Deliverable:	Analytic Report on the intervention, Denmark
Author(s):	Jakob Knud Bro Lorenzen, Danish Technology Centre for Biogas
Quality review:	Interim Report June 2017
Date:	15/08/17

Analytic report on the intervention of task 3.1-3.6

(Interim Report June 2017)

Grant Agreement N°:	691755
Starting Date:	01/01/2016
Duration:	36 months
Co-ordinator:	Nils Daugaard, EC Network
Contact details:	0045 3250 8800
	nda@ecnetwork.dk

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

Table of Contents

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

Introduction

This interim report is covering the period from the beginning of the project 1. January 2016 to May 2017. The report covers activities connected to work package 3 in BiogasAction. At the end of the report, there is a table summarizing all the activities related to task 3.2–3.6.

Connected to the report is a number of appendices attached, that documents the different activities in task 3.2-3.6. This covers both minutes, participants lists and other material in Danish with a short summary in English.

3.1: State of departure and intervention strategy/implementation plan 2016

Task 3.1 covers a state of departure and will set the road for task 3.2 – 3.6 – the invention strategy. It summarizes the development of the Danish Biogas sector from the beginning of 90ties and to 2016. A numbers of challengers is detected and will be treated in the following tasks.

The Danish biogas industry has in recent years seen a major progress. Among the reasons is the improved framework conditions, partly as a result of a long-term commitment from the industry itself, as well as an increased focus on renewable energy and out phasing fossil fuels. This means that the industry today is facing a number of opportunities and challenges. To understand this, the industry's development is described in brief below. The industry's own view of the challenges is to be further specified based on interviews in which both members, support staff, and suppliers, have given their input. This puts into perspective the management challenges and opportunities for operating biogas plants in the future.

At this moment 154 biogas plants are in operation in Denmark, producing biogas equivalent to 1.2 TWh /year. Animal manure is the most important biogas feedstock, with a high future potential. Roughly 7% of the produced animal manure is today supplied to biogas plants, but the aim is to increase it to 50% by 2020. Along with manure, organic wastes from mainly food processing industries are co-digested, boosting the methane yield per digested biomass unit. Today biogas is mainly used for heat and power production, but the interest for upgrading and use as vehicle fuel is increasing. The first four Danish biogas upgrading plants were in operation in 2014, and several other biogas upgrading projects are at various planning stages. There are seven biogas filling stations and more are about to be established.

Historically, the industry has functioned as a service for agriculture and delivered energy for district heating plants under the Heat Supply Act. This framework has had an impact on the industry's structure and development. The Heat Supply Act does not give the opportunity to increase earnings, because profits must be sent to the heat customers in the form of cheaper heating. Also the agricultural interests had had great significance because the plants were originally built to meet the increasing demands for storage and utilization of manure in connection with the NPO Action Plan of 1986 and subsequent the water environmental plan.

Despite the challenges that come from being a company that offers solutions for different actors, many plants have evolved into well-run plants that is ready to develop within the new framework, which occurs as a result of change of society with more focus on green energy. But still it gives new challengers to the existing plants especially in relation to the agriculture industry, because the biogas industry in Denmark are mostly based on manure.

First of all, because the agriculture industry both can acts as suppliers, customers and owners of biogas plants. The biogas plants (both the old and the new ones) must therefore have a good and

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

fruitful relationship with the farmers. It is important because the suppliers of manure does not receive a payment for manure, as in a more classical relationship between company and supplier. The plans "borrows" the raw material, and it typically return with an improved fertilizer potential. The added value is not capitalized, although it has a value for farmers, while helping to relieve society of both environmental and climate challenges.

Secondly transport costs for the supply of raw materials and return of the digestate is a large part of the total cost of a biogas plant. Transport costs for pickup and delivery of biomass in the form of manure is between ¼ and 1/3 of the total cost of the Danish biogas plants.

Thirdly, the plants have the ability to get rid of the digested manure again including the extra nutrients that are supplied from other biomasses on the plant. This means that the agriculture industry both acts as a supplier and customer. It should also be mentioned that the returned biomass must contain at least 75% of manure on the dry substance, if it is to be applied by manure Executive Order rules. If there is more waste, it must be applied by the sludge directive, which may present challenges for the individual farmer.

