



Report and Recommendation of the President to the Board of Directors

Project Number: 49067-001
September 2017

Proposed Loan Chana Green Company Limited Southern Thailand Waste-to-Energy Project (Thailand)

This is an abbreviated version of the document approved by ADB's Board of Directors that excludes information that is subject to exceptions to disclosure set forth in ADB's Public Communications Policy 2011.

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 18 September 2017)

Currency unit	–	baht (B)
B1.00	=	\$0.030
\$1.00	=	B33.10

ABBREVIATIONS

ADB	–	Asian Development Bank
AEDP	–	Alternative Energy Development Plan
DMC	–	developing member country
EGAT	–	Electricity Generating Authority of Thailand
EPC	–	engineering, procurement, and construction
GED	–	Gulf Energy Development
GHG	–	greenhouse gas emission
IPP	–	independent power producer
PPA	–	power purchase agreement
SPP	–	Small Power Producer
	–	CONFIDENTIAL INFORMATION DELETED
WTE	–	waste-to-energy

WEIGHTS AND MEASURES

km	–	kilometer
kWh	–	kilowatt-hour
MW	–	megawatt
TPY	–	ton per year

NOTES

- (i) The fiscal year (FY) of Chana Green Company Limited ends on 31 December.
- (ii) In this report, "\$" refers to United States dollars.

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I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan of up to B1,109 million (or its equivalent in US dollars) to Chana Green Company Limited for the Southern Thailand Waste-to-Energy Project in Thailand.

II. THE PROJECT

A. Project Identification and Description

2. **Project identification.** Agriculture has played an important role in Thailand's economic development, but it has also led to serious environmental and social challenges in managing the mass amount of residual waste that is generated from the harvesting process. The agriculture sector of Thailand accounts for approximately 10% of the country's gross domestic product and nearly 40% of Thailand's population depend on farming for their main livelihood. Thailand is a major producer of rice, sugarcane, cassava, rubber, and palm oil. Thailand's agricultural products are estimated to produce over 80 million tons of waste a year. Rural households utilize small amounts of agricultural waste to provide basic energy requirements for cooking and heating. However, the bulk of waste in Thailand is destined to be burned in the fields unless applications for industrial use are sourced. Uncontrolled burning produces negative impacts on human health, atmospheric visibility, soil, groundwater, and greenhouse gas (GHG) emissions. The challenge for Thailand and many other developing member countries (DMCs) is to find a solution to manage and reduce the agricultural waste in an environmentally and socially acceptable manner. Waste-to-energy (WTE) technology offers an effective solution by converting the agricultural waste, also known as biomass, into a dependable and renewable source of commercial electricity.

3. Thailand's natural gas resources have long been a reliable source of low-cost energy, but growing demand and dwindling domestic reserves mean that it must find new fuels and technologies to help meet its future power needs. Thailand's power consumption has risen by on average 3.6% per year during 2005–2016 and demand is expected to double over the period from 2015 to 2036. To meet its growing energy demand, Thailand has adopted the Alternative Energy Development Plan, 2015–2036 (AEDP) which sets out targets for renewable energy deployment.¹ The plan contains a target of 30% of final energy consumption and 20% of installed electricity generation capacity from renewable energy sources by 2036. To meet these targets, biomass will become the second largest renewable power source after solar, attesting to the immense potential of residual waste from agriculture in the country. The AEDP sets out a target to increase the installed generating capacity of biomass to 5,570 megawatts (MW) by 2036 from its current installed capacity of 2,943 MW.

4. WTE plants that utilize biomass are prioritized in Thailand's renewable energy policy because of the additional advantage of supporting farmers and rural communities. Biomass WTE promotes rural development by contributing additional income to farmers who sell their agricultural waste as well as small enterprises who engage in waste collection and transportation. Substituting fossil fuels with agricultural waste for power generation can also improve Thailand's energy security, save foreign exchange by reducing the need for energy imports, and shield the economy from the impact of global energy price fluctuations. Further, biomass is a sustainable form of power generation because it has a carbon-neutral footprint. The biomass absorbs the same amount of carbon during its cultivation cycle as it releases when consumed as a fuel. Unlike other renewable energy technologies such as solar and wind, which are intermittent, WTE can also

¹ Government of Thailand, Ministry of Energy. 2015. *Alternative Energy Development Plan, 2015–2036*. Bangkok.

operate on a firm, reliable, and dispatchable basis, providing a more direct substitute for base-load generation using fossil fuels. The substitution effectively reduces the grid's GHG emission factor by displacing generation that otherwise would have been provided using fossil fuels.

