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Collaboration Initiative on Biorefineries**

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D 4.3 Guidelines on the best practice of establishing and managing a StarCluster

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| PP | Restricted to other programme participants (including the Commission Services) | |
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1. Introduction

The multidisciplinary nature of research related to biorefineries requires a coordinated multidisciplinary approach. However, only a small percentage of European publicly funded research is coordinated in intergovernmental organisations, programmes or spent jointly in the Community's Research Framework Programme. The remaining rest is funded via National or regional programmes. These funding programmes are very important, but they often unnecessarily duplicate each other, or lack the scope and depth required to make a significant impact.

One of the main aims of Star-COLIBRI was the clustering of existing activities on Biorefineries in Europe to implement synergies, avoid duplication and maximise results. This included following tasks:

- to promote coordination of on-going biorefinery-related research at European and national levels,
- to define research priority needs and;
- to promote information exchange on any aspect of the entire production value chain

In order to achieve these goals Star-COLIBRI has been applying a new and innovative project clustering strategy, which consists of several consecutive steps.

The StarClustering strategy

This strategy focuses on promoting role model project clusters that consist of a large, leading research project, called a “Star-Project”, and several smaller, more specific “Comet projects”, i.e. projects of excellence covering specific aspects, often funded at the national level with a shorter lifetime and fewer resources.

By working together on mutually beneficial terms, the Star- and Comet-Projects should be able to bridge technology gaps, combine resources to reach a critical mass, homogenise approaches, such as life-cycle analysis, and become more visible to the industry, society and policy makers.

The theoretical approach in the search for potential StarCluster constellations is divided into several subtasks: While the first step of the StarClustering strategy is to identify the Star projects¹, the second step is to identify matching Comet projects that could gain from collaborating with a Star project whilst facilitating the success of the same Star projects. In the previous deliverables^{2,3} the procedure of identifying suitable Comet projects that could potentially be linked with the Star projects to form a StarCluster has been described in detail. The separate steps are visualized in fig. 1.

¹ Star-COLIBRI: Deliverable 3.2: “Identifying potential Star projects and coordinating information collection via the ETPs National Support Groups”, 2010

² Star-COLIBRI: Deliverable 3.3: “First analysis of gaps, overlaps and complementarities”, 2010

³ Star-COLIBRI: Deliverable 3.4 „Report suggesting suitable StarClusters“, 2011

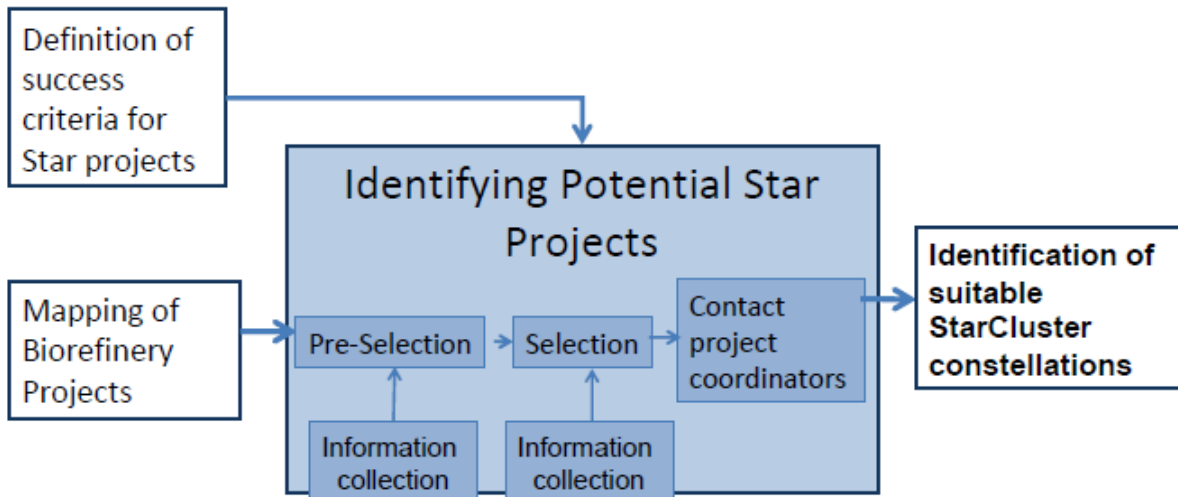


Fig. 1: First part of the StarClustering Strategy: Identification of Star project and matching Comet projects

In a third step Star-COLIBRI’s so-called “StarCluster liaison office” will support the establishment of collaboration between the previously determined Star and Comet projects (fig. 2). The present report will mainly focus on the last step of the process, since the other ones have already been described in deliverable 3.2 “Identifying potential Star projects and coordinating information collection via the ETPs National Support Groups”, in deliverable 3.3 “First analysis of gaps, overlaps and complementarities” and in deliverable 3.4 “Report suggesting suitable StarClusters”. However, in order to illustrate the whole process, there will also be a summary of the previous deliverables.

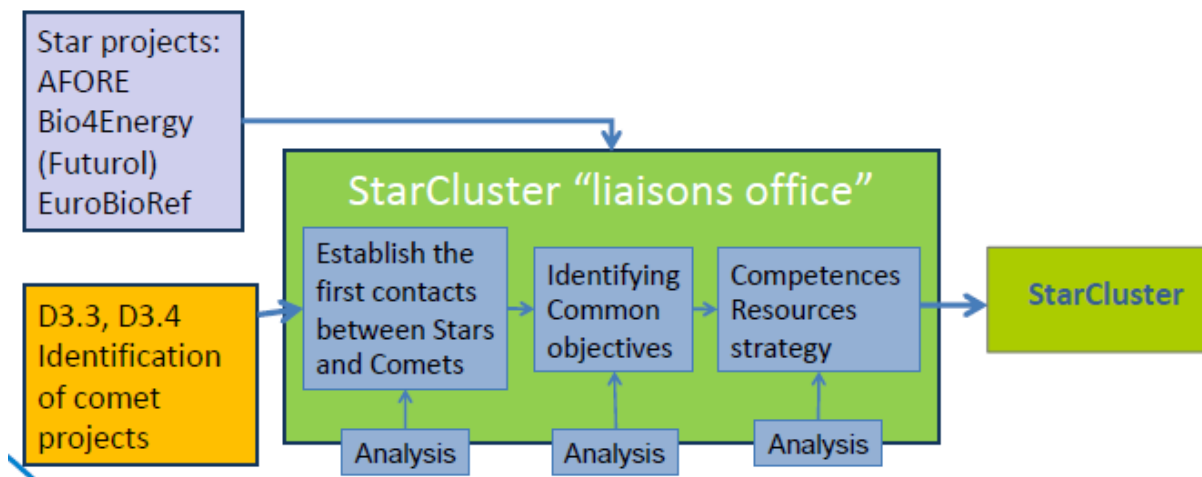


Fig. 2: Second part of the StarClustering Strategy: establish collaboration between Star and Comet projects

According to Star-COLIBRI’s opinion, StarClustering will bring numerous mutual benefits for the participating parties. Apart from gaining critical mass and thus having more impact by joining forces, the projects might also profit from a broader resource base in regard to knowledge and/ or technologies and from avoiding overlapping research activities.

After all this strategy will also help to increase the transparency within this sector, since StarClusters will be more visible than the numerous, small research projects by themselves. This will help in reducing the many overlaps in the biorefinery research and development field.

