Way Agreement Dated 1 January 2017 – Underground transmission system (No.EIE 003/2560)	EIE	7 Years extendable	For installation of the underground transmission system
Glow SPP 3 Co., Ltd.			
1. Partial Land Lease Agreement in Map Ta Phut Industrial Estate (Port) Dated 6 December 1996 – Phase 3 (No. 4/2539-NorPor)	IEAT	28 Years	For installation of plant building and undertaking industrial business on generating power, steam and industrial water.
2. Partial Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 23 January 2007 – Underground cable (No.2/2550-NorPor)	IEAT	28 Years and it can be extended for another 20 years	For installation of Underground Transmission Line

Description	Lessor	Lease Period	Objectives
3. Partial Right of Way Agreement for Undertaking Business which are Beneficial to or Relates to Business Undertaking in Map Ta Phut Industrial Estate Dated 2 October 2000 –230 KV Transmission Line (No.1/2543-NorPor)	IEAT	29 Years	For installation of 230 kV Transmission Line
4. Partial Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 2 October 2000 – 230 KV Transmission Line (No.4/2543-NorPor)	IEAT	29 Years	For installation of 230 kV Transmission Line
5. Partial Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 2 October 2000 – 230 KV Transmission Line (No.5/2543-NorPor)	IEAT	29 Years	For installation of 230 kV Transmission Line
6. Joint Agreement to develop an area to construct a shipping berth in the Industrial Estate Dated 7 August 2000 – Coal Harbor (No.2/2543)	IEAT	30 Years extendable	For development of area to construct a dedicated berth in Map Ta Phut Industrial Estate for transportation services of coals to be used in business of power plant and steam of the Company.
7. Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 30 March 2016– Intake Sea Water (No. 005/2560 -SorTorRor)	IEAT	1 Year extendable	For maintenance sea water intake structure for cooling system

Description	Lessor	Lease Period	Objectives
8. Partial Land Lease Agreement in Map Ta Phut Industrial Estate Dated 19 December 2007 – Coal Stock Yard (No.2/2550-NorPor)	IEAT	30 Years and can be extended for another 20 years	For installation of coal stock yard.
9. Right of Way Agreement in Map Ta Phut Industrial Estate (Port) Dated 30 September 2009 – Sea Water Intake underground tunnel (No.ForKorMor.TorLor.1/2552)	IEAT	27 Years extendable	For installation of Sea Water Intake underground tunnel
10. Right of Way Agreement in Map Ta Phut Industrial Estate (Port) Dated 30 September 2009 – Sea Water Discharge underground tunnel (No. ForKorMor.TorLor.2/2552)	IEAT	25 Years extendable	For installation of Sea Water Intake underground tunnel
11. Land Lease Agreement for Industrial Purpose Dated 30 January 2003 – Underground cable in AIE	PTT	16 Years	For installation of underground cable
12. Agreement of servitude Dated 1 August 2005 - Underground cable in AIE	AIE	14 Years	For installation of underground cable
13. Partial Agreement of servitude Dated 7 October 2009 - Underground cable in AIE	AIE	15 Years	For installation of underground cable
14. Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 1 July 2009 – 230 KV Transmission Line (No.1/2552)	PTT	20 Years extendable	For installation of 230 kV Transmission Line

Description	Lessor	Lease Period	Objectives
15. Partial Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 23 September 2011 – Underground Cable (No. 3/2554-NorPor)	IEAT	13 Years	For installation of underground cable (115 kv bundle)
16. Partial Right of Way Agreement for Industrial Purpose Map Ta Phut Industrial Estate Dated 8 March 2013 – Underground Cable (No.3/2556-NorPor)	IEAT	11 Years	For installation of underground cable (for customer – BST)
GHECO-One Co., Ltd.			
1. Partial Land Lease Agreement in Map Ta Phut Industrial Estate (Port) Dated 6 December 1996, Memorandum Dated 11 April 2008 – Phase 3 (No. 4/2539-NorPor)	IEAT	28 Years	For installation of plant building and undertaking industrial business on generating power, steam and industrial water.
2. Partial Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 2 October 2000 – Air right of 230 KV Transmission Line (No.1/2543-NorPor)	IEAT	29 Years	For undertaking business on air right of 230 kV Transmission Line
3. Partial Land Lease Agreement in Map Ta Phut Industrial Estate Dated 19 December 2007, Memorandum Dated 11 April 2008 – Coal Stock Yard (No.2/2550-NorPor)	IEAT	30 Years and can be extended for another 20 years	For installation of coal stock yard