5. The Ministry of Energy implements its WTE policy for biomass through the small power producer (SPP) and very small power producer programs. The programs allow for private developers to build, own, and operate WTE power projects and enter into power purchase agreements (PPAs) with Thailand's state-owned power utility companies, the Electricity Generating Authority of Thailand (EGAT) and the Provincial Electricity Authority of Thailand. Renewable energy projects that utilize biomass are entitled to receive a B0.3 per kilowatt-hour (kWh) tariff incentive for 7 years in addition to the base wholesale electricity tariff. The tariff incentive is provided to promote investment in WTE technologies.

6. The southern-most provinces of Thailand are some of the poorest in the country. Political conflict and unrest in Southern Thailand has impeded investment, employment, and overall development and growth. The associated risk of investing in Southern Thailand has also led to underinvestment in the local power system, which continues to experience energy shortages. To reduce risk and promote investment in the power sector of Southern Thailand,² WTE power projects are entitled to receive a special tariff incentive of B1.0 per kWh for 7 years in addition to the B0.3 per kWh tariff.

7. **Project design.** The project entails the construction and operation of a 25 MW biomass WTE power project located in Chana, Songkhla province of Southern Thailand.

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8. The primary source of waste will be rubberwood sourced from local farmers, sawmills, and intermediary suppliers located within 150-kilometer (km) radius of the project site. All electricity produced by the project will be purchased by EGAT under a 5-year, automatically renewable PPA with a contracted capacity of 20.6 MW under the SPP program. The project will receive two tariff incentives in addition to the base wholesale electricity tariff. The tariff incentives include B0.3 per kWh for utilizing biomass and B1.0 per kWh for investing in Southern Thailand, both for a period of 7 years from commercial operations, after which time the project will only receive the base wholesale tariff.

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9. **Borrower and sponsor.** Chana Green, the borrower, is a project company set up to own, develop, construct, and operate the project. The project is wholly owned by Gulf Energy Development (GED), the sponsor, which is a leading private sector power generation company in Thailand with the largest portfolio of gas-fired power projects in the country.³ Currently, the company has 10 operating gas-fired projects with total installed generation capacity of 4,373 MW, of which GED's equity capacity is 1,755 MW. GED is positioned for strong growth with the largest power project pipeline in Thailand. The company has an additional 7,022 MW of installed generation capacity currently under construction and development, which is scheduled to commence commercial operations by 2024. As of May 2017, GED's total current portfolio,

² Power projects located in Yala, Pattani, Narathiwat, and four subdistricts in Songkhla (Chana, Na Thawi, Saba Yoi, and Thepha) province are eligible for the B1.0 per kWh tariff incentive.

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including projects under construction and under development, consists of four gas-fired independent power producers (IPPs) (8,976 MW), 19 gas-fired SPPs (2,395 MW), four rooftop-solar very small power producers (0.60 MW), and the proposed Southern Thailand WTE project (25 MW). In addition, the company holds a 9% equity interest in SPCG Public Company Limited, one of the largest solar power companies in Thailand with 36 solar farms totaling 260 MW.

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10. The Asian Development Bank (ADB) has a longstanding relationship with the sponsor since 2007 when ADB supported the company during its first IPP bidding process. ADB provided long-term debt for two of its IPP projects, the Nong Saeng Natural Gas Power Project and the Ayudhaya Natural Gas Power Project (totaling 3,406 MW installed generating capacity), which represented the first project financing arrangements in Thailand with loan tenures of 23 years. The Nong Saeng Natural Gas Power Project was recognized as one of the top 40 private–public partnerships (PPPs) in emerging markets by the International Finance Corporation and Infrastructure Journal.⁴ The Ayudhaya Natural Gas Power Project received Project Finance Deal of the Year (2012) from Project Finance International.