Farmers are also dependent on the biogas plant. Their production of animals can be tied to getting rid of manure from their holdings to a number of suppliers. It's for example applicable both on Bornholm, where Biokraft acts as a distribution center, and in Ribe, where the plant also distributes biomass between farmers. The farmers cost can be too high for them to immediately step out of a collaboration with the plants, because then they will have to pay to get rid of manure. However, not all farmers are depended on a plant – At Blåbjerg Biogas, the farmers are not dependent on the biogas plant in relation to environmental approval.

Regarding other biomass, the biogas sector is also being challenged. Other biomass is often easier to carry around, as it typically has a higher energy content per. tons, and therefore also a higher willingness to pay. It is typical biomass from slaughterhouses or other food production. The plants have in recent years experienced increased competition in this area. Some plants have experienced an increase in payment between 1500 and 3000% in the period from 2001 to 2013. Where previously it was between 10 and 20% of the total cost of purchases they now anywhere up to 70% of the total cost of goods purchased. Several plants have also been made aware of that suppliers of other biomass such as Danish Crown, would rather sell to one big customer than several small ones. It provides a challenge for smaller plants.

Hence other biomass is an area where the biogas plants are experiencing increasing challenges and therefore it is also an area that is being looked at from both the industry and the state.

Compared to the overall social development, there is a paradigm shift across the industry, thanks to the increasing focus on energy and climate. The industry has always been aware that it contributed positively to the climate and energy challenge, but it is only in recent years that the rest of the outside world have become aware of it.

Biogas has a broad appeal as production also solves challenges in terms of food production, sustainable agriculture, resource management, climate and employment. One could even say that the biogas plants continues to be companies that offer a variety of solutions to various challenges in the society.

The paradigm shift is also supported by new opportunities to sell gas. A large part of the plants still provides gas and heat for public heat supply and thus fall under the Heat Supply Act "break-even" principle. Whit more plants upgrading, It means changing customer relationships and a refinement of biogas, which is not seen in the past. The industry is shifting from being the district heating law to be a competitive company. This challenges the entire organization.

In addition, several new players are moving into the market because it has become more attractive due to gas prices and the possibility of combining biogas production with existing business – e.g. NGF Nature Energy, an energy company. There are new constellations with energy companies or other

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

actors who act both as funders and producers. The traditional cooperative mindset of agriculture is generally not as pronounced as it was with the construction of the biogas industry in the 90s. Many of the new plant is started based on agriculture and they are still involved, but in the funding process, they have taken external partners in. E.g. both plants in Holsted and Bevtoft started with agriculture.

Several new plants and the growing expansion of the industry, which also comes through the expansion of existing plants, providing a natural pressure on staff resources, which most likely means that in future there will be increasing demand for employees and thus increasing employment.

Through a number of interviews with the plants, they have expressed a number of challenges. The challenges span from general challenges and to more operational-oriented challenges when it comes to ensuring continuous operation. Part of the challenges is in line with the above.
All interviewed plants have expresses that reports to various authorities takes time from daily operations. An operator even expressed that he is spending more in the office than he is out on the plant.

Also, some of the reports also requires accountant approval, which consequently confer a direct economic expense. Some plants also points out that the report requires a lot documentation before the accountant will approve the report and thus it is an additional expense in both time and resources.

The Strategic analysis in relation to WP 3.2- WP 3.6

The following analysis is based on the above and summarized in 2 tables. The SWOT table summarizes the existing Strengths , weaknesses, opportunities and threats and the stakeholder analysis describes the benefits and how they can contribute promoting biogas in Denmark. After the tables, the initiatives under 3.2-3.6 is described in brief. Finally a time schedule for intervention is presented.

Table 2 The below SWOT is a summery from above.

