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EPC and technology providers for biomass & biogas to power projects in Viet Nam

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Foreword

Dear readers,

The Climate Protection through Sustainable Bioenergy Markets in Viet Nam (BEM) project aims to improve the preconditions for a sustainable use of biomass for electricity and heat generation in the country. The project focuses on the improvement of planning, technical and financial capacities of respective actors in the biomass energy sector in order to realize bankable investment projects.

Renewable energy is an emerging fast-growing sector in Viet Nam. Until December 2020, there was 16,500 MW of solar energy and around 600 MW of wind energy developed and connected to the grid. All of these capacities are being developed in the recent years. To support the initialization of a similar development in the bioenergy sector in Viet Nam it is necessary to provide a sound basis of information and to prepare the sector for the potential huge development in the near future.

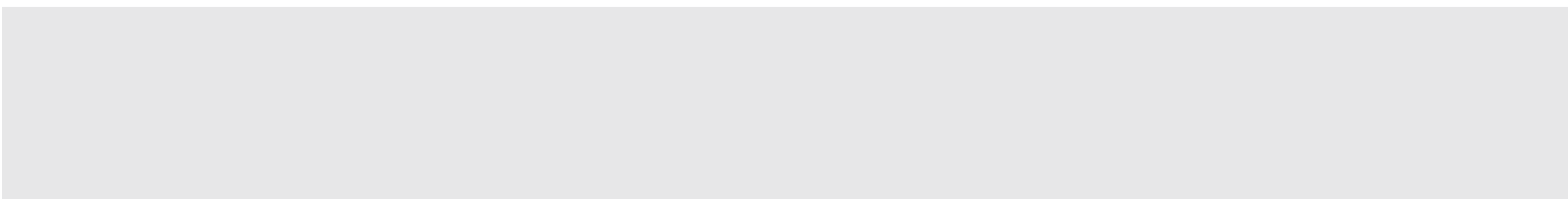
This report is designed to give a quick overview of EPC and technology providers for biomass and biogas to power projects in Viet Nam for decision makers and interested parties

The main objectives of the study are the following:

- Market survey and generate information of engineering, procurement, and construction (EPC) companies/service providers/technology suppliers with regard to biomass and biogas power plant in Viet Nam.
- Gaining contact and insights of the service of these companies to support for upcoming activities under BEM project to make.

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Abbreviations

BEM	Bioenergy Markets
EPC	Engineering Procurement Construction
EU	European Union
EUR	Euro
FIT	Feed-In-Tariff
GHG	Green House Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
IKI	International Climate Initiative
NDC	Nationally Determined Contribution
OpEx	Operational Expenditure

01

Executive Summary

Executive Summary

To support the initialization of a similar development in the bioenergy sector as in the solar and wind energy sectors in Viet Nam it is necessary to provide a sound basis of information and to prepare the sector for the potential development in the near future.

This report is prepared to give a quick overview of EPC (Engineering, Procurement and Construction) and technology providers for biomass and biogas to power projects in Viet Nam for decision makers and interested parties.

The main objectives of the study are the following:

- Market survey and generate information of EPC companies/service providers/technology suppliers with regard to biomass and biogas power plant in Viet Nam.
- Gaining contact and insights of the service of these companies to support for upcoming activities under BEM project to make.

There are two main ways to develop technical projects:

1. Owner engineered, where the project owner executes the project with engineers, consultants, builders and suppliers.
2. Appointing an EPC company as single point of contract and contact but mainly as guarantor, via bank guaranties, of the project execution.

To make investment finance easier, bankable, for complex technological projects using companies providing turn-key solutions is a proven way. These companies usually are called EPC providers. This is the reason why the study focused on the identification of companies providing EPC services. Since investment costs for biogas projects are much lower than investment costs for biomass projects, it was quite difficult to identify companies interested in offering EPC for biogas projects in Viet Nam. For this reason, the biogas paragraph lists companies that could offer EPC as well as biogas technology suppliers.