The title of this report might be slightly misleading. The experiences have shown that this strategy can not be pursued in a uniform, but only in a rather individual way. Furthermore, some significant barriers have been identified, which complicate the process and which should be addressed in order to establish a better framework for international, cross-project collaborations. For these reasons, it was not possible to develop general guidelines for establishing StarClusters. Instead, the following report describes the first experiences with this new strategy, including the problems that were encountered and how they were overcome by the Star-COLIBRI team. This eventually results in a general analysis of the whole process, in which barriers and opportunities are highlighted and recommendations are given.

2. The StarClustering strategy in practice

The StarClustering Strategy has been developed to address Star-COLIBRI's aforementioned objectives. This said, it has to be clear that it has been a theoretical concept that needed to be tested by the Star-COLIBRI team for its feasibility. This chapter reports about Star-COLIBRI's actual experiences with this process, first results and about adaptation of the theoretical concept that had to be made.

2.1 Identification of Star projects

The process started with the search for Star projects⁴ and the definition of respective selection criteria⁵. But what actually is a so-called Star-Project? According to the Star-COLIBRI definition, a Star project is a large, leading research or demonstration project that could have a substantial impact on the European market by 2020. It means that it must be an R&D project with a real industrial strategy. Importantly, a Star project must be a collaborative R&D project and cannot be carried out in one company or institution alone. Neither can a pilot or a demonstration facility be considered an R&D project by itself. However, a collaborative R&D project utilising a certain facility (pilot, demonstration or full-scale) can be considered a Star project.

In previous and partly parallel work steps a mapping of European biorefinery R&D projects and the establishment of a biorefinery portal⁶ were accomplished. The information resulted in a fairly comprehensive research project database - hosted on the Star-COLIBRI Biorefinery Portal. Approximately 300 European biorefinery and biorefinery-related research projects had been identified during the mapping process in task. This pool of R&D projects was used as basis for the selection of so called Star projects.

It was decided to firstly apply a pre-selection, in which a project-budget related filter has been applied in order to exclude small projects with a total budget of less than Euros 4 million. This Euro 4 million filtering resulted in a list of 44 projects. These projects were then further evaluated by Star-COLIBRI by applying the pre-defined seven pre-selection criteria (listed below).

⁴ Star-COLIBRI: Deliverable 3.2: "Identifying potential Star projects and coordinating information collection via the ETPs National Support Groups", 2010

⁵ Star-COLIBRI : Deliverable 3.1: „Definition of success criteria for Star-, Comet projects and StarClusters“, 2010

⁶ Star-COLIBRI: Deliverable 2.3: "Preliminary report on the global mapping of research projects and industrial biorefinery initiatives", 2010

Criteria for PRE-SELECTION of potential Star projects

1. Raw materials must be biomass: biomass of vegetal and/or animal origin, including industrial and urban waste.
2. The potential Star project should have an end date no later than 2020 (our primary timeline).
3. As the project must have an actual industrial application, there must be at least one key industrial partner in the consortium.
4. The project must not be focused only on the laboratory level but have at least a pilot scale step. The reason behind this criterion is to show that the Star project has a real industrial strategy.
5. A Star project should have potential impact on the European scale, which requires a certain critical mass; one way of measuring this is through the budget of the potential Star project. The preselection threshold was set at a minimum project budget of Euro 5 million.
6. The project should not be coming to an end as there would be no time left to initiate collaborations. Only projects with at least 18 months left of the project duration were selected.
7. The project should integrate several parts of the production value chain and should not be focused on only one step.

If the required information for such an evaluation could not be obtained within the timeframe of this step, or if severely conflicting information made it impossible to confirm a project passing a certain selection criteria, the project was not retained for Star project evaluation.

In the following step, the selection criteria from task 3.1⁷ were applied for the evaluation and ranking of the remaining projects based on their perceived potential impact. The following project features were evaluated in this step:

Criteria for SELECTION of potential Star projects

1. Innovation for the market

“Innovation” means that a Star project must bring added value to the market. The project must be based on a technological breakthrough. This added value could concern new products or also better technology to produce the same product with different technology or feedstock. It could be also the development of a new technology that highly improves efficiency and thus costs. A Star project must not duplicate what has been done before elsewhere. It cannot be just incremental. For instance, a bioenergy demonstration project based on the development of an improved cogeneration process cannot be considered as a potential Star project.

2. Significant impact on the market

A Star project must show explicit and promising industrial objectives. Furthermore it must have a significant impact on the market by the time horizon of 2020. “Significant impact” means that the industrialization step of the project would have an important market size and/or would need an important quantity of biomass.

⁷ Star-COLIBRI : Deliverable 3.1: „Definition of success criteria for Star-, Comet projects and StarClusters“, 2010

In other words, it would influence the industry concerned and the agriculture/forestry system to the supply chain level by the time horizon of 2020. As a counter example, a project focused on a tiny niche market and moving a very limited quantity of biomass would have very little chance to have a significant impact on the European market by 2020 and could not be selected as a Star project. The main idea is that a Star project must contribute to create or to strengthen European champions in their respective market segments.

3. Consequent industrial co-financing

The presence of industrial partners in the Star project's consortium is not enough to guarantee a real industrial strategy within the project. Industrial partners must be key players (at least one) within the project. Furthermore, there must be a real involvement of the industry partners. This commitment can be easily linked to the financial engagement of these partners. Substantial industrial co-financing was considered as an important success factor for a Star project. For this criterion, the maximum score will be attributed to projects showing a more than 33% of industrial co-financing (of the total project's R&D budget).

4. Quality of the strategy

The strategy of a Star project has to integrate different parts of the value chain and should not be focused on one step. To be successful, a Star project (as defined within the scope of this study) must have a multidisciplinary approach (feedstock, logistic, process) and should integrate a multi-criteria evaluation: technology implementation plan, economic and market issues, regulatory issues (coherence with the EU policies), environmental issues. Moreover, the project must be based on the use of the best biomass sources in Europe, the most promising techniques and aiming at the most promising markets.

5. Sustainability

A Star project must also include environmental and sustainability aspects such as energy efficiency, environmental performance, impacts on food production schemes, impact on water use and quality, changes in land-use, sustainable access to biomass, impact on biodiversity and net balance of greenhouse gases. It was not possible, within the scope of this task, to define quantitative criteria linked to sustainability issues. The important point is that these issues must be fully incorporated in the project's strategy.

In order to establish a fair and complete evaluation basis, the selection steps required additional information collection. It has to be taken into account that this is quite a time-consuming process. More information on the selection process can be found in Star-COLIBRI's deliverable D 3.2 "Identifying potential Star projects and coordinating information collection via the ETP's National Support Groups".

The main result of the selection process was a list of 18 potential Star projects that were ranked according to their perceived quality. For practical reasons it was decided to make a cut after the first nine projects. These projects entered the StarClustering process.

After a first contact by Star-COLIBRI partners and a couple of time-consuming internal discussions within the selected projects, four of them eventually expressed their willingness to take part in the StarClustering process⁸. In the following these projects are shortly presented:

- EuroBioRef
- FUTUROL
- AFORE
- Bio4Energy

⁸ Star-COLIBRI: Deliverable 3.3: "First analysis of gaps, overlaps and complementarities", 2010

EUROBIOREF



EUROpean Multilevel Integrated BIOREFinery Design for Sustainable Biomass Processing

EC FP7 project Global Budget of 38 M€ **Public Financing:** 23 M€ (EC)
Coordination: Franck Dumeignil, CNRS / UCCS, Lille (France)
Start: Mar-2010 **Stop:** Feb-2014 **Webpage:** www.EuroBioRef.org

Project overview

EuroBioRef will bridge the gap between agriculture and chemical industry by integrating the whole biomass chain in a Multi-feedstock (non-edible), Multi-process (chemical, biochemical, thermochemical), Multi-products (aviation fuels and chemicals) commercial viable and adaptable approach for a sustainable European bioeconomy.