11. Integrity due diligence was conducted in accordance with ADB’s Integrity Due Diligence Guidelines for Nonsovereign Operations. The results of this analysis are set out in the integrity disclosure document.

B. Development Impact, Outcome, and Outputs

12. **Impact.** The project is aligned with the following impact: Energy mix diversified through the addition of alternative energy capacity and more electricity consumption from renewable sources.

13. **Outcome.** The project will have the following outcome: sustained operation of a private sector biomass WTE power plant in Southern Thailand.⁵

14. **Outputs.** The outputs will be a constructed biomass WTE power plant project and generated local employment.

C. Alignment with ADB Strategy and Operations

15. **Consistency with ADB strategy and country strategy.** The project is consistent with ADB’s Midterm Review of Strategy 2020.⁶ The review reaffirmed ADB’s support under its Strategy 2020 for development that is environmentally sustainable; the role of the private sector in meeting growing energy demand in the region; and capitalizing on ADB’s operating strengths in infrastructure development, finance, and other areas.⁷ The midterm review also supports the expansion of environment-friendly technologies for clean and efficient energy generation and use, as well as a larger role for private sector financing of infrastructure.

⁴ International Finance Corporation. 2013. *Emerging Partnerships: Top 40 PPPs in Emerging Markets*. Washington, DC.

⁵ The design and monitoring framework is in Appendix 1.

⁶ ADB. 2014. *Midterm Review of Strategy 2020: Meeting the Challenges of a Transforming Asia and Pacific*. Manila.

⁷ ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila.

16. The project is consistent with ADB's country partnership strategy for Thailand, 2013–2016.⁸ The country strategy supports three core strategic pillars: knowledge and innovation, private sector development, and regional cooperation and integration. These are to be operationalized in four program areas: (i) infrastructure; (ii) finance sector development; (iii) the environment, including climate change; and (iv) regional cooperation and integration.

17. **Consistency with sector strategy and relevant ADB operations.** The project is consistent with ADB's Energy Policy, which emphasizes investments in energy efficiency, renewable energy projects, and wider access to energy.⁹ The project will contribute to ADB's target of \$6 billion in annual financing for climate mitigation and adaptation by 2020 to accelerate low-carbon growth and reduce regional GHG emissions.

D. Project Cost and Financing Plan

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E. Implementation Arrangements

18. Table 3 summarizes the implementation arrangements.

Table 3: Summary of Implementation Arrangements

Aspects	Arrangements
Regulatory framework	The project is being developed under Thailand's SPP program. The SPP program allows for private developers to build, own, and operate power projects in the 10 MW–90 MW capacity range and to sell electricity to EGAT under standardized PPAs.
Management	The project will be managed by GED, one of the largest power generation companies in Thailand. GED has successfully managed 14 gas-fired power projects (6,195 MW) and one waste-to-energy power project (23 MW) from early development to operation stage.
Implementation period	CONFIDENTIAL INFORMATION DELETED
Construction arrangements	CONFIDENTIAL INFORMATION DELETED
Supplier and/or contractor	CONFIDENTIAL INFORMATION DELETED
Operations arrangements	
Revenue structure	EGAT will purchase all electricity produced by the project under a standardized PPA with a contracted capacity of 20.6 MW. The PPA has a 5-year term with automatic extensions. The automatic extension of the contract term of the PPA will mean that, at a minimum, the PPA term matches the 25-year economic life of the project and exceeds the full term of the debt. The project will receive monthly revenue by selling electricity on a tariff formula comprising the countrywide average wholesale rate plus a tariff incentive. The tariff incentive comprises B0.3 per kWh for utilizing biomass and B1.0 per kWh to promote investment in Southern Thailand, both for a period of 7 years from the start of commercial operations.
Major cost structure	CONFIDENTIAL INFORMATION DELETED

⁸ ADB. 2013. *Country Partnership Strategy: Thailand, 2013–2016*. Manila.

