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INDUSTRIAL DEVELOPMENT ORGANIZATION

PROMOTING SMALL SCALE BIOMASS POWER PLANTS IN RURAL THAILAND

Involving communities in Thailand's sustainable energy future

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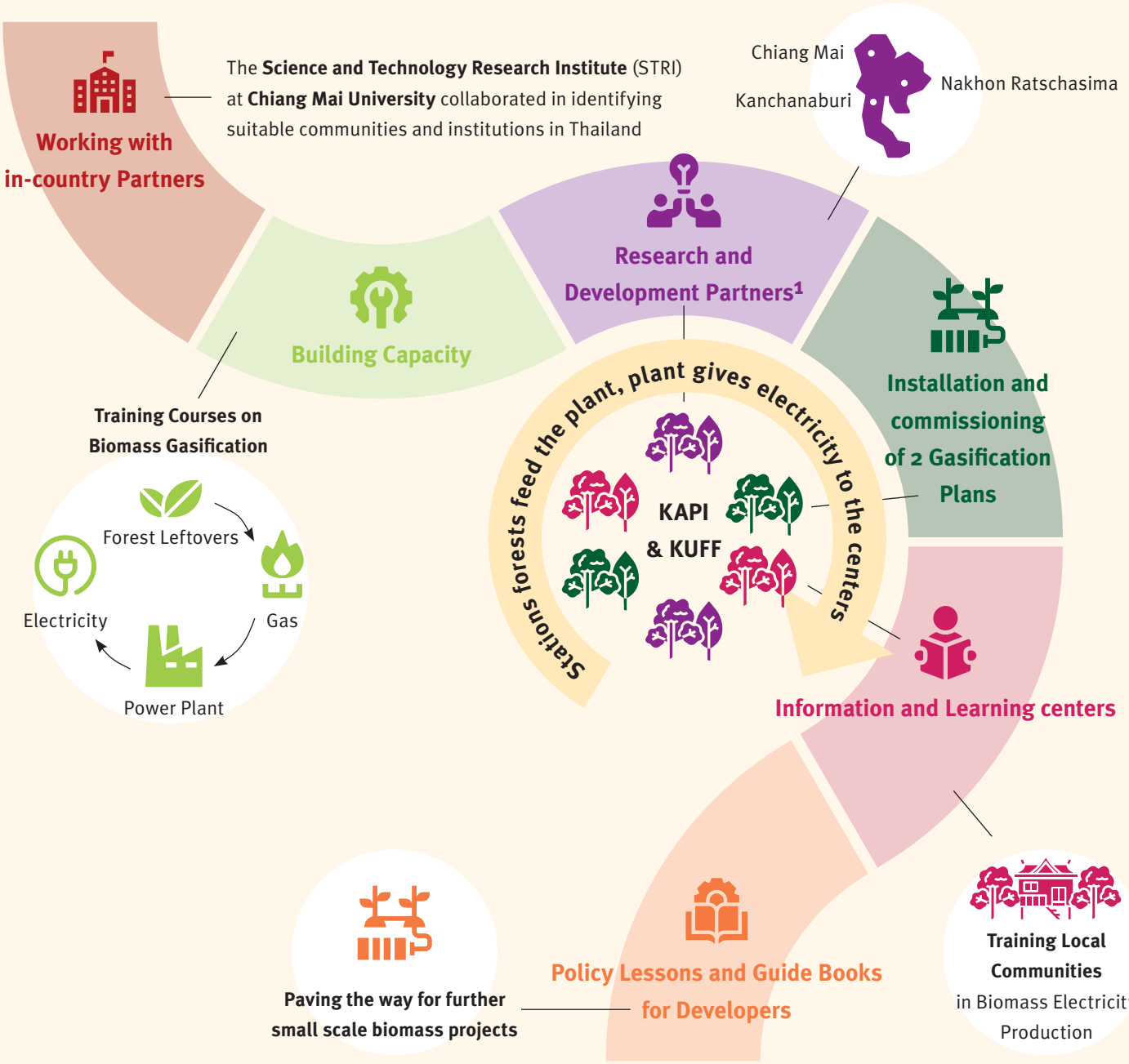
SUSTAINABLE DEVELOPMENT GOALS



Promoting Small Scale Biomass Power Plants in Rural Thailand for Sustainable Renewable Energy Management and Community Involvement

1.) Together with the STRI, University of Chiang Mai, 2 more partners were identified
Kasetsart Agricultural and Agro-Industrial Product Improvement Institute (KAPI), Kanchanaburi Province
Kasetsart University Faculty of Forestry (KUFF) training and research station, Nakhon Ratchasima Province

Involving communities in Thailand's sustainable energy future

With electricity demand rising annually in Thailand, the Thai government is committed to a more sustainable energy future, with renewables making up a bigger share of the energy mix. Small-scale biomass gasification plants – which generate electricity from agricultural and wood processing waste – have the potential to increase energy autonomy in rural communities, and the country as a whole, while reducing carbon emissions. With funding from the Global Environment Facility (GEF) and in cooperation with local project partners, the United Nations Industrial Development Organization (UNIDO) implemented a project to promote this technology and build capacity for sustainable, community-driven renewable energy management in rural Thailand.