For this report 60 international EPC companies and technology providers from the bioenergy sector were contacted by email & phone. On interest, they were asked complete the questionnaire and if possible, to provide additional information. Of the 60 companies contacted, only 26 returned a completed questionnaire. This can be seen as an indicator that the Vietnamese market is not considered as attractive as other Southeast Asian markets. Nonetheless, the listed companies provide a good basis for implementing bioenergy projects in Viet Nam.

Chapter

02

Introduction and definitions

Chapter 2: Introduction and Definitions

1. Introduction to the BEM project

The Climate Protection through Sustainable Bioenergy Markets in Viet Nam project (BEM) aims to improve the preconditions for a sustainable use of biomass for electricity and heat generation in the country. The project will focus more on the improvement of planning, technical and financial capacities of respective actors in the biomass energy sector in order to realize bankable investment projects.

The project supports Viet Nam's efforts in climate protection by promoting the energy recovery of already generated biomass waste for power and heat production. As a contribution to reduce emissions, and thus to achieve the Vietnamese Nationally Determined Contribution (NDC), the International Climate Initiative (IKI) project promotes Greenhouse Gases (GHG) abatement capacities by improving the conditions for sustainable use of bioenergy in power and heat production, through the capacity building of important stakeholders for high investment (private sector, authorities, banks).

To make investment finance easier, bankable, for complex technological projects using companies providing turn-key solutions is a proven way. These companies usually are called EPC providers.

2. EPC provider

2.1. Definition of EPC

Under an EPC contract a contractor is obliged to deliver a complete facility to a developer who need only turn a key to start operating the facility, hence EPC contracts are sometimes called turnkey construction contracts. In addition to delivering a complete facility, the contractor must deliver that facility for a guaranteed price by a guaranteed date, and it must perform to the specified level. Failure to comply with any requirement will usually result in the contractor incurring monetary liabilities. The EPC contractor coordinates all design, procurement and construction work and ensures that the whole project is completed as required and in time.

1. E: Engineering functions include basic engineering, detailed engineering, planning, construction engineering.
2. P: Procurement functions include logistics and transport, receiving, procurement, invoicing, purchasing.
3. C: Construction functions include electrical installation, mechanical erection, civil engineering.
4. EPCC: the last C denotes commissioning functions including after-sale-services, testing and commissioning, and modernization of plants.
5. EPCM: the last M denotes management. This is a services-only contract, under which the contractor performs engineering, procurement, and construction management service. Under an EPCM arrangement, the client selects a contractor who provides management services for the whole project on behalf of the client. The contractor under EPCM arrangement has the capacity and experience to manage project. The contractor can be the leader in joint venture to realize the project.

2.2. Why EPC

There are two main ways to do technical projects:

1. Owner engineered, where the project owner executes the project with (own or appointed) engineers, consultants, builders and suppliers.
2. Appointing an EPC company as single point of contract and contact but mainly as guarantor, via bank guaranties, of the project execution. The extent of the guaranties (execution, performance, ...) is depending on what is agreed upon. As this is a very complex legal mater, details are not discussed in this report.

The first option is usually the cheaper but far more demanding on manpower and responsibilities. The second options costs considerably more, as the EPC contractor has to cover possible risks financially but frees resources and makes the EPC company responsible for the execution of the project instead of many.

As internationally active EPC companies have to bear a greater financial risk than technology suppliers, and this in different countries, only economically powerful companies can offer EPC. In addition, the extra costs incurred by an EPC assignment are usually only economically feasible for larger projects. A typical budget for a bio-energy EPC project would be over USD20Mio.

Investment costs for biomass projects (USD3Mio to over USD50Mio) are typically a multiple of investment costs for biogas projects (below USD1Mio to USD5Mio). Therefore, it was quite difficult to identify companies interested in offering EPC for biogas projects in Viet Nam. For this reason, the biogas paragraph lists companies that could offer EPC as well as biogas technology suppliers.