Strengths	Weaknesses
• Big potential for energy • New possibilities for biogas (upgrading) • Known and well used technology • Great potential for CO2 reductions in municipalities/Denmark • Local and national business potential • National skills both process area and industry area • Better use of fertilizers • Municipal experience from some municipalities can be used in other municipalities	• The spread of animal units • Unknown field for several municipalities • Financial problems in the field of agriculture • Local obnoxious problems at biogas plants • Logistical challenges when transporting manure • Untrained staff • High level of documentation form the state • Increasing prices on other biomass
Opportunities	**Threats**
• Security of energy supply • Growing focus on green energy • Political agenda • Large climate effect • Environmental benefits • Reduced spread of infection and weed seeds • Reduced obnoxious smells compared to “normal” manure • Biogas can be used in transport (heavy transport)	• The biogas price – a subsided price with future uncertainties • The overall financial situation • Lack of industrial waste to boost the biogas production – increases the price • Sewage sludge as fertilizer is not popular for food producers • Low levels of methane relative to the natural gas network • Not in my backyard

This project has received funding from the European Union’s Horizon 2020 research and innovation programme.

• Wide knowledge regarding biogas in Denmark – export potential	• Biogas Task force and Traveling team (both governmental actors) are closed down by 31. December 2015 • Lack of educational opportunities

Below is a stakeholder analysis.

Stakeholder	Benefits for the stakeholder	How can they contribute?
The agriculture industry	• Fertilizer potential • Less use of pesticides • Future business potential • Environmental improvement	• Manure and other biomass • Shareholder or co-owner • Receiving degassed manure
Municipalities/state	• Security of energy supply • CO2 reductions • Environmental improvement • Local agricultural interest • Waste water treatment	• Improve case processing times e.g. EEI (Evaluation of Environmental Impact) • Promote green energy • Buy green energy
Existing plants	• Bigger plants • Better economy • Contribute to green economy and a green society •	• Experience and knowledge regarding running a biogas plant • They know where the problems are.
Power and energy companies (local and central)	• Ensuring energy supply • A green profile	• Business with plants and farmers
Association for Danish Biogas plants / Business Association for biogas	• Great knowledge regard all aspects of biogas	• Knowledge and stakeholder contacts.

The implementation strategy:

In the following, the individual tasks will be described with focus on the implementation strategy and the activities that are initiated and expected to be initiated throughout the project period. There will be a short state of departure, the intervention and then status in BiogasAction and the future work.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

3.2: Institutional-building

3.2 Institutional-building

State of departure:

As mentioned before DFFB is, as partner in BiogasAction, a new association in landscape of biogas in Denmark. It was established in 2015 as an association, that should focus on education and knowledge sharing among professionals in the Danish biogas industry. It should also focus on knowledge sharing between the sector and the public in order to improve the corporation and the development of the biogas industry.

The biogas sector.

During the development of the biogas sector in Denmark from 1990, the biogas business established 2 organizations to promote the business. The biogas plants established “Foreningen for Danske Biogasanlæg” (Association for Danish Biogas Plants) and the hole business established “Brancheforeningen for Biogas” (The association for Biogas). These 2 associations have been working side by side until now. From the end of 2015 and the beginning of 2016, there have been a discussion regarding merging the 2 associations.

On the public side, the Danish state established in 2012 (as a result of an energy agreement in the parliament) a Biogas Taskforce and a support team for biogas planning in municipalities. They both supported the development of biogas on Denmark. The development of biogas was also supported by better prices for biogas. After the shut-down of Biogas Task force and the support team for Biogas planning in municipalities at the end of 2015, there is a new situation for biogas.

Intervention

To promote biogas, there is a need for dialog with stakeholders interested in biogas in Denmark and to start a dialog with the existing associations for biogas. To start the dialog, there will be held regional mobilization meetings in Denmark, with the aim of establishing regional or national networks. These mobilization meeting will focus on public stakeholders and will give the stakeholders the possibility to meet in order to strengthen the cooperation between actors, improve conditions and promotion for new plants, especially with respect to planning and financing. Other networks will also be establish according to the new situation with the merging of the 2 old associations. The different networks will consist of representatives from municipalities, from the two Danish biogas associations, from farmer organizations, knowledge institutions and project developers. There will also be a close dialog with the plants.

A special focus will be on establishing a project network consisting of all the different biogas projects, that we have in Denmark. The aim will be to make sure that these projects will coordinate the different work, that each project is during.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme.

Status in BiogasAction:

BiogasAction have been, through DFFB, working on different levels in order to consolidate a national platform for biogas. There has been held meeting in western and eastern part of Denmark with different actors. List of actors can be seen in the appendix.