Many small agricultural and wood processing operations throughout Thailand produce biomass residues that are either unutilized or under-utilized. In this context, biomass gasification is the ideal technology, but until now attempts to implement it in Thailand have been unsuccessful. There are various reasons for this, related to the regulatory environment as well as the fact that the technology itself, and the required equipment, are not mature or readily available in the country, and there is a lack of expertise and training. This means that successful demonstration projects are needed, as well as efforts to raise capacity and promote awareness and understanding of the technology. This GEF-funded project was initiated by the Thai Ministry of Energy, with UNIDO playing an implementation role. Its objective was to promote the use of small-scale gasification to help reduce greenhouse gas emissions, while encouraging community participation in establishing and operating pilot plants that use local biomass residues to generate electricity. UNIDO engaged project partners in Thailand and coordinated stakeholder dialog to implement a project that is building capacity for decentralized, diversified renewable energy in the country.

The outcomes of the project included:

- Biomass gasification heat and power generation training programs for Thai developers
- Construction and commissioning of two 125 kW demonstration biomass gasification plants with research partners in rural Thailand
- Establishment of information and learning center at Chiang Mai University Science and Technology Research Institute for training, knowledge gathering and sharing and exhibition purposes
- Two publications based on the experience and expertise gained during the project: a 'Guidebook for Developers' and 'Policy Lessons' for community-based small-scale biomass power plants in Thailand

Building capacity

The Thai Ministry of Energy's Department of Alternative Energy Development and Efficiency led on the provision of training courses for biomass gasification heat and power generation. The Department developed training materials and a safety manual, and conducted a course for 200 participants in May 2015 and again in May 2016.

By mid-2017, there were 15 grid-connected biomass gasification power plants in operation in Thailand, with total installed capacity of 14.8 MW.

Working with in-country partners

Upon project approval, UNIDO engaged the Science and Technology Research Institute (STRI) at Chiang Mai University in northern Thailand as technical consultant. Dr Chatchawan Chaichana, Head of the university's Energy Technology for Environment Research Center, was instrumental in implementation of the project.

Kasetsart Agricultural and Agro-Industrial Product Improvement Institute (KAPI) and Kasetsart University Faculty of Forestry (KUFF) were identified as qualified project partners with the expertise to help establish information and learning centers (I&LCs) attached to pilot biomass gasification plants for demonstration and research purposes.

Kasetsart Agricultural and Agro-Industrial Product Improvement Institute (KAPI), Kanchanaburi Province

KAPI's main aim is to develop new processing technology that will add value to biomass and agricultural products. Its 41-hectare seedling production center and research station is located in Kanchanaburi Province in western Thailand. It focuses on research and development for fast-growing tree varieties, including experimental plots for biomass feedstock.

KAPI developed a plan to upgrade the Kanchanaburi center to carry out research, development and knowledge transfer operations covering the entire biomass energy cycle, from plantations to sustainable electricity distribution. Around 50 households are located within a 5km radius of the station, and the pilot 125 kW biomass gasification plant offered an opportunity to educate local farmers and communities about this renewable energy model.

"People in the communities have been able to be part of the project from the beginning," Dr Pinalee Vaithanomsat, Director of KAPI, clarifies. "Our aim is to establish a power plant that the community can truly benefit from, and then take this model, adjust it, and apply it to other communities."

The Wang Nam Khiao training and research station was initiated in 2017

Kasetsart University Faculty of Forestry (KUFF) training and research station, Nakhon Ratchasima Province

KUFF's training and research center in the scenic Wang Nam Khiao district of Nakhon Ratchasima Province, in northeastern Thailand, is the forestry faculty's largest research station. It is used to train students as well as to conduct research and development into fast-growing trees and bioenergy products. A project to develop a learning center for green energy to replace fossil fuels, with community involvement, was initiated at the Wang Nam Khiao station in 2017. The pilot biomass gasification plant project was therefore a perfect fit, facilitating research into the utilization of biomass feedstock produced by local communities, the research station's plantations, and as waste from a local paper factory.

Pilot plant delivery, installation and commissioning

UNIDO's project team liaised with The Energy and Resources Institute (TERI) in India, the supplier of the gasification plants, to arrange site visits and consultations with both partners as well as to coordinate the transportation and delivery of the equipment. TERI visited both sites while civil works were in progress in May 2019, and delivery of the first equipment was scheduled for early 2020.

The Covid-19 pandemic resulted in delays to the delivery of the gasifier plants. Personnel on site, TERI, STRI, and UNIDO took part in online coaching to complete the successful installation and commissioning of the gasification plants in November 2020.

Information & learning center at Chiang Mai University opened in December 2019

Information and learning centers (I&LCs)

into three zones where visitors can learn about biomass fuel as well as gasification technology, and view tailored information in the multimedia space.

The KAPI and KUFF on-site I&LCs were opened in November 2020, when UNIDO officially transferred the gasification plants to the partners. Training for local stakeholders in the operation and maintenance of the plants took place at the centers.

Making a difference locally, nationally and globally

Building and commissioning the demonstration small-scale biomass plants, in tandem with community engagement and education, has already had an impact on local communities. Boonmee Duanglamai, a villager from Muang in Kanchanaburi Province, comments:

"It's good that the people in the community have a job to do and a chance to earn more income. If we have leftover wood or branches, we can sell them to the power plant."

And in Nakhon Ratchasima, villager Sanitpong Tooklang confirms: "One of the benefits is that this project guarantees that my community will have electricity to use. In addition, my community can become a place where other communities can come