The main objective of the project is to develop a biorefinery concept, which is integrated, flexible and modular to enable valorisation of each biomass fraction in a sustainable economy scheme.

FUTUROL



National project Global Budget 76.4 M€ **Public Financing:** 29.9 M€ (OSEO)
Coordination: Dr. Frédéric Martel, Procethol 2G, Pomacle (France)
Duration: 8 years (Sep 2008 – Aug 2016) **Webpage:** www.projet-futurol.com

Project overview

FUTUROL is a French national and industry driven R&D project. The project is managed by Procethol 2G, a private company especially founded for the project. The focus is on bioethanol from lignocellulosic biomass.

FUTUROL has been developed to build the value chain of cellulosic ethanol from fields to tanks. The aim is to bring to the market a process, technologies and products (yeasts and enzymes). The process must be versatile in regard to feedstocks (agricultural byproducts, forest biomass, dedicated crops, etc.), competitive and sustainable.

AFORE



Added-value from chemicals and polymers by new integrated separation, fractionation and upgrading technologies for Sustainable Biomass Processing

EC FP7 project Global Budget of 10.9 M€ **Public Financing:** 7.6 M€ (EC)

Coordination: Dr. Anna Suurnäkki, VTT, Helsinki (Finland)

Duration: 4 years (Sept 2009 - Aug 2013) **Webpage:** www.eu-afore.fi/index

Project overview

The main aim of *AFORE* is to develop novel, industrially adaptable and techno-economically viable solutions for the separation, fractionation, and primary upgrading of valuable chemical components from forest residues, wood chips, and chemical pulping liquors to be used as starting materials for current and novel value-added applications. It is expected that *AFORE* will enable the European forest and pulping industry to substantially increase its profitability and overall income while, at the same time, positively impacting on the sustainability of the processes.

Bio4Energy



Grant application in Strategic Research Area of strengthening the international competitiveness of Sweden in the Energy sector

National project Global Budget > 25 M € **Public Financing:** 20 M €

Coordination: Prof. Stellan Marklund, Umeå University, Sweden

Duration: 4 years (March 2010 - Feb 2014) **Webpage:** www.bio4energy.se

Project overview

Bio4Energy is a joint research program on climatically-sound biorefineries between the universities in northern Sweden - Umeå University, Luleå University of Technology and the Swedish University of Agricultural Sciences. The constellation also includes more than 20 R&D companies and industrial partners. The researchers use two main technologies for conversion of raw materials into renewable fuels, biobased electricity or materials: (i) The thermal conversion of biomass and (ii) novel biocatalysts and bioprocesses for conversion of raw materials to products.

2.2 Identification of collaboration needs

The goal of the next step was to perform a thorough analysis of the selected and interested projects' work programmes in order to determine the area(s), where a cooperation with suitable other projects could be beneficial. Publicly available information, however, was not sufficient for such an analysis. For this reason, the five project coordinators were asked to provide more detailed, and hence confidential, information on the project work in form of the Description of Work (DoW) or other working documents.

At this stage the first problems were encountered in the outlined "Analysis step" in the StarClustering process: Except for Bio4Energy, the project coordinators requested a signed non-disclosure agreement (NDA) from the Star-COLIBRI consortium prior to the delivery of more detailed (confidential) information. The signing of the NDA, however, turned out to be a very time consuming process due to the summer vacation period in between and several legal concerns from the side of the project consortia. This caused major delays in Star-COLIBRI's work schedule and in the progress of the Clustering process, which requires respective adaptations of the StarClustering strategy.

Bio4Energy was the only project that immediately provided its Description of Work (DoW) for further analysis. This proved to be difficult, though, since the DoW is kept very general. It revealed, however, that Bio4Energy is also rather a research programme than a single project by itself. It therefore can not participate in the StarClustering process by definition. Nonetheless, it was decided to include Bio4Energy in the process since Star-COLIBRI could also help in this case to extend and foster international collaboration. EuroBioRef in contrast, has never signed the NDA because of internal discrepancies, making the process much more difficult.

In the further process it was realised by the involved Star-COLIBRI partners that in contrast to the strategy's theoretical outline, examining and analysing project information, regardless of its completeness, will not be sufficient to reveal potential collaboration areas. It is crucial to actively involve the project coordinator and ideally also the workpackage leaders from the very beginning. Only with their input it will be possible to identify their specific collaboration needs and also to determine project areas, where no collaboration with other projects is wished at all for reasons of e.g. high confidentiality of research results and conflict of interests. This very much facilitates a successful search for potential Comet projects.

As a start, a questionnaire was developed aiming to identify collaboration needs or interests. The questionnaire was sent to the respective project coordinators for completion. The questionnaire was supposed to help in the preparation of the subsequent personal meetings, facilitating a more focused discussion.

Unfortunately, the questionnaire was only completed by three of the projects: EuroBioRef, FUTUROL and Bio4Energy. The answers were kept very short and general, which was certainly also a result of the missing NDA. It consequently was only of limited use for the preparation of the meeting. However, it was a helpful first step to make the Star project consider different collaboration options and to get first ideas in what areas they might be interested to cooperate with other projects.

Furthermore it was decided to arrange meetings between Star-COLIBRI representatives and the respective Star project coordinators as soon as possible to discuss in person the potential collaboration areas of the project. Arranging meetings with the Star project coordinators proved also to be quite challenging due to summer vacations and the lacking NDA. It was not at all possible to get short term appointments. This is another very time consuming factor, which has caused considerable delays in the accomplishment of the clustering task, and which has to be taken into account in future StarClustering efforts.

Within a time-span of about three months it was possible to conduct all scheduled interviews with the four selected Star projects' coordinators. In these meetings, first collaboration areas for each project could be identified. However, these areas were still very unspecific and broad, making the search for useful Comet projects rather difficult. The reason for that was mainly the lack of an NDA (*EuroBioRef* and *AFORE* had still not signed at the time of the meeting), but also the recent start of the project in the case of *Bio4Energy* and the absence of work package leaders in the discussions, who could have provided more detailed information. It was therefore decided to have a **second meeting** together with the respective **work package leaders**.

The second meeting with *AFORE's* coordinator and work package leaders was arranged five months after the first meeting. In the meantime, the *AFORE* participants signed the NDA and have had more focused internal discussion about potential collaboration needs. As a result, they have provided a list with respective areas of interests. During the second meeting this list was refined with assistance of *AFORE's* work package leaders, and priorities were set⁹. This meeting was crucial to really **specify the collaboration needs**. Consequently a more focused search for Comet projects could take place. At this stage, it was also decided to extend the search beyond the contents of Star-COLIBRI's biorefinery portal and to also include suitable contacts (individuals or institutions) of the participating Star-COLIBRI partners.

As for *Bio4Energy* second meeting was conducted in York together with *Bio4Energy's* work package leaders, two months after the first one. During the first meeting it was not possible to identify specific potential cooperation areas although there was no NDA required.

In this meeting however, a specific topic was elaborated, in which the *Bio4Energy* consortium was still lacking comprehensive expertise⁵. Subsequently, Star- COLIBRI started the **search for comets**, but besides also explained the functionality of the Star-COLIBRI's biorefinery portal and encouraged the *Bio4Energy*-team to also look for suitable collaboration partners themselves.