DFFB has been involved in the merging of the two old associations. At this moment, the new biogas association (Foreningen Biogasbranchen – established on the 28th of Marts 2017) is discussing, due to the activities done by DFFB (as part of BiogasAction) how to incorporate DFFB as an integrated part of the biogas sector in Denmark. At this moment DFFB is taking care of knowledge sheering and training as a part of a cooperation. Meetings on further cooperation will be held during 2017. A closer cooperation with the new association will indeed strengthen the work done in BiogasAction. Whether DFFB will be merging with the new association or function as an independent association is still unclear.

On the project side, DFFB has established a network for biogas projects and actors working with different aspects of biogas (annex 1 – 7 participants). The aim of this network is to make sure that there will be a coordination between the many projects within biogas in Denmark. The first meeting was held in December 2016 and the next meeting is in May or June 2017 – see appendix for further information.

In relation to educational institutions and how to promote and establish a biogas platform for educational activities for biogas, DFFB has established contact and a network for educational institution, who is working with biogas (see e.g. annex 7 (4 institutions) and annex 8 (4 institutions)). The institutions are a vocational institution and an academy institution. The network also consists of biogas plants in order to identify or uncover different education and training needs at the plants. See further in task 3.5 for educational activities.

Forward planning:

In relation to new activities and forward planning, the idea is to consolidate the cooperation and perhaps integration/merging with the new biogas association in Denmark. DFFB is in a close contact with the new association and meetings regarding the cooperation is in place.

A national platform for educational institutions is an ongoing activity due to the new biogas education that is underway. See task 3.5.

One of the most important areas will also be how the work with the differences between east and western part of Denmark.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

3.3: Strengthening the biogas sector framework

State of departure

One of the main challenges in the administrative procedures is the uncertainties in the municipalities and the project developers regarding planning new biogas plans and the approval procedure.

A biogas plant requires a great deal of permissions. Besides a building permission and the approval by The Danish Veterinary and Food Administration a biogas plant also need environmental approval.

It is not essential that biogas plants are placed in an area directly appointed in the municipal plan, but it will make it easier. Compared to the municipal plan (rural planning), it is important that the biogas plant is placed in an area not covered by space constraints, for example as protected areas or areas designated for urban purposes. It should therefore be in the so-called "white" areas of the municipal plan. If a biogas plant is to be placed in an area of space constraints, it requires a municipal plan amendment (addition to municipal plan). In addition, there are differences in the case of a farm plant or greater (common) plant. A farm plant require a rural zone permit from the municipality while a larger (common) plant requires a local plan.

A biogas plant also requires an environmental permit. As a minimum, the plant needs an EEI (Evaluation of Environmental Impact) screened. If the screening concludes that there are likely to be significant effects on the environment, it requires an actual EEI. Also in this context, the size of the plant is a significant factor. A larger (common) plant will lead to an actual EEI. However, it may also be the case for a farm plants.

Construction of a biogas plant requires the following approvals from public authorities:
A. Building Permit
B. Planning Act Authorization
C. Approval as listed activities
D. EEI
E. Approval from The Danish Veterinary and Food Administration

As shown above, there is clear rules on how the authorities should deal with cases concerning the establishment of biogas plants. In addition to improve and promote biogas, the state decided I 2009 to set up a support team in biogas which assist the municipalities with the location of the biogas plant. Unfortunately by the end of 2015, this team was closed.

Clear guidelines are in place, but there are not very many experiences with the procedures in the municipalities – especially in eastern part of Denmark. Today, there is not many municipal employees who have experience with biogas. That is a challenge for municipalities. There is need for a build-up of case management skills within the municipal authorities – especially in the eastern part of Denmark (Zealand).

To address these challenges, there is a need of getting the stakeholders to work together in an earlier stage. For this reason, the project will set-up a number of training activities for municipalities and the project developers, and will guide engaging public authorities or how to make a rural planning that

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

takes into account the location of biogas plans. Targeting the main stakeholders, the project could also set-up more generic models for how to promote and develop a better framework for the biogas sector.

