



# Extended Annual Review Report

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Project Number: 46907-014  
Loan Number: 2912  
November 2019

## Gulf JP UT Company Limited Ayudhaya Natural Gas Power Project (Thailand)

This is an abbreviated version of the document, which excludes information that is subject to exceptions to disclosure set forth in ADB's Access to Information Policy.

**Asian Development Bank**



## CURRENCY EQUIVALENTS

Currency unit – baht (B)

		<b>At Appraisal</b>	<b>At Project Completion</b>
		16 August 2012	10 February 2017
B1.00	–	\$0.03	\$0.03
\$1.00	–	B31.54	B31.00

## ABBREVIATIONS

ADB	–	Asian Development Bank
CCGT	–	combined-cycle gas turbine
COD	–	commercial operation date
EGAT	–	Electricity Generating Authority of Thailand
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EPC	–	engineering, procurement, and construction
ERC	–	Energy Regulatory Commission of Thailand
GED	–	Gulf Energy Development Public Company Limited
GNS	–	Gulf JP NS Company Limited
GSRC	–	Gulf SRC Company Limited
Gulf JP	–	Gulf JP Company Limited
GUT	–	Gulf JP UT Company Limited
HSE	–	health, safety, and environmental
IPP	–	independent power producer
J-POWER	–	Electric Power Development Company Limited
Lao PDR	–	Lao People's Democratic Republic
LTPA	–	long-term parts agreement
MEA	–	Metropolitan Electricity Authority
MHI	–	Mitsubishi Heavy Industries
O&M	–	operation and maintenance
ONEP	–	Office of Natural Resources and Environmental Policy and Planning
PDF	–	Power Development Fund
PEA	–	Provincial Electricity Authority
PPA	–	power purchase agreement
PPP	–	public–private partnership
PSD	–	private sector development
PTT	–	PTT Public Company Limited
RIP	–	Rojana Industrial Park
ROW	–	right-of-way
RRP	–	report and recommendation of the President
US	–	United States

## WEIGHTS AND MEASURES

GWh	–	gigawatt-hour
km	–	kilometer
kV	–	kilovolt
kWh		kilowatt-hour
MW	–	megawatt

## NOTES

- (i) The fiscal year (FY) of Gulf JP UT Company Limited ends on 31 December. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2000 ends on 31 December 2000.
- (ii) In this report, "\$" refers to United States dollars.

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**BASIC DATA**  
**Ayudhaya Natural Gas Power Project**  
**(Loan No. 2912 – Thailand)**

<b>Key Project Data</b>	<b>As per ADB Loan Documents</b> (\$ million)	<b>Actual</b> (\$ million)
Total project cost	1,651	1,516.20
ADB investment:		
Loan:		
Committed	185	184
Disbursed		172.445
<b>Project Administration and Monitoring</b>	<b>No. of Missions</b>	<b>No. of Person-Days</b>
Due diligence and loan negotiation	NA	NA
Project administration	2	9.0
XARR mission	1	12.5 <sup>a</sup>

ADB = Asian Development Bank, NA = not applicable, Q = quarter, XARR = extended annual review report.

<sup>a</sup> The total XARR mission field days were divided equally between Gulf JP UT Company Limited and Gulf JP NS Company Limited.

Source: ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Gulf JP UT Company Limited for the Ayudhaya Natural Gas Power Project.* Manila.

## EXECUTIVE SUMMARY

The project consists of the design, construction, and operation of a 1,600-megawatt combined-cycle natural gas power plant on a 25-year build–own–operate basis in Ayutthaya Province, Thailand. The project was awarded to Gulf JP Company Limited (Gulf JP) as part of the second independent power producer bidding round in Thailand in 2007. In October 2012, ADB approved a loan of \$185.0 million to Gulf JP UT Company Limited (GUT), a special-purpose company set up to implement the project. Several international financiers and Thai banks participated in the financing of the project with senior loans totaling \$1,253 million.

The project was designed to provide reliable, least-cost, baseload power to Thailand. It was awarded in 2007, commenced construction in December 2012, and achieved commercial operation in December 2015. The project was completed on schedule and 8% under budget at a cost of B1,516 million.

Overall, the project was rated *successful*, based on the criteria in (i) the project Administration Instructions 6.07B on the preparation of extended annual review reports for nonsovereign operations, issued in July 2008; and (ii) the Guidelines for the Preparation of Project Performance Evaluation Reports on Nonsovereign Operations, issued in November 2014. The four main criteria used were development results, ADB's additionality, ADB's investment profitability, and ADB's work quality. Development results were evaluated based on (i) contributions to private sector development and ADB's strategic development objectives; (ii) economic performance; (iii) environmental, social, health, and safety performance; and (iv) business success.