2.2.1. Bio-energy project – technical risks

In bio-energy project, be it with biogas or with biomass, literary millions of parts have to work together. From single parts (like screws) to machinery (like pumps, fans, turbines) to sub-systems (like feeding systems, controllers) to the final energy plant. All these systems need work together under all conditions (part load, full load, emergency) and need to be able to handle errors safely. Technical problems can arise from:

- a) Failing machinery: Machinery usually leaves the supplier in good condition it can be damaged during install or commissioning by third parties. In these cases, the warranties may be void and the recovery of damages will involve several parties including insurance companies. This can lead to lengthily litigation procedures.
- b) Failing or under-performing systems and sub-systems. In these cases, also many parties are involved, from design engineers & consultants to installers & suppliers. Again, the recovery of damages will involve several parties including insurance companies. This can lead to lengthily litigation procedures.

Bottom line: This kind of problems can cause serious financial problems. Even if litigation comes to conclusion, it is not sure that the damages can be recovered from the guilty parties.

2.2.2 Bio-energy project – bank perspective

From the perspective of the financing institutions (banks) they need to know:

1. Can the project pay back the loans.
2. What risks are involved.

3. How can the risks be mitigated.

Assuming that the project has a valid business case to satisfy the first condition (paying back the loan) the second condition (risks) becomes the crucial one. In the banks Due Diligence the risks will be addressed and mitigation methods discussed:

1. Financial risks like change in feed-stock costs and energy sales prices.
2. Design risks like being able to perform as expected.
3. Construction risks like the ability to finish the build- and start-up in time and budget.
4. Operational risks like achieving output and runtime within OPEX.

As shown in 2.2.1 there are a lot of possible issues that can happen during the build- and start-up. The important point for the bank is who is available to pay. Having an EPC company as guarantor reduces the banks risk exposure greatly.

3. Methodology

While the previous study [1] concentrated on EPC providers in Viet Nam, this desktop study contacted 24 international EPC providers for biomass technology and 36 EPC providers and technology supplier for biogas technology by email and phone.

Chapter

03

Biomass EPC

Chapter 3: Biomass EPC

1. EPC companies interested to work in Viet Nam

For this report 24 international EPC companies and technology providers were contacted by email & phone. On interest, they were asked complete the questionnaire [2] and if possible, to provide additional information. Also included is the information of the previous report [1].

Company name [alphabetic order] June2021	country of origin	Appendix number	Additional information
<u>ENESCO</u> JOINT STOCK COMPANY	Vietnam	3	yes
Fives <u>Cail-KCP</u> Limited	India	4	yes
<u>ISGEC</u>	India	1	
<u>JGC</u>	Japan	1	
<u>KPN</u> Green Energy Solution Public Company Limited	Thailand	5	yes
<u>LAWI</u> Engineering GmbH	Germany	6	yes
<u>Thyssen</u> India	Germany	7	
<u>TPSC</u> Toshiba	Japan	8	yes
<u>TSK ELECTRONICA Y ELECTRICIDAD,</u> <u>S.A.</u>	Spain	9	yes

Table 1: List of EPC suppliers interested in the Vietnamese biomass market

Company details, materials provided, and the questionnaires can be found in the appendix. **The list is not qualifying any company, it is based on the information provided by the companies at time of this study. Interested parties have to do their own due diligence.**

Company references list provided June2021	Power output up to [MWe]	Steam output up to [TPH]	Steam pressure up to [bar]	Industries
<u>ENESCO</u> JOINT STOCK COMPANY	7	200	110	Sugar, Palm oil, wood processing, Pulp&Paper
Fives <u>Cail-KCP</u> Limited	30	150	110	Sugar, food processing
<u>ISGEC</u>				Power generation
<u>JGC</u>	75			Palm kernel shells
<u>KPN</u> Green Energy Solution Public Company Limited	17			Rice mills, Palm oil residues, wood
<u>LAWI</u> Engineering GmbH	28	115	68	Rice mills, Palm oil residues, wood, sugar
<u>Thyssen</u> India		130	87	Sugar
<u>TPSC</u> Toshiba	75			Power generation
<u>TSK ELECTRONICA Y ELECTRICIDAD</u> , S.A.				Power generation

Table 2: List of EPC references as provided

Please note: missing specifics were not provided by the companies.

