IEA Bioenergy

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TASK 32

Biomass Combustion and Cofiring

Final Proposal for Task Prolongation for the new triennium 2016-2018

ExCo76
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in collaboration with the National Team Leaders of Task 32

Triennium 2016-2018

Task / Strategic Project (SP)* Proposal Summary Sheet – final version for ExCo 76

Task / SP* Title: Biomass Combustion and Cofiring **Proposer: Jaap Koppejan**

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Endorsement by ExCo Member of participating country

Country: The Netherlands **Name: Ir. Kees Kwant** **Signature:**

Objective

The objective of Task 32 is to collect, analyse, share, and disseminate strategic, technical and non-technical information on biomass combustion and co-firing applications, leading to further acceptance and performance in terms of environment, costs and reliability, and to support the existing momentum in market introduction of improved combustion and co-firing systems in its member countries.

Work scope

The proposed biomass combustion and cofiring task is a prolongation of Task 32, with continued focus on market dissemination and implementation. In the upcoming triennium is secured through close interaction with individual industries, industry groups (VGB) and other IEA IA's (GHG, FBC, DHC, CCC) and Bioenergy tasks (33,34,36,38,40). The program of activities addresses a number of key technical, economic, environmental, and social issues that impede market dissemination of a wide range of biomass combustion and co-firing technologies, fuels, and socio-economic conditions that prevail in the different member countries of this Task. Main dissemination channels are the task 32 website for reports and databases, a digital newsletter, workshops at main conferences, and outreach activities to non-member countries.

Work programme

WP1. Decentralised heat production
WP2. Efficient industrial combustion and CHP
WP3. Near zero emissions from industrial combustion
WP4. Cofiring and full conversion
WP5. Low grade fuels and fuel pretreatment
WP6. Climate impact of biomass combustion and bio-CCS
WP7. Dissemination and outreach

Deliverables and Target Groups

D1. Workshop on measures for better design of cleaner and smaller stoves (for equipment manufacturers)
D2. Strategic study on the potential for renewable heat from biomass boilers, including options for optimal technical integration of biomass boilers with other renewable energy forms for heat (for policy makers and equipment manufacturers).
D3. State of the art report on application of biomass combustion based CHP with case studies and identification and assessment of innovative developments (for potential end users)
D4. Expert workshop to disseminate results of research projects on new emission reduction concepts in stoves and boilers (for research organisations and industry)
D5. Report on consequences of part load operation on boiler performance (efficiency and emissions (for policy makers)
D6. Workshop on options for cofiring in existing and new power plants with VGB, IEA CCC (for power producers)
D7. Review on the implication of high percentage cofiring on fly ash utilisation (for policy makers and traders)
D8. Updated cofiring database (for utilities)
D9. Workshop with Task 36 and 42 on options for use of solid recovered fuels, residues from biorefineries and other challenging biomass fuels
D10. Inter task project to evaluate the costs/benefits for fuel pretreatment of biomass residues in the supply chain for thermal conversion (with task 33, 34, 36, 40 and 43)
D11. A workshop with IEA and IEA GHG agreement to identify options for bio-ccs. (for policy makers)
D12. Website upgrade and update (industry, policy makers)
D13. Task outreach meeting with T40 to a non-IEA Bioenergy member in Asia (policy makers, industry)

Management Qualifications

Task Leader: Jaap Koppejan, Netherlands. Managing Director of Procede Biomass, an R&D company specialised in development and market implementation of thermochemical biomass conversion technologies.

Topic leaders: Thomas Nussbaumer, Verenum, Switzerland. Specialist in small scale biomass combustion technologies
Claes Tullin, SP, Sweden: Specialist in industrial size biomass combustion technologies
Marcel Cremers, DNV-GL, Netherlands. Specialist in biomass torrefaction and biomass cofiring technologies

Annual Budget US$ 180,000; **Budget per participant**; US$ 15,000, assuming 12 countries participate. In case more countries participate, the contribution per country will be lowered accordingly.