Status in BiogasAction

During the first period of BiogasAction, meetings has been held in western and eastern part of Denmark in relation to biogas planning and how to promote planning of biogas plants (see e.g. annex 2 (20 participants) and 3 (12 participants)). These meetings has shown, that there are differences in the way planning is working or being done either if the municipality is from Jutland/Funen or Zealand. Due to these differences, we have used Municipality of Vejen in Jutland as an example of how to work with biogas. Officials from Vejen have been participating in training courses in Zealand in order to explain how they work and how municipalities can promote and use biogas as a part of their policy. This has also been done in Jutland. See appendix for further explanation.

Officials from municipalities have also been visiting biogas plants in order to get a better knowledge on how biogas plants are functioning and what problems they are struggling with.

Forward Planning:

One of the big issuers in the future work of BiogasAction is how to connect biogas to household waste in relation to the biogas sector framework. (First meeting is planned for August 2017 in connection with ECNet and Gate 21). That's also why BiogasAction is planning to go into closer cooperation with municipalities and waste companies in order to use household waste in the future energy production from biogas. BiogasAction will make sure that the national plan for waste management is connected to biogas production and that municipalities rethink biogas.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

3.4: Optimizing business models and financing of biogas projects

State of departure

Traditionally, the Danish model has been of cooperatives between farmers and to produce biogas for CHP and to use the degassed biomass as fertilizer. This is changing now. We have seen more and more plants, that are planning to upgrade the biogas and to send it to the grid, but it gives challenges to the financing side of a project (especially public guaranties), due to the Danish legislation. Hence, there is a need for optimizing the existing business models or to implement new models, based on e.g. useful information provided by WP2. The project will go into a dialog with upcoming projects in an earlier phase and try to optimize financing models for the Danish way to plan and organize biogas plants. Hopefully, the experience from this exercise will lead into some generic models for pre-phase financing of biogas plants.

Also new technology will have focus in business plans and models. This applies both to upgrading technology and other ways of producing biogas.

Intervention

BiogasAction in Denmark will have focus on the new possibilities for biogas plants in Denmark, This means that biogas models and financing of biogas projects will work with different models for new and extensions of biogas plants. This means also a upcoming focus on ecologic biogas plants and how this can promote both biogas and ecological production in Denmark.

From WP2, BiogasAction has identified different tools, that will be used in the task. E.g. Bio Energy Farm II has some interesting tools for both small and big scaled biogas plants.

Traditionally, biogas plants have earned money on their biogas. In the future, biogas plants will have to look for other ways to earn their money so that they are not only dependent on the biogas prices. BiogasAction will therefore also look at new business models for biogas plants.

Status of BiogasAction

The new situation in Denmark causes biogas plants to think differently. Based on a number of contacts and collaborations, DFFB is at this moment preparing business plans for 2 plants. This is an ongoing process and we are planning to have the first models in winther 2017.

The first business plan is a farmer based plant, where the biogas will be combined with wind and perhaps a technology for methanisation of the CO2 from the biogas production. (Hydrogen from electrolysis can be used together with CO2 to produce methane. This is called methanisation. The CO2 source may, for example, be biogas, which contains approximately 35% CO2, but the CO2 may also come from other sources, eg. breweries, bioethanol factories or possibly power stations – see http://www.energinet.dk/EN/GAS/Udvikling-af-gasteknologier/Teknologier-til-produktion-af-VE-gas/Sider/Metanisering.aspx)
The second activity in this task is a more “traditional way” to make biogas although the organization of the plant is new. At this moment BiogasAction is working together with an agriculture service

This project has received funding from the European Union’s Horizon 2020 research and innovation programme.

company (a company that's doing field work for farmers) who wants to extent it's field of work by offering manure handling in form of biogas production. They are seeking a business model or plan in form of a feasibility study. Here is tools from former biogas project in use – e.g. Bioenergy farm II is help and useful.

Forward planning

At this moment BiogasAction has identified one more possibility to make a business model and is looking for further possibilities. One action could be to start up a plan for merging smaller plant in some sort of collaboration. This has to be investigated further the next couple of months.