2. EPC companies not interested to work in Viet Nam

Most companies did not disclose their lack of interest. Of those who did the reasons were:

- The economic conditions in Viet Nam are not sufficient to allow for the costs & time spent to develop successful projects.
- The risk / reward ratio was not sufficient.

Chapter

04

**Biogas EPC and technology
suppliers**

Chapter 4: Biogas EPC and technology supplier

For this report 36 international EPC companies and technology providers were contacted by email and phone. On interest, they were asked complete the questionnaire [1] and if possible to provide additional information. Of the 36 companies contacted, only 17 returned a completed questionnaire.

1. EPC companies interested to work in Viet Nam

Seven companies of the firms that returned a questionnaire are able to provide EPC service. However, all companies have pointed out that they need local partners for e.g. civil works, grid connection to be able to offer EPC. Whether these companies would offer EPC under the current framework conditions (e.g. non-existent FIT) is questionable. Of course, these companies would be interested in offering the necessary services for the realization of a biogas plant, such as engineering, procurement construction supervision, plant commissioning, for a local EPC contractor or an owner engineered biogas plant.

Company name (alphabetic order)	Country of origin	Appendix number	Additional information
agriKomp GmbH	Germany	11	X
Alensys Engineering GmbH	Germany	12	X
EnviTec Biogas AG	Germany	13	
Hangzhou Energy & Environmental Engineering Co., Ltd.	China	14	
Krieg & Fischer Ingenieure GmbH	Germany	15	
n-bio GmbH	Germany	16	
WELTEC BIOPOWER GmbH	Germany	17	

Table 3: List of potential EPC suppliers interested in the Vietnamese biogas market

The questionnaires with further information from each company listed can be found in the appendix. **The list is not qualifying any company, it is based on the information provided by the companies at time of this study. However, all these companies have international experience, not only in Europe but also in Southeast Asia. Interested parties have to do their own due diligence.**

2. Technology supplier

As mentioned under 2.2 in chapter 2, biogas technology suppliers were contacted in addition to EPC supplier. These companies were more interested in the Vietnamese market because they are technology suppliers and can therefore control the potential financial risk more easily.

Company name (alphabetic order)	Country of origin	Technology offered	Appendix number	Additional information
Awite Bioenergie GmbH	Germany	Gas analysis system with flow meter, external sensors for humidity, pressure, temperature and more, laboratory digester modules incl. gas analysis system	18	
Baur Folien GmbH	Germany	Gas storage membranes, double layer system, external gas storage system	19	X
Börger GmbH	Germany	Substrate feeding system, Pumping and macerating system, Tank systems	28	X
ennox biogas technology GmbH	Austria	Biogas torch, biogas treatment equipment	20	
Erich Stallkamp ESTA GmbH	Germany	Pumping and macerating system, Agitators, Digesters, Gas storage membranes	21	
Franz Eisele u. Söhne GmbH & Co. KG	Germany	Pumping and macerating system, Agitators	22	
Membrane Systems Europe B.V.	Netherlands	Double membrane covers, Rectangular double membrane covers, Single membrane covers, Lagoon digesters, Concrete protection	23	
Pumpenfabrik Wangen GmbH	Germany	Pumping Technology Feeding and Transfer Systems, Debris Removal and Cutting Systems	24	X
SUMA Rührtechnik GmbH	Germany	Long shaft pump, submersible pump and accessories like lifting frame, Long shaft agitators, submersible agitators	25	

Vogelsang GmbH & Co. KG	Germany	Substrate feeding system, Pumping and macerating system	26	
Wiefferink B.V.	Netherlands	Digesters (Combibag), Gas storage membranes	27	X

Table 4: List of biogas technology suppliers interested in the Vietnamese biogas market

The questionnaires with further information from each company listed can be found in the appendix. The list is not qualifying any company, it is based on the information provided by the companies at time of this study. However, all these companies have international experience, not only in Europe but also in Southeast Asia. Interested parties have to do their own due diligence.