Unfortunately this could not be organised for the projects *EuroBioRef* and *FUTUROL*. It was actually envisaged to have respective meetings at Star-COLIBRI's European Expert Forum Conference that was organised in Budapest in April 2011. The reasons for that were the still missing NDA in the case of *EuroBioRef* and time constraints for *FUTUROL*. Consequently, the search for comets for both of these projects was based on the information given in the first meeting.

However, despite of having provided these two projects with a list of suggested Comet projects, *EuroBioRef* and *FUTUROL* did not decide for a specific one, which Star-COLIBRI could have contacted. Even though, the Star-projects are still expressing their interest in the clustering idea, it must be stated that, at the time of the writing of this report, for *EuroBioRef* and *FUTUROL* the whole process stopped at that stage for the aforesaid reasons, but also because of doubts regarding legal, financial and organisational aspects of such cross-project-collaboration.

⁹ Star-COLIBRI: Deliverable 3.4 „Report suggesting suitable StarClusters“, 2011

⁵ Star-COLIBRI: Deliverable 3.4 „Report suggesting suitable StarClusters“, 2011

2.3 Meeting with potential collaboration candidates (Comet projects)

The StarClustering process continued for *AFORE* and *Bio4Energy*. Since there are several different and individual options for the next steps in the StarClustering process, they will be described separately in the following subsections.

AFORE

It was possible to determine several contacts, which were presented to the *AFORE*-team as potential cooperation partners. Nevertheless, only two meetings could be organised so far, mainly because of time constraints of both parties or lack of interest.

One meeting was initiated by the University of York, one of the Star-COLIBRI partners, because during the discussions in the second meeting it was noticed that University of York is partly active in the same areas as the *AFORE* project. Two months after the second meeting, University of York and the *AFORE* coordinator decided to have yet another meeting, in order to discuss in detail in which areas a cooperation could be possible. The discussion and presentation of each ones activities revealed that there are in fact some overlapping research efforts. However, both parties did not see a possibility to join forces at the stage of the respective project. Nonetheless they actually decided to maybe apply together for a completely new project after the current ones are finished. According to their perception, applying for a new project is much easier than initiating collaboration between two running projects, mainly for administrative reasons (e.g. need for a time consuming amendment and restructuring of the projects' descriptions of work).

The second meeting was organised with the coordinator of the German "Lignocellulose Biorefinery" project in the framework of the "Nordic Wood Biorefinery Congress" in March 2011. This meeting was supported by a Star-COLIBRI representative, who presented some possible ways of cross-project collaboration in regard to the organisational structure. However, during the discussion, it was realised that the two projects do not have very much in common. Hence, no potential cooperation area could be identified. However, since both projects are still active in the same industry sector (forest industry) the coordinators decided to stay in contact and to organise a networking event together next year (for which they would have appreciated the help of Star-COLIBRI, if it was still running).

Concerning the StarCluster strategy, the *AFORE* representatives saw persisting problems in intellectual property right and confidentiality issues, financing aspects and in the considerable expenditure of time necessary for establishing a StarCluster. They very much doubted that all the prerequisites for such collaboration, like an amendment of the project description, the respective examination and written approval by the funding organisation (i.e. European Commission) and a financial solution can be obtained within the quite limited timeframe of most of the considered R&D projects. One solution was seen in starting collaboration with the identified partners in a completely new project. Therefore the networking activities initiated by Star-COLIBRI were very much appreciated. In conclusion, *AFORE*'s feelings about the StarClustering process are quite positive, although it is not clear yet, if the strategy will work like it was initially planned.

Bio4Energy

Eventually the *Bio4Energy* partners identified three researchers, who could provide the knowledge needed and who could potentially form a so called Comet project associated to the *Bio4Energy* project.

Star-COLIBRI then started to contact the three candidates, outlining the circumstances and asking, if they were willing to participate in the clustering process. There were some initial inquiries about the specific procedures and especially about finances, but all three candidates were quite interested and eventually agreed to participate.

In its coordination role, Star-COLIBRI representatives organised three different telephone meetings with all concerned parties in a three weeks interval. These telephone meetings were used to introduce the StarCluster strategy and to provide a platform for the potential Cluster participants to get to know each other and to exchange ideas about collaboration options. A Star-COLIBRI representative has moderated the telephone conferences and successively asked the participants to

- 1) Introduce themselves, the institution they are working for and projects they are involved in
- 2) Make an inventory list presenting their respective equipment
- 3) Identify actual research projects, so that the project-to-project criteria for StarClustering would be satisfied for a potential collaboration
- 4) Contact potential industry sponsors for a potential public-private partnership

During the presentations it was noticed that there actually is a certain cross-over in regard to activities and techniques. All participants saw this situation as promising potentiality for cooperation, with the idea of establishing a scaling up of the respective activities, in mind.

However, it was not clear, how they could actually finance such collaboration. Neither of them had additional budget left to use for work that was not previously defined in their respective project's description of work. Consequently it was decided by the different parties to write a new project application, which could then be part of the *Bio4Energy* programme. Working on the new project description, following input was collected from each party by the *Bio4Energy* representatives:

- Partner description
- State-of-the-art description
- List of problems and necessary research areas
- Scientific approaches
- Suggestions of tasks and work packages
- Suggestions of best interaction of partners and optimal use of available lab and pilot facilities

The *Bio4Energy* team then started to develop a preliminary structure for the future project's "description of work", which the other parties could complement according to their notions. In parallel the responsible Star-COLIBRI representative started to complete the so-called "Master Plan" for a future collaboration. This document was developed by Star-COLIBRI's coordinator and will help to better organise cooperation and to clearly define responsibilities and mutual actions (see Annex 1).

Besides the preparatory work for the project application the participating universities decided to organise a mutual Erasmus Mundus student exchange. However this proved to be more difficult than expected since the enrolment rules and requirements seem to differ from country to country. The concerned university representatives collected as much information on the process as possible and were preparing a joint application for Erasmus Mundus at the time of writing this report. The application will be submitted in March 2012.

Eventually it was decided to establish a potential StarCluster consisting of the 4 involved European Universities, which was named *Bio4Flow*. In order to receive some funding to get started with initial studies on the previously defined research topic, a small joint application was submitted to Processum, a Swedish fund for industrial research and development. The application was successful and resulted in a fund of € 20.000 for a first phase collaboration.

It was agreed with all participating parties that they will receive a certificate for having participated in the StarClustering process.

In the following chapters, recommendations are given for improving the conditions for creating StarClusters or other forms of increased cooperation. Furthermore, the experiences made during this process will be transformed into suggestions for structure and finance options for such collaborations.

3. Possible Framework for StarClusters

3.1 Organisational structures of StarClusters

In order to determine matching Comet projects for future cooperation with a Star project, it is necessary, as next step, to both, identify the joint action areas and to fix terms and conditions of such collaboration in order to assure a synergetic effect for all participating parties.

For this purpose Star-COLIBRI has developed a pseudo-business plan called “StarCluster Master Plan” aimed at providing a framework and guidance for the future StarCluster. Such a Master Plan was for instance used for the cluster around the Star project *Bio4Energy* and can be found annex 1.

The StarCluster Master Plan contains a short overview of the participating parties and the respective projects, including contact details and an inventory list of the respective resources that can potentially be used for joint actions. Furthermore it identifies a common vision and objectives, which are the basis of determining joint actions and areas of responsibility within the StarCluster. This also means that a coordinator for the cluster work has to be appointed. In order to achieve the objectives, specific milestones of the cooperative work and an approximate timeline are also formulated. Another section of the StarCluster Master Plan concerns legal and contractual details and, depending on the structure of the collaboration, may require conclusions of a Memorandum of Understanding, non-disclosure agreement, consortium agreement, etc..