The contributions to private sector development and ADB's strategic development objectives were rated *satisfactory*. The project met its major development targets, which included the successful commissioning a 1,600-megawatt combined-cycle gas turbine power plant, employing more than 1,200 people during construction and more than 70 permanent staff during operation, and purchasing significant quantities of goods and services locally during construction. However, it only partially achieved its annual energy generation target because of low dispatch from the Electricity Generating Authority of Thailand. The project nevertheless continues to serve as a reliable peaking plant, which is critical to ensuring energy security in Thailand.

The project was rated *satisfactory* for economic performance.

The project was rated *satisfactory* for environmental, social, health, and safety performance. It has complied with national laws and regulations, as well as ADB's Safeguard Policy Statement (2009). A comprehensive environmental management plan and an environmental monitoring plan were formulated as part of the approved environmental impact assessment report. The project has set a prominent industry standard for community relations by establishing the Power Plant Environmental Inspectors Committee and the Joint Community Participation Committee to review environmental, social, and health performance and the status of compliance, and to promote trust and confidence between communities and the project.

Business success was rated *excellent*.

ADB's additionality was rated *satisfactory*. ADB played a catalytic role by providing long-term financing of 23 years and thus encouraging local commercial banks to extend their loan terms to 23 years to support the transaction. ADB's participation further enhanced the confidence of local and international private investors in mobilizing capital to undertake megaprojects in Thailand.



The project demonstrated the critical role of the private sector in the viability of large-scale infrastructure projects like GUT that require substantial capital investments.

ADB's investment profitability was rated *satisfactory*.

ADB's overall work quality was rated *satisfactory*. ADB monitored the evolution of the second independent power producer bidding process and efficiently processed the loan to GUT and to its sister project, Gulf JP NS Company Limited (GNS). ADB played a leading role in mobilizing external debt for the project and moving the lenders to extend their loan maturities beyond the customary tenors. The quality of ADB's monitoring and supervision was also satisfactory. ADB has a strong relationship with the client group, which has enabled multiple repeat transactions with the group.

Key issues and lessons for ADB from this project are as follows.

- (i) Strong contract structures and credible counterparties are of key importance in attracting long-term lenders and investors.
- (ii) ADB's early engagement with the Gulf Group helped the emergence of a regional player.
- (iii) GUT's dispatch rate has remained low since the project began commercial operation in 2015. Low dispatch rates over the long-term raise concerns about project sustainability and heighten the risk of tariff renegotiation. However, this evaluation believes that such risks are remote but need to be monitored closely.
- (iv) The project set standards for community participation.



## I. THE PROJECT

### A. Project Background

1. The Ayudhaya Natural Gas Power Project consists of the design, construction, and operation of a 1,600-megawatt (MW) combined-cycle gas turbine (CCGT) power plant on a 25-year build-own-operate basis at the Rojana Industrial Park (RIP) in Ayutthaya Province, Thailand. The project sells power under a 25-year power purchase agreement (PPA) to the Electricity Generating Authority of Thailand (EGAT), the national power utility.<sup>1</sup> In 2012, the Asian Development Bank (ADB) appraised the cost of the project at \$1,651 million. In October 2012, ADB granted a loan of \$185.0 million to Gulf JP UT Company Limited (GUT), a special-purpose company set up to implement the project.<sup>2</sup> Several international financiers (including the Japan Bank for International Cooperation, the Bank of Tokyo-Mitsubishi UFJ, Ltd., and Sumitomo Mitsui Banking Corporation) and Thai banks cofinanced the project with senior loans totaling \$1,253 million.

2. The project was awarded to Gulf JP Company Limited (Gulf JP) as part of the second independent power producer (IPP) bidding round in Thailand in 2007. It was the second IPP that was awarded to Gulf JP in the same bid round; the first was for the Nong Saeng power plant. ADB participated in the financing of the Nong Saeng Natural Gas Power Project in 2011 and its follow-on project the Ayudhaya Natural Gas Power Project in 2012.

3. The origins of these two natural gas projects date to the mid-1990s, when the Government of Thailand decided to deregulate the electricity sector and encourage private sector participation. The objective was to improve sector efficiency, promote competition, and lower electricity prices for end consumers. The government, through the Ministry of Energy, invited bids for its first IPP bid process, in 1994, which was deemed successful.<sup>3</sup> This was followed by a hiatus for new IPP issuances, as electricity demand dipped after the Asian financial crisis of 1997. However, with a steady pickup of economic growth and electricity demand by mid-2000s, the Ministry of Energy invited bids for the second IPP bidding round in 2007. This bid round attracted 20 qualified bidders with a total capacity of 17,407 MW, of which 4 were selected on a least-cost basis.