New business model will have a greater focus in the coming period. New ways of earning money for the plants will be investigated. Within the last year we have seen biogas plants who have challengers getting rid of degassed biomass. BiogasAction will look for possibilities for collaboration with fertilizer companies and see if there is a possibility for the biogas plants to make some kind of project with them.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

3.5: Optimizing biogas production

State of departure

The biogas sector is self-taught with few educational activities within the educational system, meaning that most plants have their own way of doing things, not based on shared knowledge. During the 90ties and 00s, the business had some knowledge sharing activities. They also tried to develop educations for biogas. From 2010 and until now these activities faded out, especially the educational work.

To increase knowledge sharing, training and education, the focus will be on developing a knowledge base containing information on different aspect of biogas e.g. pump systems, pre-treatment, plant maintenance, etc.

A certified biogas education program could be initiated in cooperation with educational institutions, and training courses at a national level at an existing plants. The aim is to establish a knowledge and information base about biogas and to design and implement a biogas training program.

In relation to increase the technology level within the biogas sector, BiogasAction will, in Denmark, focus on a more systematic approach to biogas production. It could in relation to implement new technology or new “feeding” structures to produce biogas.

Status of BiogasAction

Lessons learned: Due to the situation in the business with lack of education and knowledge sharing, BiogasAction has used a lot of time and resources to meet plants, educational institutions and other stakeholders within biogas. One of the lessons learned is that you must gain their trust before you can educate them. There is also a lack of educational material, no or few figures for the process and an unknown area for educational institutions.

Training sessions:
During the first part of the project 4 training activities has been held so far: Pumps and maintenance, responsibilities in board work, general maintenance, Economy and reporting and teamwork. (see annex 4 (19 participants), 5 (12 participants), 6 (8 participants) and 9 (20 participants), annex 11 (12 participants)). This is mainly targeting existing employees and boardmembers at biogas plants.

An ordinary education:

One of the major tasks in Denmark is to ensure that there is qualified labor for the extensive expansion that is taking place in Denmark. Hence BiogasAction has used a lot of effort in relation to develop an education for biogas workers or future workers. BiogasAction has made contact and also formed a network between educational institutions and biogas plants in order to uncover the needs at a biogas plant (see both task 3.2 and annex 7 and 8). Based on this, a biogas education within the ordinary education system has been developed and will start in autumn of 2017 and the beginning of 2018. It is a Process Operator education specialized in biogas. It is a vocational education where the student sign an apprenticeship at a biogas plant and is shifting between school and plant. A broader description of the education is being made in cooperation with the educational institution.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme.

Knowledge sharing activities:

In order to perform better at each plant, DFFB has created a knowledge sharing network for biogas plants, where focus is on benchmark on key performance indicators. Data will be available anonymously to others (see annex 6 (8 participants)).

Other activities on optimizing biogas production:

BiogasAction has also helped new employees with one-to-one training (peer-to-peer learning) between different plants. Especially in connection with a new daily manager.

In relation to biogas production and a more systematic way to produce biogas, BiogasAction is working on a more systematic way to feed the digester. Together with a network of biogas plants, DFFB is investigating the possibilities for collaboration regarding laboratory facilities, so plants can measure different content and gas potentials relative to the contents of the individual digesters.

Forward Planning:

DFFB will continue to offer courses for biogas plants in Denmark. On the basis of meetings with, in particular, Operations Manager, DFFB will provide a number of topics that the plants find relevant. For example, it could be laboratory exercises and how to feed the plants optimally. Due to the closer collaboration with the new association it will be easier to develop new courses and training activities.

One of the areas that requires special efforts in the coming period is an effort to provide apprentices to the forthcoming education that will be established. The situation with lack of labor requires more people in the industry. Here is the upcoming education a very important impact and therefore resources must be used to get the education known.

DFFB will also continuing the focus on how to improve systematic ways to feed biogas plants. Perhaps DFFB will, in cooperation with a number of biogas plants, seek funds to establish laboratorial facilities and to develop a business model for cooperation on these facilities.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

3.6: Assistance to specific high quality biogas project development

State of departure

In 2015, several projects in Denmark were not moving forward due to some financial and technological challenges. From 2016 this has changed; a lot a new biogas plants are now being build. Based on the knowledge gained in 3.2-3.5 (and from WP2), the project can focus on a number of biogas projects and identify how these projects can move forward. In the originally application, 4 specific projects where identified with different challenges. They were considered eligible to start a dialog with, in order to share gained knowledge from the project. The projects were; Biogas in the Triangle Region (farmer association planning to build 2 plants), biogas plant in Videbæk (new plant), Linkogas in Rødding (expansion plans) and Hashøj (expansions plans). This preliminary list could though be adjusted during the development of the project. The work involves a dialog and assistance to a feasibility study for each of them, and there could be further assistance in their process towards implementation of their project, e.g. be alternative financing models.