In some cases it may also be useful to opt for a written barter agreement, in which the different parties decide to exchange items or services of equal value. This implies that it is necessary to firstly judge the value of the offered item/service and to compare it with the one of the other party, which could sometimes pose a challenge. A written barter agreement should in any case include a detailed description of the products/ services being exchanged as well as a specification of any relevant terms and conditions.

This might be especially appropriate for the exchange of information and experiences between projects active in similar fields.

It is important to keep in mind that specific individual solutions need to be found for each cluster. This foremost depends on the “level of cooperation” that has been decided on. That means for example that the core of a cluster may be

- i. a “knowledge-network”, where experiences from research work are exchanged
- ii. joint training/ education, e.g. through student exchange
- iii. complementing each other’s facilities/ machinery to scale up the research,

or even other specific collaboration options.

The organisational structure for each case has to be set individually. However the aforementioned key points addressed in the Master Plan should be considered for every serious collaboration. It, therefore, offers a good framework for starting the discussion among the concerned parties.

3.2 Financing options for StarClusters

One big hurdle of the StarClustering process has been the uncertainty of additional financing for joint actions. In the following Chapter 4 (Conclusions and Recommendations) it is therefore suggested to facilitate cross-project collaboration for instance by allocating a certain part of each project budget to dedicated cooperation and networking activities.

Nonetheless, there actually are several options for R&D projects to start collaboration on a financially secure basis. The different possibilities will be addressed in the following:

Public-Private Partnerships (PPPs)

A PPP is a collaboration set up for a pre-determined duration, between public and private actors, where both parties are involved in the decision-making process and are prepared to offer co-investment in terms of finance, personnel, facilities and information, to achieve specific objectives in the area of science, technology and innovation¹⁰. This might be particularly interesting for demonstration projects, where several private actors are involved. The public part in this scenario could be on one hand the research partners in the project offering knowledge and personnel and on the other hand as co-financing source for instance the European Commission. This could be the case if the project fulfils the requirements of a specific program (e.g. in the context of Joint Technology Initiatives (JTI) or the European Industrial Bioenergy Initiative (EIBI), etc.; refer to Star-COLIBRI's: D 4.1 "Report on Public-Private Partnership possibilities in the area of biorefineries" for more detailed information), where up to 50 % of public co-financing is possible.

COST-actions

COST is the abbreviation for "European Cooperation in Science and Technology". It is an intergovernmental framework aiming at reducing the fragmentation in European research investments, increasing the mobility of researcher and fostering cooperation within the European Research Area and beyond¹¹. COST offers an opportunity for European researchers to jointly develop ideas for common research projects or initiatives across all scientific disciplines. There is a continuous open call researchers can use to submit their proposals. This is a two stage process: after registering, the applicants submit a preliminary proposal by a set collection date, which give an overview of the proposed action's goal and anticipated impacts. After assessment, the best proposals are selected and the successful applicants are then invited to submit a full proposal⁷.

However, the research activities themselves must be nationally funded by the participating member countries. COST funds only cover the networking activities such as meetings (e.g. travelling, subsistence, local organiser support), conferences, workshops, short-term scientific exchanges, training schools, publications and dissemination activities.

Since the projects in a potential StarCluster would already have a grant/ subsidy agreement for the planned research, COST might be a suitable solution to apply for financial support of

¹⁰ Star-COLIBRI: D 4.1 "Report on Public-Private Partnership possibilities in the area of biorefineries"; <http://www.star-colibri.eu/publications/projectresults/>

¹¹ COST – European Cooperation in Science and Technology: www.cost.esf.org

international cross-project networking and cooperation activities, which would be the basis for creating a StarCluster.

Entering a call together

As experienced during Star-COLIBRI's work, it might not in every case be appropriate to apply for a COST-action. Reasons may be too short, remaining project durations and/ or too complicated administrative hurdles, like writing time-consuming amendments to adapt the respective projects' "Description of Work". In this case it might be advisable for the concerned project members to write a complete new proposal addressing the research topic of interest to both parties. This is not in the original sense of the StarClustering idea, which is aiming at achieving cross-project collaboration, but it is nevertheless a financing option of previously established networks that should be included for completeness.

There are different frameworks to apply for funds. The main ones are described below. Which is the best suited one naturally depends on the research topic and whether an appropriate call can be found.

The Seventh Framework Programme (FP7)

The "Framework Programme for Research and Technological Development" is a programme with a total budget of € 50 billion that still runs until 2013. The money is used to co-finance research, technological development and demonstration projects¹². The projects funded by this programme must be carried out by transnational consortia and must bring a "European added value"⁸. The programme comprises five major "building blocks": Cooperation, Ideas, People, Capacities and Nuclear Research. Two third of the funding volume is dedicated for the "Cooperation-block", which covers different research areas. The most interesting for (cluster-based) biorefinery-related research projects are probably the areas of "Food, agriculture and fisheries, and biotechnology"; "Energy" and "Environment". Another interesting funding option might also be found in the context of the "People"-programme, where initial training of researchers (e.g. Marie-Curie Networks) and industry-academia partnerships are supported.

The European Commission annually releases work programmes, including a schedule of "Calls for Proposal" that will be published throughout the year. Each call covers a specific research area, which might not be applicable for the project that was intended to be proposed. It is necessary to wait for a suitable call. The annual work programmes and the full texts of the Calls are published on the FP7 section of CORDIS: www.cordis.europa.eu/fp7/.⁸ This web site also includes "The Guide for Applicants" giving advice regarding the application process. Each call has a deadline, which needs to be respected when submitting a proposal. Proposals will then be evaluated by a panel of independent experts to see if the quality of research proposed is worthy of funding.

¹² European Commission: FP7 in Brief – How to get involved in the EU 7th Framework Programme for Research; European Communities, 2007

INTERREG programme

The INTERREG programme aims to promote interregional co-operation and to improve the effectiveness of regional policies and instruments. To achieve this goal the programme funds, among others, the exchange and transfer of experience and knowledge between regions in the EU¹³

INTERREG promotes cooperation between the cities, regions and member states of the European Union and forms part of Objective 3 "European Territorial Cooperation". As in the previous INTERREG III period, the INTERREG IV support concentrates on three strands.¹⁴

- Cross-border cooperation (Strand A): advancement of economic and social cooperation in adjacent border regions based on joint strategies and development programmes,
- Transnational cooperation (Strand B): cross-national cooperation between national, regional and local authorities in transnational cooperation areas to strengthen a harmonious spatial development of the whole EU area and a better integration of the new member states,
- Interregional cooperation (Strand C): cooperation networks and exchange of experiences in order to improve the efficiency of existing regional development and cohesion instruments.

Projects are supported within the European Regional Development Fund (ERDF). Consortia composed of national, subnational, regional and local authorities, universities and non-governmental organisations in the transnational cooperation areas are eligible for funding. Depending on the programme, it is possible for private stakeholders to participate under certain preconditions.¹⁴

INTERREG does not provide pre-financing. Eligible costs (costs that are in line with the programme requirements and can be approved for co-financing from the ERDF) will be later reimbursed.¹⁵

Typical tools for exchange of experience are networking activities such as thematic workshops, seminars, conferences, surveys, and study visits. Project partners cooperate to identify and transfer good practices. Possible project outcomes include for example case study collections, policy recommendations, strategic guidelines or action plans. INTERREG IVC also allows light implementation or piloting, but only if these complement the exchange of experience activities.¹⁰

Project proposals can be submitted as reaction to a suitable call.