4. The project was designed to provide reliable, least-cost baseload power to Thailand. It was awarded in 2007, with an expected commercial operation date (COD) of between 2012 and 2014. At the time, it was believed that (i) electricity demand would continue to grow in line with Thailand's historical trend rate of 4.22% per year during 2010–2030; (ii) scheduled plant retirements could result in Thailand's reserve margin dropping from 27.6% in 2009 to 15.0% by 2030; and (iii) to maintain an adequate reserve margin (above 15.0%), the Thailand Power Development Plan 2007–2021 (PDP 2007) noted that the country would need to add 54,005 MW of generation capacity by 2030 to its existing capacity of 29,212 MW.<sup>4</sup>

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<sup>1</sup> Thailand's power sector is structured under a single-buyer model whereby EGAT—the sole state transmission utility and major generator—supports private participation in generation while controlling the system planning, operation, and pricing functions.

<sup>2</sup> ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Gulf JP UT Company Limited for the Ayudhya Natural Gas Power Project in Thailand*. Manila.

<sup>3</sup> During the first IPP bidding round, EGAT offered 5,934 MW of capacity. In this round, 88 bids were received and 7 bidders were eventually awarded 6,695 MW of capacity.

<sup>4</sup> Electricity Generating Authority of Thailand. 2007. *Thailand Power Development Plan, 2007–2021*. Bangkok.

## B. Key Project Features

5. **Plant configuration.** The project has a nominal capacity of 1,600 MW, split into 2 blocks of 800 MW.<sup>5</sup> The project's use of Mitsubishi M701F4 gas turbines was considered prudent because (i) the gas turbine model was an evolutionary upgrade to Mitsubishi's proven F-series model (first introduced in 1992, with the latest model dated 2009), which made it a reliable design, capable of exceeding the PPA's stipulations; (ii) the gas turbines reported a thermal efficiency of 50%, which was higher than prevalent gas turbine efficiency levels in Thailand. This reassured the plant's owner and the lenders that the plant would achieve high merit order among competing CCGT IPPs;<sup>6</sup> (iii) the gas turbines resulted in low nitrogen oxide and noise emissions, which made them compliant with national air quality standards; and (iv) the gas turbines' flexibility to declare availability using natural gas or fuel oil mitigated supply interruption risks.<sup>7</sup>

6. **Power purchase agreement.** The project signed a 25-year PPA with EGAT in October 2008, under which the plant receives availability payments and energy payments.<sup>8</sup> The availability payments cover the project's capital expenditure, fixed maintenance expenditure, return on equity, and debt repayments. The fixed tariff includes a United State (US) dollar component, wherein 50% of the payment was indexed to US dollars. This largely mitigated currency risk to the project. The energy payment component of the tariff, comprising fuel cost and variable operation and maintenance (O&M) expenses, provided a pass-through of fuel and variable O&M costs to EGAT. The PPA structure, together with a credible offtaker, resulted in GUT receiving adequate cashflows to cover debt servicing despite low dispatch rates since the COD.

7. **Gas sales agreement.** GUT receives natural gas under a 25-year gas sales agreement with PTT Public Company Limited (PTT). The agreement, which is governed by the 1996 master IPP program gas sales agreement between PTT and EGAT, mitigates key risks for the project. EGAT bears the gas availability risk and minimum take-or-pay obligation toward PTT. Since the IPP's PPA does not have a minimum dispatch requirement, no take-or-pay is imposed on the IPP.

8. **Associated facilities.** A 20.3-kilometer (km) gas pipeline was laid to receive gas from PTT's Wang Noi–Kaeng Koi gas metering station and a 16.4 km transmission line was erected by EGAT (reimbursed by GUT) to transmit electricity from the GUT plant to the Pha Chi 2 substation. An "added facility charge" was included in the PPA to cover for the construction of the associated facilities. EGAT conducted the power flow study while deciding on the interconnection.

9. **Engineering, procurement, and construction and operation and maintenance contract.** The project was implemented under a fixed-price, date-certain turnkey engineering, procurement, and construction (EPC) contract structure. The EPC contractor was competitively selected and awarded to a consortium of Mitsubishi Heavy Industries (MHI), the equipment

<sup>5</sup> Each block includes (i) two Mitsubishi M701F4 gas turbines, each with its own generator, capable of operating using natural gas or fuel oil; (ii) two heat recovery steam generators, coupled with the gas turbine to recover exhaust heat; and (iii) one steam turbine fed with steam generated from the heat recovery steam generators. Each block had a dedicated and independent closed cooling water system.