3. Companies not interested to work in Viet Nam

Of the 19 companies contacted that did not send information, only three provided a response; all others did not provide any information. One of the two companies has no interest on the southeast Asian market at all and the other two are already active in many other countries and do not want to become active in one further country. Most companies contacted asked about the current Feed-In-Tariff (FIT) for biogas as this can be an important economic factor for a biogas plant. Since there is currently no biogas FIT in place and the last biogas FIT was very low, the interest of the companies in the market was mostly very reduced.

4. Evaluation

Internationally operating European companies from the biogas sector have so far been active in the Southeast Asian region mainly in Thailand, China, Malaysia, Indonesia and the Philippines. Undisputedly, there is a very large biogas potential in all Southeast Asian countries, so when evaluating the individual biogas markets, special attention is paid to the economic framework conditions. Due to the non-existent FIT for electricity produced by biogas plants, the Vietnamese market seems comparatively uninteresting, which is confirmed by the limited interest shown by the EPC and biogas technology supplier. Nonetheless, the listed companies provide a good basis for implementing agricultural, agro-industrial and municipal biogas plants in Viet Nam.

Chapter

06

**Limitation of the report and
recommendation**

Chapter 6: Limitation of the report and recommendation

1. Limitation of the report

60 EPC and technology providers for biomass and biogas technology from Asia, Australia and Europe were contacted as part of the study. In addition, European and German associations were contacted to inform in their newsletters about the BEM project in Viet Nam and interested companies about the present study. Nevertheless, not all companies that might be interested to enter in the Vietnamese bioenergy market could be contacted within the scope of the study.

All company-related data were provided by the respective companies and were not validated as part of this study.

2. Recommendation

The feedback from the companies may provide a good basis to improve local EPC capabilities by know-how transfer, co-operation and Joint Ventures between the international and local companies.

These data might be used by the BEM project to actively initiate cooperation, with the help of matchmaking events, technology dialogues, initiating project developments, etc. This might reduce the concerns of international companies and support the development of local knowledge.

In addition, it could be helpful to put the results and data online on a new website to be set up (e.g. “service provider Bioenergy Vietnam”). Then, other international companies that have not provided their data yet could still upload their data. Thus, one could generate a constantly updated “bioenergy service provider” platform.

In order to find economic solutions to implement envisaged bioenergy plants, it will be necessary to identify adapted solutions. In this regard, the international companies that have given feedback, as well as interested local companies, could play an important role in minimizing both financial and technical (e.g. after sale service, maintenance, warranty claims) risks.

Chapter

07

Appendices

Appendix Biomass

- [1] [BEM EPC Report 2021.01.12.pdf](#)
- [2] [EPC Questionnaire Companies 20210505.pdf](#)
- [3] [EPC Questionnaire Companies ENESCO JSC May2021.pdf](#)
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- [4] [EPC Questionnaire Fives Cali KCP Ltd May2021.pdf](#)
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Appendix Biogas

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- [19] [EPC Questionnaire Baur](#)
Imageprospekt DMGS
Kläranlagen+Industrie
- [20] [EPC Questionnaire Ennox](#)
- [21] [EPC Questionnaire Stallkamp](#)
- [22] [EPC Questionnaire Eisele](#)
- [23] [EPC Questionnaire MSE](#)
- [24] [EPC Questionnaire Wangen](#)
EPC_Dongying China_Wangen
EPC_pumps Dongying Wangen
- [25] [EPC Questionnaire Suma](#)
- [26] [EPC Questionnaire Vogelsang](#)
- [27] [EPC Questionnaire Wiefferink](#)
Wiefferink1
Wiefferink2
- [28] [EPC Questionnaire Börger](#)
Boerger_Flyer Technology_Agriculture+_Biogas_Plants

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