¹³ Environment-LIFE Funding – Other Funding; <http://ec.europa.eu/environment/life/funding/otherfunding>

¹⁴ INTERREG programme:
http://www.interreg.de/cfn_032/nn_457658/INTERREG/EN/Programme/Programme__node.html?__nnn=true

¹⁵ INTERREG IVC – Funding: <http://i4c.eu/funding.html>

ERA-NETs

The objective of the ERA-NET scheme is to support the cooperation and coordination of research activities carried out at national or regional level in the Member States and Associated States through:

- the networking of research activities conducted at national or regional level, and
- the mutual opening of national and regional research programmes.

The scheme will contribute to improve the coherence and coordination of research programmes across Europe to overcome fragmentation of the European Research Area (ERA). The scheme will also enable national systems to take on tasks collectively that they would not have been able to tackle independently¹⁶.

Through the ERA-NET scheme the European Commission only funds activities like coordination, networking, opening of national/ regional funding programmes, support of joint applications and development of joint funding strategies. However, the actually project work is nationally funded by the respective participating member states.

Calls for proposals with a certain deadline are published on a regular basis. Project proposals can only be submitted in reference to a suitable call.

In 2010, for instance, the two ERA-NETs WoodWisdom-Net 2 and ERA-NET Bioenergy published a joint call: „Sustainable forest management and optimised use of lignocellulosic resources – Bridging gaps between research disciplines, producers, consumers and society“, which included the topic “biorefinery”¹⁷

LIFE Programme

LIFE is another EU financial instrument supporting environmental and nature conservation projects throughout the EU. Since 1992, LIFE has co-financed some 3115 projects, contributing approximately €2 billion to the protection of the environment¹⁸

There are annual calls for proposal. Applicants have to submit there proposals to the “competent national authority” of the respective member state in which the coordinating beneficiary is registered and will then be forwarded to the commission. Further information on specific calls and application regulations can be found at the European Commission website: <http://ec.europa.eu/environment/life/>.

The previous listing of funding programmes that can be used to submit a project proposal is not exclusive and only comprises the most popular ones. There might also be other and more suitable funding opportunities for specific research topics that have to be identified for the individual case.

¹⁶ CORDIS: Coordination of research activities <http://cordis.europa.eu/coordination/era-net.htm>

¹⁷ ERA-NET Bioenergy : www.eranetbioenergy.net

¹⁸ European Commission – Environment – Programmes: <http://ec.europa.eu/environment/life/>

4. Conclusion

Conclusion

The addressed R&D projects showed a strong interest in the general StarClustering idea. However, it was not possible to create StarClusters in the manner and timeframe initially outlined in Star-COLIBRI's description of work for various reasons. Nevertheless, in the case of Bio4Energy, the involved parties succeeded to establish a different sort of cluster suitable for their purposes.

In this chapter the main problems of the StarClustering Strategy will be summarised and resulting recommendations are given for improving the conditions for establishing StarClusters or other forms of increased cooperation.

One of the **problems** in the StarClustering strategy derives from the definition of Star projects as large and industry-driven projects. Such flagship projects are characterised by more difficult communication and decision-making structures than smaller projects and there are always intellectual property rights involved, even already between the original project partners. This creates problems as soon as alterations from the original project design are discussed – which would be needed to establish collaboration with another project in form of a StarCluster.

Hence, it is most likely that the original StarCluster concept, as devised by Star-COLIBRI, works much better with smaller, national projects because it is less complicated for those projects to open up for further collaboration. In contrast, the large, mostly EU-funded projects that were in Star-COLIBRI's focus (Star projects) will always demand a time-consuming amendment-request. This aspect was frequently mentioned in the discussion with Star project representatives. It was doubted that it would be possible to sign a contract with another project before the own project finishes mainly because of the need for NDAs, requests for amendment to the respective funding organisation and modification of the projects' work plans.

- **Administrative hurdles:** before starting a cross-project cooperation it is necessary to write an amendment of the original projects' description of work, which needs to be examined and approved by the respective funding organisation
- **Necessity of confidentiality agreements (NDA)** because of potential intellectual property right (IPR) conflicts and confidentiality issues for large projects with industry involvement

The NDA proved to be a crucial document not only for the actual cross-project collaboration, but also as basis for the outlined StarClustering process. It is essential for obtaining detailed project information and a thoroughly completed questionnaire as well as for organising meetings and having constructive discussions with the project coordinator.

Another shortfall of the original StarCluster concept is the idea to determine specific additional research/ collaboration needs by external experts (i.e. Star-COLIBRI research partner). This proved to be impossible because there is only limited information available describing the project design and even in discussions the Star project representatives are usually reluctant to talk about problems that they have encountered (i.e. areas, where cooperation would be needed).

- **Collaboration needs** can not be pointed out by external people (like the Star-COLIBRI team), but must be actively **determined by the project consortium itself**, which is a time-consuming process that needs to be taken into account in the initial planning.

When this was realised, the StarClustering concept was adapted accordingly. However this consequently meant much more involvement by the selected Star project representatives, which was not accepted in every case. Most of the Star projects did not want to allocate a lot of time for an effort, where the added-value might still be uncertain – especially in regard to the time-consuming administrative hurdles.

Another significant problem is the lack of money needed for such collaboration since additional working hours and travelling expenses are most likely involved. It was a major reason for many Star-projects to refuse participation in the StarClustering process. Even though most of them were quite interested in the general idea of more transparency, networking options, new contacts, etc., it was not clear for them how to finance any additional collaborative or networking actions that are not pre-determined by the project outline.

- No **budget** for collaboration activities

StarClusters by definition are project-to-project collaborations. The experiences have shown that there are also other forms of collaboration than what was previously defined by Star-COLIBRI, e.g. a cluster of European research institutions like in *Bio4Flow*. StarClusters, as by definition, are project-to-project collaborations and are particularly challenging for the afore-mentioned reasons.

- Project-to-project collaborations are not in every case feasible. Other **forms of cooperation** must be considered and supported as well, e.g. a project cooperating with suitable institutions, companies, by themselves, or a cluster consisting of different European research institutions, etc.

5. Recommendations for Establishing Project Collaborations in the future

There are many aspects that can be improved to facilitate joint research activities, especially in the form of StarClusters, as experienced in the respective tasks of the Star-COLIBRI project. Following changes of the initial strategy and framework requirements are suggested by Star-COLIBRI:

- Collaboration of projects that complement each other is quite beneficial as it will save resources (in regard to finances, man power, facilities/ technology, etc.) and facilitate the successful outcome. The project design and administrative regulations should be adapted in a way that allows research projects to more readily cooperate with one another. Star-COLIBRI suggests including a networking and cooperation task in each project's outline right from the beginning. As it was experienced, networking efforts are time-consuming and can only be addressed when previously outlined in a dedicated (sub-) task. Hence, it is necessary that funding institutions become more flexible, reduce administrative hurdles and allow re-allocation of the budget.