⁹ ADB. 2009. *Energy Policy*. Manila.

Aspects	Arrangements
Operation and maintenance	CONFIDENTIAL INFORMATION DELETED
Relevant parties	Revenue under the PPA is supported by EGAT, a state-owned power utility company in Thailand with a credit rating of BBB+ from Standard & Poor's (2013)
Performance monitoring	The borrower will submit semiannual environmental and social monitoring reports to the Asian Development Bank during construction, and annually thereafter. The performance indicators are included in the design and monitoring framework (Appendix 1).

EGAT = Electricity Generating Authority of Thailand, GED = Gulf Energy Development, kWh = kilowatt-hour, MW = megawatt, O&M = operation and maintenance, PPA = power purchase agreement, Q = quarter, SPP = small power producer, CONFIDENTIAL INFORMATION DELETED
Source: Gulf Energy Development.

F. Projected Financial and Economic Performance

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III. THE PROPOSED ADB ASSISTANCE

A. The Assistance

19. The proposed ADB assistance includes a local currency loan not exceeding B1,109 million or its equivalent in US dollars, with a tenor of up to 18 years. The longer repayment period of the ADB loan is necessary to lower the operational debt service leverage over the life of the project. Reducing the project's asset-liability mismatch by amortizing the high up-front capital costs over a longer period improves the project's economic viability. The limited availability of long-term financing in Southern Thailand is a market failure due to the macro and political instability in the region. Accessing short-term debt to finance long-term assets results in higher liquidity risk and firm-level economic volatility. This impacts the willingness of developers to invest in long-term infrastructure assets, which ultimately hampers the level and growth of economic activity in the region.

B. Value-Added by ADB Assistance

20. ADB's financial assistance will help provide an environmentally sustainable solution to the abundant agricultural waste that is produced from farming and wood industries by converting biomass into a renewable source of electricity. ADB's assistance helps the long-term economic viability of the project, supports the government's renewable energy program and targets, and validates the WTE business model in a DMC. The demonstration effect from ADB's assistance helps reduce the risk perception associated with WTE projects and creates awareness of the benefits and sustainability of WTE that can be applied to other rural communities and DMCs.

21. ADB's 18-year financing of a private sector project in Southern Thailand signals long-term confidence to other banks and developers considering investing in infrastructure assets within the region. Economic development in Southern Thailand has been hindered by underinvestment due to political conflict and unrest. Access to financial credit is limited, especially long-term financing that is required for large infrastructure projects. ADB's financing intervention goes beyond the project and sector to encourage investment more broadly in other types of infrastructure projects and industries seeking capital within the Southern Thailand region.

C. Risks

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IV. POLICY COMPLIANCE

A. Safeguards and Social Dimensions

22. In compliance with ADB's Safeguard Policy Statement (2009), the project is classified as category B for the environment and category C for involuntary resettlement and indigenous peoples. An initial environmental examination report was submitted to the Office of the Natural Resources and Environment Policy and Planning and is expected to be approved in October 2017. The project site and its immediate vicinity do not support natural vegetation of any ecological significance. The potential environmental and social impacts of the project have been identified and effective measures to avoid, minimize, mitigate, and compensate for adverse impacts are incorporated in the environmental and social management plan. A series of public consultation meetings with various stakeholders were conducted from 2016 to 2017 and the concerns have been addressed by Chana Green. The institutional capacity and commitment of Chana Green to manage the project's social and environmental impacts are deemed adequate and described in the environmental and social management plan.

23. The project with an installed generating capacity of 25 MW will be located in Ku subdistrict, Chana district, Songkhla province, Southern Thailand. Chana Green, the borrower, acquired 150 *rais* (24 hectares) of private land 2 years ago for the project. Sale deeds have been executed and payment has been completed based on negotiated and agreed prices for the acquired properties.¹⁰ An upgrade of an existing transmission line (from 33 KV to 115 KV) by the Provincial Electricity Authority of Thailand will be required for the project. However, no land acquisition is necessary as the existing transmission line right-of-way will be used. No properties or improvements will be impacted during transmission line upgrading. There are no indigenous peoples at the project site.