<sup>6</sup> Poyry. *Final Technical Due Diligence Report for Gulf Sriracha Combined Cycle Natural Gas Power Plant Project in Thailand*. 25 October 2018. According to the lender's technical advisor, GUT would report 50% thermal efficiency compared to 45%–50% for EGAT CCGT plants, 47%–50% for other CCGT IPPs and small power producers, 36%–37% for existing gas turbine power plants, and 30%–37% for coal-fired power plants (on a higher heating value basis at full load).

<sup>7</sup> The project uses diesel oil as a back-up supply and during the fuel switching-over tests requested by EGAT. This accounted for less than 0.4% of total fuel consumption in 2018.

<sup>8</sup> The PPA was amended twice, in June 2009 and May 2011, to extend the implementation dates for the project. In the aftermath of the global financial crisis, larger projects faced a greater challenge in reaching financial closure and, with low growth in electricity demand, the need for large IPPs was reduced.

supplier, and Sino-Thai Engineering and Construction Public Company Limited, the contractor. Both contractors had significant experience in their fields, and work was managed through a coordination agreement with joint and several obligations imposed by GUT on the two contractors. The project also entered into a 25-year long-term parts agreement (LTPA) with MHI for repair works and supply of parts for turbines with a 2% annual price escalation.<sup>9</sup> O&M works are carried out by Gulf JP, which has a strong record of running power plants in Thailand.

10. **Project structure.** Gulf JP, the project's sponsor, is a holding company with 60% ownership by the Electric Power Development Company Limited (J-POWER), Japan's largest wholesale electricity provider, and 40% by the Gulf Energy Development Public Company Limited (GED), a leading IPP developer in Thailand.<sup>10</sup>

11. **Flood risk mitigation.** Flooding was a major concern for the project site, as the earth dyke protecting the RIP was overtopped during the 2011 floods in Thailand. A review of flood protection measures recommended constructing a high flood wall to protect against the 100-year flood. Consequently, a 6.05-meter wall was built around the project in 2013.<sup>11</sup> Further, in the absence of enough insurance cover available in Thailand for flood risk, up to B4,650 million of additional sponsor support was negotiated against flood damages not reimbursed by insurers.

12. **Power Development Fund.** A unique feature of the PPA was that GUT had to contribute B0.01 per kilowatt-hour (kWh) of electricity sold to EGAT to the Power Development Fund (PDF). The PDF, which is administered by the Energy Regulatory Commission of Thailand (ERC), then spent this amount on community development projects in the vicinity of the project. GUT was actively involved with local communities in drafting funding proposals to the ERC to seek grants for local projects. The local communities have benefited from the PDF through local job creation; income generation projects; and improved infrastructure such as hospital facilities and roads.

### C. Progress Highlights

13. The project commenced construction after GUT issued the notice to proceed in December 2012. The lenders' technical advisor reported no significant delays or technical issues during the plant's construction and commissioning. In September 2014, GUT required a minor rerouting of the gas pipeline.<sup>12</sup> The project achieved the COD for Unit 1 in June 2015, and the final COD was 1 December 2015, as planned, after the completion of Unit 2. However, project completion was delayed by 2 months because of delays in filing work and completion of administrative milestones. The project was eventually completed on schedule and under budget. The actual project cost was B1,516 million, which was B135 million (8%) less than the original budget. From the COD of Unit 1 in June 2015 to the end of 2018, a total of 13,459,288 megawatt-hours of electricity were sold to EGAT. The plant's operational performance was satisfactory, with average availability reported

<sup>9</sup> According to MHI, this provided a competitive advantage for the project. Before the project, LTPAs with a duration of 25 years were rare. However, Gulf JP's ability to secure such long-term parts agreements from MHI demonstrated their commercial acumen and negotiation abilities. Gulf JP was able to leverage their order book (for 3,200 MW across two IPPs) to secure favorable EPC and LTPA prices, which eventually allowed them to offer a lower tariff during the bidding. Note that the availability payment received from EGAT covers annual LTPA payments; therefore, no financial impact is caused by the low dispatch rate in relation to the LTPA.

<sup>10</sup> Gulf JP was established in 2007 as an investment vehicle of J-POWER to develop new IPP and small power producer projects in Thailand. In April 2012, GED bought a 10% shareholding in Gulf JP, while J-POWER, through its subsidiary, owned 90% of Gulf JP. In August 2016, GED purchased 30% more shares in Gulf JP, resulting in 40% ownership in Gulf JP in 2019.

<sup>11</sup> Poyry. *Lenders' Technical Advisor Rojana Dyke Annual Monitoring Report for 2018*. 28 August 2018.