- As a possible solution for lacking budget and sparse networking and cooperation activities, Star-COLIBRI suggests to always include a certain budget for collaboration activities in the project design, which will only be available when there is proof for “external” cooperation
- The definition of Star projects should be reconsidered. The determined project budget threshold (ref. chapter 2.1) of € five Million might not be appropriate in every case. Smaller project, which are mostly nationally funded, are usually a little bit more flexible, facilitating cooperation with external partners. However, if a potential Star project is too small, it won't be possible for them to initiate additional activities.
- StarClusters must be regarded as one option for collaboration. However, there are also other ways of interaction – as seen in the examples of the Star projects *AFORE* (knowledge exchange through workshops/ networking events) and *Bio4Energy* (cooperation of different universities in the framework of one programme) – which should also be supported. It might be easier and more successful to also aim for alternative cooperation options, e.g. knowledge networks or joint training and education, and to also include collaborative actions between a research project and for instance other research institutions or even companies.
- The Erasmus Mundus exchange programme could be an additional way of strengthening cooperation between research institutions that are active in the same field but in different research projects. As experienced during Star-COLIBRI's StarClustering process (i.e. *Bio4Energy* cluster) there is a need to facilitate the exchange programme. Different regulations and prerequisites in the member states hamper this promising form of international collaboration.
- To set up any kind of collaboration in general, and the StarClustering strategy in particular, is a quite time-consuming process, which must not be underestimated. Especially the clarification of confidentiality issues and administrative prerequisites demand a lot of time. If a project includes from the start a certain budget that is only dedicated to collaboration activities (like previously suggested), it would be possible to employ somebody that takes care of these issues. However, another aspect that needs to be taken into account is that collaboration needs can only be identified after certain amount of time, since the project has to make their own initial experience and it won't be until then that they note their “gaps”.

As the experiences within Star-COLIBRI have shown, collaboration and clustering activities are quite complex and demand very individual approaches. Therefore, it was not possible to develop universal guidelines for the establishment of StarClusters. Instead, this report summarises the key aspects and contains advices and hints that will facilitate clustering processes. Furthermore, it includes recommendations for policy makers in order to establish an optimal and effective framework for European cooperation.

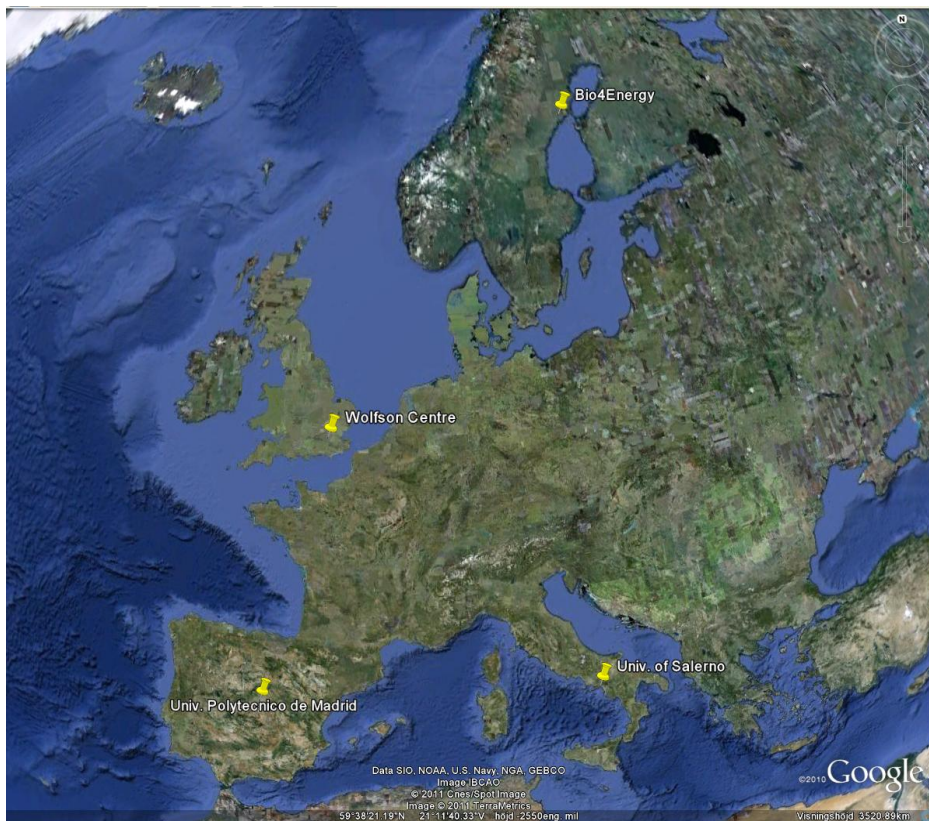
Annex 1: Example of a draft StarCluster Master Plan

Bio4Energy StarCluster

“Efficient bulk handling of biomass - storage, fractionation and feeding of industry scale biorefineries”

Master Plan

Draft version: 2



Cluster Name: “Bio4Energy StarCluster”

Leading project: Bio4Energy

Potential Comet Project(s):

1. UPMs “Silo” project
 2. “RFCS” project (U. Of Salerno)
- Greenwich project(s) - to be decided

Preliminary Cluster starting date: 1 Mars 2011

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6. 1. StarCluster Overview

1.1 Project list (table)

1. Bio4Energy
2. Wolfson Centre, University of Greenwich
3. "RFCS project" University of Salerno
4. "UPM" Title: "Study on Buckling and Dust Explosions in Agricultural Steel Silos. Simulation with Numerical methods and Experimental Validation" Reference number: AGL2009-13181-C02-01 (Universidad Politecnico de Madrid)

.....

1.2 Full partner list (table)

| Partner Nbr | Organisation short name | Partner Name | Organisation type | Country/region | Project |
|-------------|-------------------------|---|--------------------|----------------|------------|
| 1 | UMU | Umeå University | Academic | Sweden | Bio4Energy |
| 2 | ETC | Energy Technology Centre | Research Institute | Sweden | Bio4Energy |
| 3 | Innventia | Innventia | Research Institute | Sweden | Bio4Energy |
| 4 | LTU | Luleå Tekniska Universitet | Academic | Sweden | Bio4Energy |
| 5 | Processum | Processum Biorefinery Initiative | SME | Sweden | Bio4Energy |
| 6 | SLU | Swedish University of Agricultural Sciences | Academic | Sweden | Bio4Energy |
| 7 | Wolfson | Wolfson Centre, University of Greenwich | Academic | The UK | |
| 8 | Salerno | University of Salerno | Academic | Italy | |
| 9 | UPM | Universidad Politecnica de Madrid | Academic | Spain | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |

1.3 Contact Persons details

| Table 1.3 Contact Person Details | | | | |
|----------------------------------|--|--------------|--|----------------------|
| Name | Role | Project | email | phone 1 |
| Stellan Marklund | Programme Director Bio4Energy | Bio4Energy | stellan.marklund@chem.umu.se | +46 90 786 57 15 |
| Torbjörn Lestander | Coordinator pre-treatment and fractionation platform | Bio4Energy | Torbjorn.Lestander@slu.se | |
| Sylvia Larsson | | Bio4Energy | sylvia.larsson@slu.se | +46(0) 907868790 |
| Mike Bradley | Univ. Of Greenwich | | M.S.A.Bradley@greenwich.ac.uk | +44 (0) 20 8331 8646 |
| Robert Berry | Univ of Greenwich | | R.J.Berry@greenwich.ac.uk | |
| Alvaro Ramirez | Univ. Politecnica de Madrid | | alvaro.ramirez@upm.es | +34 (0)913365620 |
| Diego Barletta | Univ. Of Salerno | "RFCS" | dbarletta@unisa.it | +39 089962499 |
| Johan Elvnert | Main liaisons person | Star-COLIBRI | johan.elvnert@cei-bois.org | +32 474 923 724 |
| Kristin Sternberg | Backup liaisons person | Star-COLIBRI | k.sternberg@fnr.de | +49 384 369 301 67 |

1.4 Areas of responsibility in StarCluster

| Table 1.4 Areas of responsibility in StarCluster | |
|--|------|
| Areas of responsibility in StarCluster | Name |
| Updating the Biorefinery Portal | |
| | |
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7.2. Common vision and objectives

The cluster objectives should be more ambitious than the sum of the individual project objectives. They should be as clear concise as possible.