24. During construction, an estimated 300 workers will be engaged, mainly as skilled and unskilled laborers. Chana Green will comply with national labor laws and, in accordance with ADB's Social Protection Strategy (2001), will take measures to comply with the internationally recognized core labor standards.¹¹ Chana Green will report regularly to ADB on (i) its (and its contractors') compliance with such laws, and (ii) the measures taken by the company to safeguard the project. Information disclosure and consultation with affected people will be conducted in accordance with ADB requirements. The project is categorized as having no gender element, given the limited potential for gender-inclusive design of the project. Stakeholders, including communities in the vicinity of the project, were informed and consulted about the project. The initial environmental examination includes a grievance redress mechanism to receive complaints and facilitate their resolution.

B. Anticorruption Policy

25. Chana Green was advised of ADB's Anticorruption policy (1998, as amended to date). ADB will ensure that the investment documentation includes appropriate provisions prohibiting

¹⁰ Rai is a unit of area, commonly used in Thailand, and is equal to 1,600 square meters.

¹¹ ADB. 2003. *Social Protection*. Manila (adopted in 2001).

corruption, money laundering, and the financing of terrorism, and remedies for ADB in the event of noncompliance.

C. Investment Limitations

26. The proposed loan is within the medium-term, country, industry, group, and single-project exposure limits for nonsovereign investments.

D. Assurances

27. Consistent with the Agreement Establishing the Asian Development Bank (the Charter),¹² ADB will proceed with the proposed assistance upon establishing that the Government of Thailand has no objection to the proposed assistance to Chana Green. ADB will enter into suitable finance documentation, in form and substance satisfactory to ADB, following approval of the proposed assistance by the ADB Board of Directors.

V. RECOMMENDATION

28. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve the loan of up to B1,109,000,000 (or its equivalent in US dollars) from ADB's ordinary capital resources to Chana Green Company Limited for the Southern Thailand Waste-to-Energy Project in Thailand, with such terms and conditions as are substantially in accordance with those set forth in this report, and as may be reported to the Board.

Takehiko Nakao
President

26 September 2017

¹² ADB. 1966. *Agreement Establishing the Asian Development Bank*. Manila.

DESIGN AND MONITORING FRAMEWORK

Impact the Project is Aligned with			
Energy mix diversified through the addition of alternative energy capacity and more electricity consumption from renewable sources (Alternative Energy Development Plan, 2015–2036) ^a			
Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
Outcome Private sector biomass WTE power plant in Southern Thailand sustained	CONFIDENTIAL INFORMATION DELETED c. 65 additional full-time equivalent local jobs employed in operations (2017 baseline: 0)	a–c. Chana Green’s annual development effectiveness monitoring reports	Lower power production due to insufficient feedstock, lower availability, or conversion efficiency
Outputs 1. Biomass WTE power plant constructed 2. Local employment generated	1. Total installed renewable electricity generation capacity of 25 megawatts (2017 baseline: 0) 2. 300 jobs generated during construction (2017 baseline: 0)	1–2. Chana Green’s annual development effectiveness monitoring reports	Delayed commissioning resulting from force majeure events
Key Activities with Milestones Outputs 1–2. Biomass WTE power plant constructed; local employment generated CONFIDENTIAL INFORMATION DELETED			
Inputs Asian Development Bank: B1,109 million (loan) CONFIDENTIAL INFORMATION DELETED			
Assumptions for Partner Financing Not applicable			

EGAT= Electricity Generating Authority of Thailand, WTE = waste to energy.

^a Government of Thailand, Ministry of Energy. 2015. *Alternative Energy Development Plan, 2015–2036*. Bangkok.

^b **CONFIDENTIAL INFORMATION DELETED**

Source: Asian Development Bank.

LIST OF LINKED DOCUMENTS

<http://www.adb.org/Documents/RRPs/?id=49067-001-4>

1. Country Economic Indicators

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