Status in BiogasAction

Within BiogasAction we are working with both 2 new pretreatment plants for bio waste (see annex 14) and new 2 new plants (see annex 12 and 13).

Biogas plants are constantly looking to more continuous biomass supplies, and therefore two plants together with DFFB have also begun exploring the possibilities for making pre-treatment plants for different biomasses. Initially, joint meetings were held, after which the two plants will, in collaboration with DFFB, make each own business plan. Feasibility studies will be made for the 2 pretreatment plants (still not officially and is not to be shown at this moment due to some business secrets). The total investment in both plants are approximately 25-27 mill. Dkr. for each plant. (4-5 mill. Euros for each)

The 2 new biogas plants are in a very early phase and BiogasAction is helping them collecting information, the first contact to public authorities and visiting existing plants etc. One plant is a number of farmer who wants to establish a joint plant for handling livestock manure while the other plant is a company that wishes to expand the business area.

Forward Planning:

Regarding the pre-treatment plants, DFFB will make feasibility studies in 2017. These studies will be available in spring 2018.

Regarding the 2 biogas plants, 2017 will be a year where focus will be on various studies and uncovering in relation to making a business plan / feasibility study for the 2 plants.

DFFB will also have focus on how to incorporate organic household waste in biogas plans for biogas production. That will also be the case in relation to organic (ecologic) biogas. There is a growing focus on ecologic biogas due to the growing marked for ecological goods. Ecological farmers are in need of ecologic fertilizer, hence biogas will be very important in the future.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

Conclusion incl. a table, that summarizes the performance indicators.

WP3: Regional SEAP

- The overall purpose of WP3 is to define a specific intervention strategy for each target country/region and subsequently to implement the strategy with the aim of boosting the biogas production and development
- The intervention strategy is to consist of a range of specific activities and measures around the project themes: Institutional-building of the key stakeholders, Strengthening the biogas sector framework, Optimising business models and financing of biogas projects, Optimizing biogas production & Providing assistance to specific high quality biogas project development

Task	Key performed activity	Performance Indicator (PI)	PI fulfilment	Work plan for next reporting period
3.1: State of departure and intervention strategy/implementation plan	Danish technology center for biogas has develop a strategy for the intervention in Denmark. The strategy in BiogasAction relies on policies and other strategies on biogas from Denmark and the overall project objectives.	Qualitative evaluation whether the strategy & implementation plan will be effective for performing WP3.2-3.6) and giving input to an EU biogas development strategy	In the first year of the project, the process seems to be in line with the strategy. There are some challengers regarding the institutional building due to the merging of the 2 main biogas associations in Denmark. The merging has led to a vacuum in the offspring of 2016 and the winter of 2016 and 2017. Hopefully we will see a positive development in the merging in 2017.	Continuing to evaluate and perform according to the strategy in the next period of the project.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

3.2: Institutional-building	As mentioned above, there is a merging going on between the 2 main associations in biogas in Denmark. This has influence on DFFBs work in the future. We are looking forward to see what this ends up with. According to the public institutions, there has also been establish meetings with municipalities in order to form a forum for public institutions. There has also been establish a project network for projects dealing with biogas in Denmark. The network is hopefully becoming an ongoing network. A network between 2 educational institutions have been establish in order to establish ordinary educations.	• Establishment of a stakeholder forum to operate in the target region in the project period and beyond • 2 forum meetings per year • Qualitative evaluation of the effectiveness of institutional-building and networking, incl. its future viability	The stakeholder forum will most likely be connected with the new association (see description of task 3.2). A forum of educational institutions has also been established (see annex 1) 2 forum meetings has been held with municipalities. A third meeting is under way. (see annex 2 and 3) Total numbers of participants so far: 4 educational institutions and 32 participants from municipalities and institutions The qualitative evaluation is to be performed closer to the end of the project, but at this moment there seems to be different challengers according to geography (east and west are different when looking a biogas development in Denmark). This will off course affect the work in this task.	After the merging of the 2 main associations, DFFB will go into a dialog with the new association in order to clarify the future work within biogas. Meeting is to take place in April 2017. To continuing the work with public associations and trying to address the different challengers according to institutional building.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

