The Energy Cycle that Powers Thailand’s Economy

Thailand’s industrial success is fueled by decentralized energy generation, which in turn relies on Siemens’ SGT-800 gas turbines. In addition to electronics, the frozen food industry is a key energy consumer with its insatiable need for ice.

Text: Clark Shimazu  Photos: Hans Sautter
Cogeneration Plants

Over the past two decades, the Amata industrial zones in Thailand have served as the model for the country’s industrial transformation from exporter of raw materials and food products into world-class supplier of machinery, consumer electronics and high-tech components. The rapid modernization is based on a single factor: natural gas reserves in the Gulf of Thailand. The discovery of high-quality methane under the sea bed in the late 1970s led to the opening of new gas-fired power plants, a trend that continues to this day.

The latest is the Amata B.Grimm facility in the Amata City Industrial Estate in Rayong, some 150 kilometers southwest of the capital Bangkok. Here, two combined cycle cogeneration power plants, equipped with four Siemens gas turbines, sparkle in the tropical sunlight. A first impression of the labyrinth of tubes, steel towers and steam-spewing safety valves is of vast metalwork as iconic as a Baroque-era pipe organ, even if the music is a cacophony of buzzing, rattling and clanging. At the center of this temple to progress stands Cherdchai Yiwlek, the engineer who supervised the construction of three Siemens-equipped plants for Amata B.Grimm.

Standing tall, engineer Cherdchai points at a pipe that emerges from beneath the ground. “This is where the gas comes into our plant.” Just meters behind him, the water that surrounds gas shipments is drained, and then methane branches out into feeder lines for the two combined cycle cogeneration plants, which each contain a pair of Siemens SGT-800 gas turbines with 50 megawatts output, and one SST-400 steam turbine.

Cogeneration Concept

“The exhaust heat from the gas turbine is routed into a heat recovery steam generator unit to use the thermal energy for steam production to rotate an SST-400 steam turbine, which adds another 40 megawatts of electrical power to our output. Finally, the leftover steam is sent down a fat pipe to a nearby factory.” The heat is used to melt and mold material for industrial products. “We don’t have waste heat here,” Cherdchai exclaims. “For us, steam is money.”

The reuse of heat exhaust from a gas turbine, which otherwise would be lost up a chimney, is the basis for cogeneration. Using steam generated by the hot-gas turbine exhaust gases to heat buildings is becoming more prevalent across the cold climates of Europe and North America. Tropical Asia has yet to take the next leap of logic in using energy from “waste” heat to run indoor air coolers, which is technically feasible with existing technology.

Cogeneration boosts fuel efficiency, the foremost priority on Cherdchai’s mental list. This is because the price of gas is rising faster than electricity tariffs, putting profit margins under pressure.

“We don’t have waste heat here.”

Cherdchai Yiwlek, Engineer, Amata B Grimm

As is the case with most privately held small power producers, Amata B.Grimm Power usually operates inside an industrial park in need of on-site energy supply. Being close to the end user cuts long-distance transmission losses. Cherdchai adds that surplus power can be sold under contract to the national grid distributor Electricity Generating Authority of Thailand (EGAT). Most of that power remains inside the booming export-oriented economy of Rayong province, southeast of Bangkok.

Speed Depends on Teamwork

Preeyanart Soontornwata, President of the Amata B.Grimm Power Group, the leading small power producer in Thailand, is exceptional for an executive in...
“Our major concerns are efficiency and the environment.”
Preeyanart Soontornwata, President, Amata B.Grimm Power Group

the energy industry. Unlike most of her male counterparts, she is not an engineer or geologist but a financial expert, with an MBA in finance from top-ranked Chulalongkorn University. Rising to the top from her position as chief financial officer, her priorities are centered on fiscal soundness, detailed research and team building, which are all vital during this phase of rapid growth for the private-run small power producer sector. "Whenever we invest in a new project, our team studies every aspect in deep detail. Our major concerns are efficiency and the environment, which are decisive for revenues and our customers as well as for gaining regulatory approval for a new plant,” she explains. “Our choice has been the 50-megawatt version of the Siemens SGT-800 for overall quality and greatest efficiency.” Under her helm, Amata B.Grimm has 16 power plants on the registry, 6 of them already operating and 4 under construction. She has no intention of slowing down. “Over the next five years, our combined output is targeted to