<sup>12</sup> This only involved a change of pipe-laying method from an open-cut to a horizontal-drilling method to better mitigate environmental and social aspects. The pipeline route was the same as indicated in the environmental impact assessment (EIA) report and the minor change did not affect the commercial operation date.

at 97.5% compared with 94.4% forecast at appraisal. However, the plant's average dispatch of 27.6% has been well below RRP target of 89.5% expected at appraisal. This was attributed to four factors. First, electricity demand in Thailand was lower than expected. While the Thailand Power Development Plan 2012–2030 expected an annual gross domestic product growth rate of 4.3% during 2011–2030, the actual growth rate was 3.1%. Second, growth of electricity imports (mainly hydropower) from neighboring countries, including the Lao People's Democratic Republic (Lao PDR) and Myanmar, was higher than anticipated. The total import capacity increased from 640 MW in 2007 to 3,878 MW in 2018. As hydropower was placed higher in Thailand's merit order because gas is an expensive fuel, it displaced gas-based plants. Third, adoption of infirm (renewable) power sources was much faster than expected. The share of renewables in Thailand's energy generation, including hydropower and imports, rose from 13% in 2012 to 22% in 2018. Finally, EGAT dispatched its own gas plants at a higher rate than the IPPs. This was because EGAT's plants were tied to industrial consumers, which need continuous operations of those less-efficient plants for their steam and electricity requirements. While the project reported a consistent 95% start-up success rate, it has occasionally incurred dispatch penalties for failing to respond to EGAT's dispatch instructions. These failures were mostly caused by minor incidents. However, the project maintained a high availability rate of 97.4% in 2018, and the penalty was minimal, accounting for less than 0.5% of total revenue. It is too early in the project's life cycle to determine whether the occasional dispatch failure is indicative of any persisting technical issues.

## II. EVALUATION

### A. Project Rationale and Objectives

14. At inception, the project's rationale and objectives were aligned with the following strategies (i) ADB's country partnership strategy for Thailand, 2007–2011, which focused on infrastructure development and environmental sustainability; (ii) ADB's Strategy 2020, which focused on inclusive growth through sustainable and private sector-led development; and (iii) ADB's Energy Policy, which aimed to support energy efficient technologies, such as CCGT, and projects that provided least-cost power supply (footnote 2).<sup>13</sup> This evaluation of the GUT project focuses on the project's performance against four criteria: the project's development results, ADB's investment profitability, the quality of ADB's work, and ADB's additionality.

### B. Development Results

#### 1. Contribution to Private Sector Development and ADB Strategic Development Objectives

15. The project's contribution to private sector development (PSD) and to ADB strategic development objective is rated as *satisfactory*.

16. **Contribution to private sector development.** A comparison of the project's actual PSD outcomes against its ex ante design and monitoring framework indicators, shows that most PSD indicators were met. The project's implementation improved the stability of Thailand's grid by providing quick-response peaking power during a period of significant expansion in the country's infirm renewables capacity (solar, wind, and imported hydro). The plant consistently declared an availability level of more than 97% and a 95% start-up rate, ensuring grid stability and reliable power to Thai consumers. The project increased the use of public–private partnerships (PPPs) in the Thai power sector. The successful implementation of the GUT and Gulf JP NS Company

<sup>13</sup> ADB. 2017. *Country Partnership Strategy: Thailand, 2007–2011*. Manila; ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila; and ADB. 2009. *Energy Policy*. Manila.

Limited (GNS) projects strengthened the confidence of private players in Thailand's IPP framework. The success of the IPP program gave confidence to foreign players to reenter the Thai energy sector and led to the emergence of multiple local private IPPs, such as Gulf Group, B.Grimm Group, and Glow Group. This resulted in greater competitive tension during more subsequent power bids.

17. **Direct company impacts.** The direct development outcomes and impacts from the project were as follows.

- (i) **Successful commissioning.** The 1,600 MW CCGT power plant was commissioned on time (by 2015) and within budget.
- (ii) **Local purchase of goods.** The project resulted in the procurement of \$762 million<sup>14</sup> of local goods and services during construction, which was significantly higher than the \$30 million expected in the RRP.
- (iii) **Generation of clean energy.** During 2016–2018, the project generated 3,569 GWh per year of “clean power” (i.e., power generated using natural gas). This amount was much lower than the ex ante target of 11,500 GWh set in the RRP. This outcome was beyond the control of the project, as it depended on EGAT's dispatch instructions and assumed the project would function as a baseload plant with a dispatch rate of more than 89%. Although the project did not meet its clean energy generation target, this evaluation suggests that the broader goal—of lower carbon dioxide emissions as a result of the project's operations—has been partly achieved. This is because the project's implementation complemented and supported the ramp-up of renewable energy generation in Thailand, from 2,457 GWh in 2007 (1.7% of total national generation) to 17,800 GWh in 2018 (8.7% of total national generation); and electricity imports, mainly from Lao PDR hydro projects, increased faster than expected from 4,488 GWh (3.1% of total generation) in 2007 to 26,669 GWh (13.1% of total generation) in 2018. Since power generators that use hydro and renewables rank higher than CCGT in the Thai merit order, it is understandable that the system operator dispatched those generators first. However, the economic value (in terms of system stability and energy security) provided by these CCGT IPPs provides a crucial backup to ensure the continued growth of renewables in Thailand.
- (iv) **Merit order ranking.** The project achieved a mid-merit order among IPP gas-fired plants in 2016, serving as a peaking plant by offering a cost-efficient alternative to cheaper coal-fired power plants given its higher efficiency of 50%, compared with 45%–50% for CCGT projects and 36%–37% for gas turbine power plants.
- (v) **Job creation.** The project met its targets for creating new jobs by directly employing 4,569 people during the peak of construction, and an average of 1,915 during the construction period overall compared with a target of 1,200 full-time-equivalent workers. Further, during the post-COD period, the project hired an average of 70 permanent staff, as well as 59 contract workers, most of whom were outsourced security, gardening, and housekeeping staff, compared with a target of 70 permanent jobs during operation.
- (vi) **Taxes.** GUT is under an 8-year corporate tax holiday. However, it is expected to pay \$200 million in taxes during its project life (2023–2036)