Description	Lessor	Lease Period	Objectives
4. Partial Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 2 October 2000 – 230 KV Transmission Line (No.4/2543-NorPor)	IEAT	29 Years	For installation of 230 kV Transmission Line
5. Partial Right of Way Agreement for Undertaking Businesses which are Beneficial to or Related to Business Undertaking in Map Ta Phut Industrial Estate Dated 2 October 2000 – 230 KV Transmission Line (No.5/2543)	IEAT	29 Years	For installation of 230 kV Transmission Line
6. Right of Way Agreement in Map Ta Phut Industrial Estate (Port) Dated 30 September 2009 – Sea Water Discharge underground tunnel (No. ForKorMor.TorLor.3/2552)	IEAT	15 years extendable	For installation of Sea Water Discharge underground tunnel
7. Right of Way Agreement in Map Ta Phut Industrial Estate (Port) Dated 19 March 2010 - Coal Handling System (No.2/2553-NorPor)	IEAT	14 years extendable	For installation of coal handling system
Chonburi Clean Energy Co., Ltd.			
1. Land Lease Agreement in WHA Chonburi Industrial Estate 1 Dated 2 December 2016 – Power Plant (HRD 109/2559) Chonburi Clean Energy Co.,Ltd.	WHA	25 years extendable	For installation of plant building and undertaking industrial business on generating power

5. Disputes and Legal Proceedings

We are currently party to some pending litigations and engaged in the following disputes that could have adverse effect on our business:

5.1 EGAT

Glow Energy Public Co; Ltd. (Glow) is currently involved in a dispute with Electricity Generating Authority of Thailand (EGAT) regarding the different interpretation of a provision in respect of the expiry date of the term of the existing Power Purchase Agreement (PPA) for Glow Energy Phase 2 Project 1 for 90 MW under Small Power Producer (SPP) Scheme. Glow, as claimant, filed a Statement of Claim with the Thai Arbitration Institute (“TAI”) on 6 February 2018. EGAT, as Respondent submitted its statement of defense to the TAI on 26 July 2018. The matter is currently under arbitration proceedings. On 20 November 2018, the Arbitral Tribunal considered the Statement of Claim as amended and the Statement of Defense as amended, and then determined the points in dispute as agreed by both parties. The Arbitral Tribunal and the parties then established the preliminary procedural timetable for the proceedings. It was scheduled that the list of witness and evidences are to be submitted by 28 February 2019 and the hearing of witnesses will commence and end in March 2019. The award is expected to be rendered in May 2019.

5.2 Stop Global Warming Association

Stop Global Warming Association (“Plaintiff”) filed the statement of claim to Rayong Administrative Court against the competent authorities, namely Energy Regulatory Commission (“ERC”), Industrial Estate Authority of Thailand (“IEAT”), National Environment Board (“NEB”), Secretary of Office of Natural Resources and Environmental Policy and Planning (“ONEP”), alleging that such authorities unlawfully approved and granted permits to GHECO-One for operating the thermal power plant in the pollution control area. The statement of claim also requests the court to order the relevant authorities to revoke any permits granted to GHECO-One and suspend any activities of GHECO-One. The court eventually ordered to include GHECO-One as a co-defendant of the case, since it is the owner of the power plant and could be affected by court order and verdict. All defendants of the cases prepared their statement of defenses and separately submitted the same to the court in October 2013. The Plaintiff’s statement to provide additional information to Rayong Administrative Court to counter our defence was accepted by Rayong Administrative Court and submitted to us on 5 June 2014. GHECO-One submitted its counter-statement to the Rayong Administrative Court on 5 August 2014. On 28 September 2018, GHECO-One has received the Court Order setting the ending date of the facts inquiry on 29 October 2018. On 29 October 2018, GHECO-One submitted the Closing Statement summarizing the case including updates with aspect to current operational data. It could be expected that the judgment will be rendered within one year after the court’s having received the Closing Statement i.e. around October 2019.