(direct quotation Rand report intro):

Underestimation of the capital costs and performance of innovative energy and chemical process plants creates fundamental problems in planning the development and commercialization of advanced technologies —: including synthetic fuels. This report presents an empirical analysis of the following questions: What factors are responsible for inaccurate cost estimates found to be typical of pioneer process plants? How well do pioneer plants perform and what factors are responsible for poor performance? What are the implications of the answers to these questions for energy planning by industry and the government? Detailed proprietary information on 44 process plants built by 34 oil, chemical, and mineral companies sustain the quantitative analysis. The report draws implications for planning and estimating innovative projects, for comparing advanced technologies in different stages of development, and for commercializing new technologies in pioneer plants. Also mentioned are some promising avenues for research and development.

The headlines are that for pioneer process plants based on solids feedstocks, the average cost over-run is over 100% compared with the estimate against which the business case for investment was made; and around 60% of such plants do not reach full throughput even two years after the nominal start-up date. This is in stark contrast to liquids processing plants that suffered much less problems. The message is if you are buying a plant that handles bulk solids as a feedstock, you are very likely to finish up with a plant that costs far, far more than you budgeted for, and is very slow to get up to full output.

1. Methods for measuring and describing handling properties - for example Flow Function is often useless so we need a better failure criterion! Also the apparatus for determining that failure criterion needs more work.
2. Models to use the above characterisation for predicting how the material will handle in a real system
3. Use of the above for handling system design
4. How field and plant processing affects the handling properties, and how these can be optimised.
5. There is also much work to do to optimise the cost and energy consumption of such processing as well, to optimise both the handling properties and the processing properties.

There have already been many examples in industry where serious loss of money has occurred because the material does not behave in a way compatible with the handling equipment that has been supplied. Hence frequent troubleshooting is required in this area. The handling of biomass is very complex and is often the cause of more plant down-time.

2.1 Milestones

1. Identification of Comet projects

2. Complete lab equipment list

3. Establishing an exchange programme for PhD students (ERASMUS MUNDI)

4-5 PhD students to work towards their diploma from two universities

4. Find Industry sponsors for targeted R&D activities

Profile 1: Manufacturer of feeding technology

Testing of technology prototypes for extreme shape biomass

Potential candidates: Guttridge Ltd, Lincolnshire – feeder technology

Profile 2: Pelletisation

Testing of different feedstock formulations, obtaining larger quantities of biomass samples

Potential candidate: Bruks, Sweden

Profile 3: Silos and feedstock storage

Testing of new storage technologies considering in particular “first in first out”, safety, biomass logistics, preservation.

Potential candidate: Seffelin, Germany

Profile 4: Co-gasification and power production:

Testing of different pellet formulations etc at end user

Potential candidate: Vattenfall, Swedish Energy Company

2.2 Critical Mass

Critical mass is the relative increase of size the Cluster creates in terms of total budget, total number of partners, partner categories and geographical distribution. It is also the perceived benefits that can be accomplished by complementarities with a less than optimal balance between e.g. value chain representation or research partners and industry partners.

Short inventory list of accessible lab equipment and pilot scale facilities

2.3 Transparency

Transparency is a measure of the ability of the Cluster to improve dissemination of relevant information between the partners of the Cluster. The information doesn't have to be related to the joint activities of the Star-Cluster. Good transparency indicates that the partners have a working knowledge of what kind of information that might be of interest to other partners in the Cluster and that they have the proper tools and channels to share this information with each other.

2.4 Cooperation

Cooperation is the ability of the projects to work together on a project level. It is the ability of the Cluster Coordinator and the other comet project leaders to plan and execute activities that both satisfy the objectives of each individual research project, but also creates added value and helps the cluster to reach the cluster objectives.

Feeder design (Wolfson)
Bulk fractionation (all)
X-ray tomography (Bio4Energy)
Data for numerical modelling (RFCS project)
Mechanical properties fluidisation and liquefaction (all)
Online measurement (all)
How to eliminate variations in feedstock quality (all)
Design of Storage units and silos (UPM project)
Risks – Dust Explosions (UPM project)
Degradation of biomass (primarily Wolfson and Salerno)
Rheology and online measurement of material flow properties (all)
Process design
Pelletisation (Bio4Energy)
Metrology

8.3. Joint Action Plan

Table 3.1 Preliminary timeline Quarterly

| Table 3.1 Preliminary Timeline Quarterly 2011 | | | | | 2012 | | | | 2013 | | | | 2014 |
|---|----|--------|----|--------|-------------|----|----|----|-------------|----|----|----|-------------|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 |
| Duration Project 1, Bio4Energy | | | | | | | | | | | | | |
| Duration project 2 | | | | | | | | | | | | | |
| Duration project 3 | | | | | | | | | | | | | |
| Duration project 4 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Meetings planned | | | | | | | | | | | | | |
| Star-COLIBRI Budapest conference? | | 13-Apr | | | | | | | | | | | |
| External Reference Group Meetings (progress evaluation) | | 11 Apr | | 3 Oct | | | | | | | | | |
| | | | | | | | | | | | | | |
| Joint activities | | | | | | | | | | | | | |
| Application for Erasmus Mundus | | | | | March | | | | | | | | |
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| Duration Star-COLIBRI | | | | 30-Oct | | | | | | | | | |

Table 3.2 Preliminary Timeline Monthly

| Table 3.2 Preliminary Timeline Monthly | | 2011 | | | | | | | | | |
|---|--------|-------------|--------|-----|------|------|-----|-----|-----|-----|-----|
| | | Mar | Apr | May | June | July | Aug | Sep | Oct | Nov | Dec |
| Duration Project 1, Bio4Energy | | | | | | | | | | | |
| Duration project 2 | | | | | | | | | | | |
| Duration project 3 | | | | | | | | | | | |
| Duration project 4 | | | | | | | | | | | |
| | | | | | | | | | | | |
| Meetings planned | | | | | | | | | | | |
| Star-COLIBRI Budapest conference? | | | 13-Apr | | | | | | | | |
| Telephone conference 1 | 15 Mar | | | | | | | | | | |
| Telephone conference 2 | 28 Mar | | | | | | | | | | |
| Joint activities | | | | | | | | | | | |
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| | | | | | | | | | | | |
| Duration Star-COLIBRI | | | | | | | | | | | |

3.3 Jointly allocated resources

This is the in kind or direct contribution that each project is prepared to allocate to reaching the cluster objectives. For instance, if more than one of the cluster projects will carry out the same a task "X" (e.g. arranging a conference on biomass, Life Cycle Analysis, information collection activities...), some resources can be re-allocated to planning and implementing joint cluster activities.

9.4. Joint Activities and results

The joint actions describe how the available resources are allocated to reach the common objectives. It is recommended that the activities are structured according to these four main categories “Complementarities in technology”, “Training and Education”, “Harmonisation” and “Exploitation”.

| Approach of the StarCluster | |
|------------------------------------|--|
| Complementarities | Combining complementary research results and bridging technology-gaps by cross-fertilisation |
| Training/Education | The development of joint training schemes on new technologies |
| Harmonisation | Joint workshops and activities for the harmonisation of approaches such as Life-Cycle Analysis |
| Exploitation | Developing new methodology for sharing IPR, collaboration agreements etc. |

10. 5. Legal and Contractual details

How is the collaboration structured from a contractual point of view in order to reach the objectives? Please consider: Memorandums of understanding, Non-disclosure agreements, Joint ventures, Consortium Agreements etc...

No contracts signed at the current time. No conflicts of interests identified