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<sup>14</sup> This includes the total expenditure incurred on domestic EPC works (including labor costs) and associated facilities.

## 2. Economic Performance

18. The project's economic performance is rated *satisfactory*.

## 3. Environmental, Social, Health, and Safety Performance

19. The project's environmental, social, health, and safety performance is rated *satisfactory*. The project was classified category A for environment based on ADB's Safeguard Policy Statement (2009), requiring the preparation of an environmental impact assessment (EIA). The Office of Natural Resources and Environmental Policy and Planning (ONEP) issued the environmental approval on 21 February 2012. The power plant is located inside the RIP, and the RIP is responsible in treating the wastewater before discharging it to the receiving water. The wastewater treatment plant is located about 3 km from the power plant and the nearest residential area is about 0.5 km from the treatment plant.

20. A comprehensive environmental management plan and an environmental monitoring plan were also formulated as part of the approved EIA. The environment, social, health, and safety (ESHS) performance and compliance of the project were reviewed and evaluated during the extended annual review report mission conducted on 9 May 2019. The review involved a site visit and meetings with the management team and ESHS staff assigned at the corporate and plant level. The mission confirmed that the company had implemented the environmental and social mitigation measures and monitoring program during construction and operation as required in the EIA report. GUT engaged a third-party environmental consultant to conduct the required monitoring of potential environmental impacts, and the results showed that all parameters complied with Thailand national laws, regulations, the EIA limit, and international standards.<sup>15</sup> GUT submits environmental and social monitoring reports to ONEP and ADB on time. There have been no noise complaints and no barrier was installed because the power plant is located inside the industrial area.<sup>16</sup>

21. GUT established third-party environmental and social monitoring committees to review ESHS performance and the status of compliance with national laws and regulations. To promote trust and confidence in the operation of the plant, these committees are tasked with updating the communities about the status of ESHS performance and compliance. The grievance redress mechanism has been set up and any issues with the contractor during construction stage have been resolved. During the operation stage, no fines or penalties were incurred because of environmental noncompliance, and no material environmental claims were filed against GUT by the community or nongovernment organizations. However, during the construction phase, pipe-laying activities led to bentonite leakage in an orchid farm. The incident was resolved immediately. Spill-control material and equipment were immediately prepared for land containment and restoration, and all leakages were addressed.<sup>17</sup> The owner of the orchid farm filed a case in 2016, and GUT is awaiting the final court decision on compensation for the damaged farm assets and property. GUT is committed to continuously implement the best available pollution control technology to ensure that its work force and the communities are not harmed.

22. The project was categorized C for involuntary resettlement and indigenous peoples based on ADB's Safeguard Policy Statement. The power plant occupies 48 hectares of land that the

<sup>15</sup> The third-party environmental consultant develops an environmental and social monitoring report that is reviewed by the lender's technical advisor before its submission to ADB and ONEP.

<sup>16</sup> Nevertheless, GUT has conducted a noise study since 2018 to help improve overall power plant operation in terms of environmental, social, health, and safety impacts.

<sup>17</sup> Bentonite is harmful, and leakage is a normal situation that routinely occurs during horizontal direct drilling. To correct it, containment, collection, clean up, restoration, and disposal was done by the contractor. The bentonite leakage occurred inside the orchid farm and did not contaminate the public watercourse.



borrower acquired from the RIP. The gas pipeline has a total length of 20.3 km, 19.5 km of which is within the existing rights-of-way (ROWs) of EGAT and the Royal Irrigation Department. The borrower acquired the remaining 0.8 km ROW. EGAT constructed and secured the ROW for the 16.4 km transmission line as part of the PPA. The industrial site where the power plant is located and its surrounding areas have no record of settlement of any ethnic groups that meet Safeguard Policy Statement criteria to be considered indigenous peoples.