GHECO-One has applied and obtained all permits in accordance with relevant laws and regulations, and has operated its plant compliant with the requirements in the approved Environmental and Health Impact Assessment report and relevant permits.

5.3 Revenue Department

GHECO-One is currently involved in disputes and pending litigations with the Revenue Department. The issue is related to tax liability on unrealized FX gains/losses during construction, which derived from the translation of foreign currency denominated loans into THB accounting figure in the financial statements. The Revenue Department opinion's that FX gain during construction shall be taxable while FX loss shall be capitalized as cost of the plant and not be considered a taxable expense, whereas GHECO-One disagrees. However, in order to mitigate exposure to surcharges and penalties, GHECO-One re-filed tax applications to pay corporate income tax and surcharge derived from FX gain/loss during 2008-2011, while reserving its of position that such payment is not deemed as agreeing with Revenue Department's opinion. GHECO-One then started a litigation process to get refunds of disputed tax amounts for year 2008-2011 as follows:

5.3.1 Litigation for tax refund for years 2008-2009

In December 2013, GHECO-One started litigation process by submitting statement of claim to the Central Tax Court for tax and surcharge paid for years 2008-2009. This claim (for years 2008/2009) has been dismissed by the Central Tax Court on 30 September 2014. The Court has objected that, at the time of submission of this claim, the plaintiff (GHECO-One) had not have the right to file such claim since the matter was still going through an appeal at the level of the Revenue Department.

On 26 May 2016, GHECO-One re-submitted statement of claim to Central Tax Court for tax and surcharge paid for years 2008-2009. The Statement of Defense by the Revenue Department was submitted to the Central Tax Court on 19 September 2016. The first hearing for setting out the issue to consider in this case was on 16 January 2017. The hearing of witnesses commenced on 7 March 2017 and finished on 10 March 2017. The Central Tax Court, in its final judgment on 29 May 2017, ruled in favor of GHECO-One, and ordered that the Revenue Department shall return all tax and surcharges paid by the Plaintiff (in an amount of THB 129.56 million) with applicable interest on such amount. The Revenue Department submitted its appeal to the Court of Appeal for Specialized Cases on 27 July 2017. GHECO-One submitted its response to the appeal on 28 September 2017. The Central Tax Court has sent the case to the consideration of the Court of Appeal for Specialized Cases. On 2 July 2018, the Court of Appeal for Specialized Cases upheld the decision made by the Central Tax Court and ruled that the Revenue Department is to refund the corporate income tax and surcharges totaling Baht 129.56 million, but dismissed GHECO-One's request for interest. On 30 August 2018, GHECO1 filed the appeal against the verdict of the Court of Appeal for Specialized Cases, on the interest issue only, to the Supreme Court. The Revenue Department also filed the appeal against the verdict of the Court of Appeal for Specialized Cases to the Supreme Court on 6 September 2018. On 28 November 2018, GHECO1 filed the answer to the appeal of the Revenue Department. Currently, both appeals are pending the Supreme Court's acceptance of the appeals.

5.3.2 Litigation for tax refund for the year 2010

On 14 October 2014, GHECO-One filed a statement of claim for refund of tax for the year 2010 with the Central Tax Court. GHECO-One received the statement of defense on 9 January 2015. The date to determine the points for the case was on 9 March 2015. The hearing of all witnesses finished on 10 July 2015. The Court, in its final judgment on 12 October 2015, ruled in favor of GHECO-One, and ordered that the Revenue Department shall return all tax and surcharges paid by the Plaintiff (in an amount of THB 466.19 million) with applicable interest on such amount. Revenue Department has

sought and obtained multiple extensions of the deadline to appeal against this verdict and finally submitted its appeal to the Supreme Court dated 8 March 2016. GHECO-One submitted the answer to the appeal on 8 June 2016. The Central Tax Court already sent the Court's file of this case which included all the petitions, all witness statements and all documentation evidences to the Supreme Court to consider the case on 10 June 2016. On 26 November 2018, the Supreme Court reversed the Central Tax Court's judgment and dismissed the Plaintiff's complaint. Thus, the Revenue Department does not have to return the tax to GHECO-One.