Shaping Thailand for over a Century

B.Grimm was founded in 1878 as Bangkok’s first pharmacy by Bernard Grimm and his associate, Erwin Müller, and quickly took on every challenge thrown its way – from importing earthmovers to operating a telegraph system supplied by a company called Siemens. With the royal support of modernizing ruler Rama V, B.Grimm enjoyed fortuitous beginnings, and is today not only the longest-running German business, but also the oldest private company in Thailand. After the halcyon days of old Siam, things haven’t been so easy, says Harald Link, CEO of the present-day B.Grimm Group. “My grandfather Adolf Link, a pharmacist from Lübeck, came to Bangkok in 1903 to join B.Grimm.” He famously imported telephone equipment and arranged the first call between Thailand and Germany. The outbreak of World War I, however, saw the Link family detained in a prison camp in India. Still believing in Thailand, Adolf Link returned in 1920 to start over – only to be caught up in the disastrous events of World War II. After the war the family-owned business slowly reemerged and on a visit to Thailand in 1978, a century after the founding of B.Grimm, grandson Harald discovered for himself the magic of this tropical realm. At the time the Thai economy was lifting off on a continuous growth curve. The company’s greatest works have since included the construction of the Bangkok SkyTrain system (BTS), together with Siemens, and the Metro (MRT). In the late 1990s, the company formed its Amata B.Grimm Power Group. “The first power plant was difficult because we built it during the worst year of the Asian financial crisis, 1998,” recalls Link. B.Grimm has since diversified into air-conditioning and refrigeration systems, as well as transportation, healthcare and infrastructural projects. On a lesser scale, B.Grimm also entered a joint venture to assemble the ubiquitous tuk-tuks, the three-wheeler taxis that symbolize Thailand. Tourists and locals may not realize it, but the bustling Bangkok they know has been and remains a work in progress of B.Grimm.

“Please find attached a press release about our latest project.”

Hrarald Link, CEO B.Grimm Group

Four SGT-800 gas turbines and two SST-400 steam turbines at the new combined cycle power plant in Rayong’s Amata City Industrial Estate create power for regional economic development.
The power produced from fire and steam in the cogeneration plant is used at the ice factory in Rayong to freeze water. The large blocks of ice are crushed and transported to the port to cool seafood, preparing it for export.
Efficiency and lower emissions.

The SGT-800 gas turbine is the centerpiece of the power plant, ensuring highest efficiency and lower emissions. His prime concern: fuel efficiency.

Cogeneration Plants

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Since 2010, Siemens obtained orders from Thailand for more than 40 SGT-800 gas turbines. Around 20 of these turbines have already gone into commercial operation.

The fuel flexibility of the SGT-800 is outstanding: It can operate on gas from the Gulf of Thailand, the low-calorific gas from the Andaman Sea, as well as on diesel, with on-load switchover between fuels.

By combining the SGT-800 industrial gas turbine – available with ratings of 47.5 MW and 50.5 MW – with the SST-400 steam turbine, maximum fuel efficiency is achieved.

The cogeneration process recovers heat exhaust for the steam-driven turbine, and reuses steam power for industrial purposes.

In combined cycle operations the performance of the SGT-800 is best in class for its size. All SGT-800 units are equipped with a DLE combustion system to minimize NOx and CO2 emissions.

Higher efficiency and lower emissions are convincing national regulators in Thailand to approve ever more privately operated small power plants.

Cogeneration Optimizes Gas Resources

Power from under the Sea

In the faint light of dawn, Praipol stands aboard one of the trawlers bobbing on the waves. “About 70 percent of electrical power in Thailand is generated by gas-fired plants, which is a huge share compared with most countries.”

“The energy cycle begins here, in the Gulf of Thailand. An underwater pipeline carries the natural gas to the huge gas separation complex on Rayong Point, where heavier components used for plastics and the chemical industry are extracted, leaving the lighter methane as a fuel for vehicles, cooking stoves and power plants,” he states.

“The separated gas is then moved through an underground pipeline over a distance of 70 kilometers to electricity generators in Amata. The energy flow returns to the coast along high-voltage lines to power the fishing fleets and seafood industry,” Praipol explains. “A new and larger cycle then begins with the export of products to the global economy. Hard currencies come back in the other direction, driving Southeast Asia’s rapid development.”

His thoughts on energy and economics thus take a philosophical turn, in

Engineer Cherdchai Yiwiek supervised the construction of the plant.

The catch of the day at Rayong Lagoon is immediately cooled with crushed ice from the nearby factory.

The SGT-800 gas turbine is the centerpiece of the power plant, ensuring highest efficiency and lower emissions.
Frozen seafood still accounts for 8 percent of Thailand's exports. The brightly colored fishing boats in Rayong Lagoon leave the port at night, hoping for a good catch.

Thai energy expert Praipol Koomsup warns that gas reserves of the Gulf of Thailand are not infinite, and new exploration and joint production agreements must be worked out with Cambodia, Myanmar, and Vietnam. Output here is expected to decline within 10 to 15 years from now. That makes fuel efficiency more important than ever.

"The advent of AEC will accelerate power consumption, due to rising prosperity and industrial growth, so averting energy shortages is an important priority," Praipol asserts. "With all the world’s equipment suppliers and power producers gearing up for the onset of AEC, the winners will be whoever can burn gas with greater efficiency and guarantee performance over a longer lifetime." The race is on.

Thailand-based Clark Shimazu writes about science and environment issues for the South China Morning Post, Yazhou Zhoukan magazine and New America Media in San Francisco as well as several online media outlets.

Powering Thailand’s Regions

Learn about the cycle of heat and ice in the Rayong region as filmmaker Dipspong Sampattavanich follows energy expert Praipol Koomsup for one day.