23. The project employed an average of 1,915 full-time-equivalent workers during construction (2012–2015), and 70 permanent staff and 59 contract workers during operation. During the Team’s visit in June 2019, GUT has 63 permanent staff and 68 local workers outsourced—27 women and 41 men—for housekeeping, gardening, and security services. There are no reported cases on noncompliance of the contractor and subcontractors with national labor laws. GUT’s assistant vice-president and assistant manager for community relations are in charge of handling grievances, management, and coordination of activities with the community and local government agencies including corporate social responsibility activities. The surrounding communities benefited from several community activities and projects through GUT’s corporate social responsibility activities, as well as from the ERC-administered PDF contribution. No major accidents or fatalities were reported during construction and operation stages.

#### 4. Business Success

24. The project is rated *excellent* for business success. The plant’s operating performance during 2016–2018 is in Table 1.

**Table 1: Operating Performance**

	2016	2017	2018
<b>Unit 1</b>			
	<b>Actual</b>	<b>Actual</b>	<b>Actual</b>
Energy dispatched (GWh)	2,391	1,907	1,058
Dispatch rate (%)	35.5	27.8	15.7
Average availability (%)	92.9	98.7	97.4
<b>Unit 2</b>			
Energy dispatched (GWh)	2,534	2,233	541
Dispatch rate (%)	36.3	38.2	11.9
Average availability (%)	99.8	98.7	97.3
<b>Unit 1 + Unit 2</b>			
Energy dispatched (GWh)	4,925	4,140	1,599
CO <sub>2</sub> emission reduction (tons)	2,133,580	1,793,412	737,006

CO<sub>2</sub> = carbon dioxide, GWh = gigawatt-hour, RRP = report and recommendation of the President.

Sources: Lender’s technical advisor operations reports; GUT; ADB estimates; and ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Gulf JP UT Company Limited for the Ayudhya Natural Gas Power Project*. Manila.

#### C. ADB’s Additionality

25. ADB’s additionality was rated *satisfactory*.

26. **Financial additionality.** During project preparation in 2011, Thailand faced the challenges of (i) securing long-term US dollar financing, which was much needed for large IPP projects; and (ii) the country’s slow reemergence from the 2008 global economic crisis, which made investors cautious about making long-term investments there. ADB played a catalytic role at this time, both for the IPP program and GUT, by extending sufficiently long-dated financing of

23 years. Before ADB's offer of 23-year debt, most foreign banks in Thailand would only offer tenors of up to 15 years, and local Thai banks offered tenors of up to 17 years. ADB's presence was therefore critical for obtaining significant long-term foreign and local currency financing for the first set of IPP projects after the global financial crisis. This eventually allowed the project sponsors to offer a lower and more competitive tariff during the bid stage.

27. **Nonfinancial additionality.** ADB's rigorous due diligence and safeguard requirements provided the comfort needed for the Japan Bank for International Cooperation to participate, and this in turn induced other Japanese banks to support the project. ADB's safeguard requirements and advice strengthened the company's pollution control and abatement practices.

#### D. ADB's Investment Profitability

28. ADB's investment profitability is rated *satisfactory*.

#### E. ADB's Work Quality

29. **Screening, appraisal, and structuring.** ADB's overall performance in relation to screening, appraisal, and structuring is rated *satisfactory*. ADB closely monitored the progress of the second IPP bid round from the start. This led a significant amount of project preparatory safeguards due diligence work being completed before concept clearance. Thereafter, ADB processed the transaction in a reasonably short time.<sup>18</sup> ADB also played a key role in mobilizing external debt finance, and worked with other lenders to extend their loan tenors for this project. The successful financial close of the two IPP projects also created a market reference point for future project financing in Thailand. ADB's role in the transaction was widely acknowledged by the marketplace, and the transaction was awarded the 2012 Asia-Pacific Power Deal of the Year by *Project Finance International* magazine.

30. **Monitoring and supervision.** ADB's monitoring and supervision are rated *satisfactory*. ADB managed the 10 loan disbursements from November 2012 to April 2016 efficiently. ADB promptly consented to the borrower's requests for waivers and amendments to existing agreements, subject to thorough reviews. ADB kept itself updated on the project and the borrower's performance in all material areas through monitoring reports submitted by the borrower and site visits. GUT confirmed the satisfactory working relationship with ADB during the site visit. When ADB staff changed, handovers were conducted well with standardized handover checklists, formal meetings, and timely notice to the client.