5.3.3 Litigation for tax refund for the year 2011

On 22 July 2016, GHECO-One filed a statement of claim for refund of tax for the year 2011 with the Central Tax Court in the amount of THB 41.475 million. The Statement of Defense by Revenue Department was submitted to the Central Tax Court on 10 November 2016. The first hearing for pre-consideration was set out on 28 November 2016. The first hearing for setting out the issue to consider in this case was scheduled by the Central Tax Court to be on 13 March 2017 and the hearing of witnesses commenced on 23 May 2017 and finished on 26 May 2017. On 20 July 2017, the Central Tax Court rendered its judgement and ruled that the Revenue Department is to refund the corporate income tax and surcharges totalling THB 32.15 million with interest. The Revenue Department submitted its appeal against the verdict of Central Tax Court to the Court of Appeal for Specialised Cases on 19 October 2017. GHECO-One submitted its response to the appeal on 27 December 2017. On 19 November 2018, the Court of Appeal for Specialised Cases upheld the decision made by the Central Tax Court and ruled that the Revenue Department is to refund the corporate income tax and surcharges totaling Baht 32.15 million but dismissed GHECO-One's request for interest.

The Revenue Department filed the writ of certiorari and an appeal to the Supreme Court on 18 December 2018, for which GHECO-One will file its objection to the writ of certiorari and the answer to such appeal by the extended deadline of 13 March 2019. In respect of the dismissal of its request for the interest on tax refunds, GHECO-One will file the writ of certiorari, together with an appeal to the Supreme Court, by the extended deadline of 13 March 2019.

6. General Information

Name	Glow Energy Public Company Limited
Initial	GLOW
Registered Number	0107538000461
Type of Business	Generate and supply of electricity, steam and processed water to industrial customers and electricity to Electricity Generating Authority of Thailand
Registered Capital	14,828,650,350 Baht (as of 31 December 2018)
Paid up Capital	14,628,650,350 Baht (as of 31 December 2018)
Head Office Location	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9 Web Site: http://www.glow.co.th
Plant Location	5, I-4 Road, Map Ta Phut Industrial Estate, Map Ta Phut, Muang District, Rayong 21150 Telephone: 66 (0) 3868-4078-80 Fax: 66 (0) 3868-4061
Other References	
Registrar	Siam Commercial Bank Public Company Limited Registrar 1, 15 th Floor, North Wing, G Tower Grand Rama 9, 9 Rama 9 Road, Huaykwang, Bangkok 10310 Telephone: 66 (0) 2128-2324-9 Fax: 66 (0) 2128-4625
Auditor	Deloitte Touche Tohmatsu Jaiyos Audit Company Limited AIA Sathorn Tower, 23 rd - 27 th Floor, 11/1 South Sathorn Road, Yannawa, Sathorn, Bangkok, 10120

Other subsidiary companies that the Company holds shares of more than 50 percent**1. Glow Company Limited**

Head Office Location	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9
Type of Business	Provide management services, consultant services and management advisory for related companies

2. Glow IPP Company Limited

Head Office Location	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9
Plant Location	42 Moo 8, CIE - 8 Road, WHA Chonburi Industrial Estate 1, Bowin, Sriracha District, Chonburi 20230 Telephone: 66 (0) 3834-5900-5 Fax: 66 (0) 3834-5906
Type of Business	Generate and supply electricity to EGAT

3. Glow SPP 1 Company Limited

Head Office Location	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9
Plant Location	10, Soi G-2, Pakornsongkrawhrat Road, WHA Eastern Industrial Estate (Map Ta Phut), Huaypong, Muang District, Rayong 21150 Telephone: 66 (0) 3868-5589 Fax: 66 (0) 3868-5104
Type of Business	Generate and supply electricity, steam and processed water to industrial customers and electricity to EGAT

4. Glow SPP 2 Company Limited

Head Office Location	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9
Plant Location	11, I - 5 Road, Map Ta Phut Industrial Estate, Map Ta Phut, Muang District, Rayong 21150 Telephone: 66 (0) 3869-8400-10 Fax: 66 (0) 3868-4789
Type of Business	Generate and supply electricity and steam for industrial customers and electricity to EGAT