3.3: Strengthening the biogas sector framework	Within the institutional building in relation to public institutions, there has been held meeting in east and western part of Denmark. They have different challengers and we are looking on how to manage this in the best way and thereby to strengthening the biogas sector framework.	• 3-4 events/training courses for public administration aimed to improve the framework, including follow-up efforts of the recommendations • 2-4 events/training courses aimed to raise the public acceptance • Supplemented with specific measures suited the local situation • Overall evaluation of the task 3.3 achievements	There has been held 2 events, where focus has been on knowledge sharing from one municipality to other municipalities. (see annex 2 and 3) Public officers (both east and west) has also been visiting biogas plants in order to see what challengers biogas plants are struggling with. (see also annex 2 and 3) Total number of participants: 32	Work will continuing and there will be a larger focus on organic household waste.
3.4: Optimizing business models and financing of biogas projects	DFFB has been working on 3 project in the first year and has also been collecting material from other business models and feasibility studies. This biogas business is moving quit fast forward in Denmark due to the good framework conditions and this has caused many new plants.	• 4-5 pilot project and business cases suited the local conditions (feasibility studies) • Supplemented with specific measures suited the local situation (to be defined in the project's mobilisation phase)	At this moment BA is working with 2 models.	DFFB will continuing to look for new business cases to work on. Degassed biomass will hopefully be an initiative for the next period.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

		• Overall evaluation of the task 3.4 achievements		
3.5: Optimizing biogas production	Due to the lack of training and educational facilities in biogas, DFFB has started from scratch. There has been held 4 training activities with both board members from biogas plants and daily operators. Focus has been on maintenances, economy and board work. DFFB is also working on an education in the ordinary educational system. The education is an vocational education, that takes 4½ year. It is called "Process operator" and is a combination between school activity and work on a biogas plant. DFFB is also working together with an University on a tool to optimize the use of biomass in order to produce more biogas.	• A local training package incl. use of training material from previous EU national projects • Series of 6-8 trainings on specific topics for biogas plant operators • Supplemented with specific measures suited the local situation (to be defined in the project's mobilization phase) • Overall evaluation of the task 3.5 achievements	5 training activities has been held. (See annex 4 (2 training sessions), 5, 9 and 10). An biogas education within the ordinary education system is been develop. The education will start in offspring 2017 and the beginning of 2018 (see annex 7 and 8). In order to perform better at each plant, DFFB has created a knowledge sharing group for biogas plants, where focus is on benchmark on key performance indicators (see annex 6). Total number of participants: 89 board members and workers.	To continuing develop training educational activities fitting the needs at the biogas plants. In 2017 a number of meeting will be held with plant operators in order to make sure that DFFB is developing the right training and educational activities. DFFB will also focus on collecting data for benchmarking between Danish biogas plants.
3.6: Assistance to specific high quality biogas project development	New pretreatment plants for biomass is been develop within this project. DFFB is assisting 2 plants on this – approximately 50 mill dkr. in total. DFFB has also assisted and is still helping a plant in order to expand the production.	3-4 biogas projects per region will get help in order to move forward.	2 biogas pretreatment projects are being helped. The idea is to pretreat dead animals and industrial animal waste in order to insure high	DFFB will continuing the work with the pretreatment plants. DFFB is looking for further developers that needs assistants.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

	2 new biogas plants in Jutland is also being helped in order to move forward. To improve the biogas production, DFFB is working together 5 biogas plants in order to professionalize, how to measure and feed the digesters. The idea is to hire a laboratory technician and professionalize the way they feed the digester.		quality biomass for biogas plants (see annex 14). One plant in municipality of Varde and one in municipality of Herning is also being helped at a very early stage (see annex 12 and 13).	

This project has received funding from the European Union's Horizon 2020 research and innovation programme.

This project has received funding from the European Union's Horizon 2020 research and innovation programme.