#### F. Overall Evaluation

31. Overall, the project is rated *successful*. The ratings are summarized in Table 3. The project is a strong example of ADB's strategy of promoting private sector participation through PPPs for infrastructure projects to ensure economic growth. ADB mobilized commercial cofinancing and achieved financial close for this project, demonstrating the use of efficient technology; cross-border cooperation; and international standards in ESHS practices.

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<sup>18</sup> The concept clearance was obtained on 5 March 2012. After conducting detailed due diligence, the ADB Board of Directors granted its approval on 2 October 2012 and finance documents were executed on 24 October 2012.

**Table 3: Evaluation of the Ayudhaya Natural Gas Power Project**

Indicator/Rating	Less than			
	Unsatisfactory	Satisfactory	Satisfactory	Excellent
<b>Development results</b>				
(i) Contributions to private sector development and ADB strategic development objectives			✓	
(ii) Economic performance			✓	
(iii) Environmental, social, health, and safety performance			✓	
(iv) Business success				✓
<b>ADB additionality</b>			✓	
<b>ADB investment profitability</b>			✓	
<b>ADB work quality</b>			✓	
(i) Screening, appraisal, and structuring			✓	
(ii) Monitoring and supervision			✓	
	<b>Unsuccessful</b>	<b>Less than Successful</b>	<b>Successful</b>	<b>Highly Successful</b>
<b>Overall Rating</b>			✓	

ADB = Asian Development Bank.  
Source: ADB.

### III. ISSUES, LESSONS, AND RECOMMENDED FOLLOW-UP ACTIONS

#### A. Issues and Lessons

32. **Strong contract structures and credible counterparties are key to attracting long-term lenders and investors.** In the aftermath of the credit crisis, investors were apprehensive about the attractiveness of IPP projects and the availability long-term US dollar debt to enable them to reach financial close. However, the strength of the counterparties—the offtaker, EGAT; the sponsor, J-Power; and the equipment supplier, MHI—and key contractual arrangements<sup>19</sup> made the project highly bankable, which attracted significant market interest and benchmark tenors and pricing.

33. **ADB support led to the emergence of a regional player.** ADB's early engagement with the group supported the emergence of a regional champion and cemented ADB's preferred lender status with the Gulf Group. The Gulf Group's experience with GNS and GUT IPP projects gave them financial strength and technical expertise. It also provided a standardized template to replicate in future projects, which they successfully replicated in the 2,500 MW Gulf SRC Company Limited (GSRC) and the 2,500 MW Gulf PD Company Limited (GPD) projects. Meanwhile, ADB has built a strong relationship with the group, completing five transactions and with two more projects in advanced stages of processing. ADB also played a crucial and profitable role in helping the group achieve its listing in December 2017. The association with the Gulf Group also dovetails with strategy of ADB's Private Sector Operations Department of taking a proven client overseas to a challenging developing member country.

34. **Dispatch rate.** GUT has witnessed a low dispatch rate since COD in 2015. Although the plant was expected to operate as baseload, it has so far operated as a peaking plant.

<sup>19</sup> The key contractual arrangements were (i) the PPA, with capacity payments linked to a dollar index and full pass-through of fuel risk; (ii) the gas sales agreement, which had no minimum take-or-pay provisions and allocated gas equitably to all IPPs; and (iii) long-term parts assurance with low inflation.

Macroeconomic reasons and changes to the country's merit order—factors beyond the project's control—are possible reasons for this outcome.

35. **Setting standards for community participation.** GUT is committed to community relations and participation. It set an industry standard for community engagement that has been replicated by other power plant projects or requested by local communities surrounding new power plants in Thailand. GUT established the Power Plant Environmental Inspectors Committee to review HSE performance and compliance, and the Joint Community Participation Committee to source, review, and submit proposals to apply for funding from the PDF to support local activities that help improve livelihoods and quality of life. These two committees were part of GED's corporate-wide policies rooted in a very successful program at the Kaeng Khoi 2 Power Plant, and will also be implemented at GSCR and GPD.

## **B. Recommended Follow-Up Actions**

36. **Future monitoring and deal structuring.** ADB will continue to monitor the dispatch rate of the project and the demand–supply dynamics of the energy mix in Thailand as a part of the annual credit monitoring by its Portfolio Management Division. For future IPP projects in Thailand, long-term merit order analysis should be conducted during due diligence to better understand the implications of changing energy generation components under the Power Development Plan 2018 and the Alternative Energy Development Plan, 2018.<sup>20</sup>

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<sup>20</sup> Government of Thailand, Energy Policy and Planning Office. 2018. *Power Development Plan 2018*. Bangkok; and Government of Thailand, Ministry of Energy. 2019. *Vision towards the Development of Renewable Energy in the Perspective of Thailand*. Bangkok.