5. Glow SPP 3 Company Limited

Head Office Location	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9
Plant Location	11, I - 5 Road, Map Ta Phut Industrial Estate, Map Ta Phut, Muang District, Rayong 21150 Telephone: 66 (0) 3869-8400-10 Fax: 66 (0) 3868-4789
Type of Business	Generate and supply electricity, steam, processed water to industrial customers and electricity to EGAT

6. Glow IPP 3 Company Limited

Head Office Location	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9
Type of Business	Develop power generation projects

7. Glow IPP 2 Holding Company Limited

Head Office Location	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9
Type of Business	Invest in other companies

8. GHECO-One Company Limited

Head Office Location	11, I - 5 Road, Map Ta Phut Industrial Estate, Map Ta Phut, Muang District, Rayong 21150 Telephone: 66 (0) 3869-8400-10 Fax: 66 (0) 3868-4789
Branch Office	1 Empire Tower, 38 th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Telephone: 66 (0) 2670-1500-33 Fax: 66 (0) 2670-1548-9
Plant Location	11, I - 5 Road, Map Ta Phut Industrial Estate, Map Ta Phut, Muang District, Rayong 21150 Telephone: 66 (0) 3869-8400-10 Fax: 66 (0) 3868-4789
Type of Business	Generate and supply electricity to EGAT

9. Houay Ho Power Company Limited

Head Office Location	Vieng Vang Tower (Unit 15), 5 th Floor, No. 502A, Boulichan Road, Dongpalan Thong Village, Sittasanak District, Vientiane Capital, Lao PDR Telephone: (856) 21 414932-3 Fax: (856) 21 414 934
Plant Location	P.O. Box 661 Pakse, Lao PDR. Telephone: (856) 36 211720-1 Fax: (856) 36 211719
Type of Business	Generate and supply electricity to EGAT and the Electricite Du Laos ("EDL")

10. Glow SPP 11 Company Limited

Head Office Location	60/19 Moo 3, Siam Eastern Industrial Park, Mabyangporn, Pluak Daeng, Rayong 21140 Telephone: 66 (0) 3889-1324-8 Fax: 66 (0) 3889-1330
Plant Location	60/19 Moo 3, Siam Eastern Industrial Park, Mabyangporn, Pluak Daeng, Rayong 21140 Telephone: 66 (0) 3889-1324-8 Fax: 66 (0) 3889-1330
Type of Business	Generate and supply electricity and chilled water for industrial customers and electricity to EGAT

11. Glow Energy Myanmar Company Limited¹

Registered office Room number 6004 Pyay Garden Office Tower, 346/354 Pyay Road, Sanchaung Township, Yangon

Type of Business Technical and consultancy services in power sector

Other affiliate companies that the company holds shares of less than 50 percent**1. Houay Ho Thai Company Limited**

Head Office Location 1 Empire Tower, 38th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120
Telephone: 66 (0) 2670-1500-33
Fax: 66 (0) 2670-1548-9

Type of Business Holding company

2. Glow Hemaraj Wind Company Limited

Head Office Location 1 Empire Tower, 38th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120
Telephone: 66 (0) 2670-1500-33
Fax: 66 (0) 2670-1548-9

Type of Business Develop waste-to-energy projects

3. Eastern Seaboard Clean Energy Company Limited

Head Office Location 1 Empire Tower, 38th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120
Telephone: 66 (0) 2670-1500-33
Fax: 66 (0) 2670-1548-9

Type of Business Holding company

4. Rayong Clean Energy Company Limited

Head Office Location 1 Empire Tower, 38th Floor-Park Wing, South Sathorn Road, Yannawa, Sathorn, Bangkok 10120
Telephone: 66 (0) 2670-1500-33
Fax: 66 (0) 2670-1548-9

Type of Business Develop waste-to-energy projects

¹ Glow Energy Myanmar Company Limited changed its name from ENGIE Myanmar Company Limited in October 2018.

5. Chonburi Clean Energy Company Limited

Head Office Location 1 Empire Tower, 38th Floor-Park Wing, South Sathorn Road, Yannawa,
Sathorn, Bangkok 10120
Telephone: 66 (0) 2670-1500-33
Fax: 66 (0) 2670-1548-9

Type of Business Develop waste-to-energy projects