Biomass Combustion and Cofiring

Proposal for a Task for the period 2016-2018

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1. Background

Bioenergy technologies are increasingly recognised as a cost-effective option for renewable energy and GHG mitigation. Other drivers behind the global development of bioenergy technologies in general are:

- Diversification of energy carriers, technologies, and infrastructure,
- Improving access to clean energy sources,
- Reducing the use of fossil fuels and thus saving them for other applications and future use,
- Increasing the flexibility of power systems as electricity demand changes,
- Reducing pollution and emissions from conventional energy systems,
- Reducing dependency, and minimising spending on imported fuels, and
- Job creation, mainly related to the biomass fuel supply chain.

Biomass combustion technologies already have a dominant contribution to the global production of renewable energy. As biomass combustion technologies are already commercially available for many applications, it is increasingly recognised as an attractive and relevant renewable energy technology. This is particularly true for heat, which represents one of the largest shares of final energy demand in society. In contrast to many other forms of renewable energy, it can deliver high temperature heat, is despatchable, and commercially available at widely varying scale.

According to the IEA Roadmap on Biomass Heat and Power, biomass based power generation will increase by at least a factor of ten from today until 2050, accounting for 7.5% of world electricity generation. For the foreseeable future, this biomass based power generation is almost entirely based on combustion and cofiring technologies. The biomass combustion manufacturing industry is a substantial industry in OECD countries, not only as a result of increasing demand in OECD countries but also due to growing export of this equipment to non-OECD countries (such as China and India) where biomass is still available in abundance as process residues and the demand for electricity rises at steep rates. According to the mentioned IEA Roadmap, associated global investments are approx 378 billion USD in the current decade, of which one third in the OECD.

Nevertheless, in order to further enhance competitiveness and expand its use, several issues need to be addressed. The below work programme was designed after consultation with the current task 32 members to address the key issues for further market implementation of biomass combustion technologies.

2. The role of a Specific Task on Biomass Combustion and Co-firing

A continuation of the existing task on Biomass Combustion and Co-firing within the IEA Bioenergy Agreement is proposed to support the existing momentum in market introduction of improved combustion and co-firing systems in its member countries, and to strengthen the export position of OECD-based manufacturers to non-OECD member countries.

Main stakeholders of the Task are equipment suppliers, research organisations, end users, environmental NGO's and government agencies. Task 32 has a relatively strong focus on improved operational performance of commercial applications, which is reflected in the participation of several individual energy companies and industry groups in Task initiated studies, expert workshops, etc. Another important target group is policy makers, who need to set the appropriate boundary conditions for optimal market implementation based on sound scientific knowledge. Knowledge transfer to these target groups takes place in Task organised events and direct access to Task generated information and deliverables. The proposed task will facilitate effective exchange of strategic technical and non-technical information amongst its member countries, and identify key areas in society where biomass combustion technologies can play a strategic role. Strategic information is exchanged through the ExCo of IEA Bioenergy.

The Task will focus on current technical and non-technical issues that impede accelerated market introduction of various combustion and cofiring technologies. As many of those issues are the same for widely varying combustion applications, current Task members strongly support a Task in which both dedicated combustion and co-firing are covered. Another aspect is that within one Task there is no natural barrier for cross-fertilisation for knowledge developed and funding for organising technical activities (workshops and studies) is more effectively used, assuming that a larger task has relatively lower overhead costs.

3. Work Programme 2016-2018

Similar to previous triennia, this work programme for the Task on Biomass Combustion and Co-firing for the triennium 2016-2018 has been prepared through mutual interaction with the ExCo and the task members over a period of 1.5 years.

A detailed description of each of the above topics, with proposed actions and deliverables, is provided below. Detailed proposals for the work involved are available or in draft for most deliverables mentioned here. This includes a number of opportunities for corporation with other tasks. These collaboration have already been discussed with the other tasks.

With the firm commitment to this work programme expected from ExCo members at ExCo76, NTL's can already start to finalise the more detailed programming of work at the task meeting, which will happen in the same week as ExCo76.

3.1 WP1. Domestic heat production

Since the history of mankind, traditional woodstoves have been used for cooking and heating. In OECD member countries, hand fired domestic space heating stoves are used at large. These installations often use woodfuel resources originating from the informal sector, which otherwise have very limited use, therefore growth in this application can lead to additional renewable energy without competition with significant competition with other bioenergy applications.

A key issue that has been addressed several times by Task 32 is the release of aerosols from incomplete combustion in highly populated areas, where health impact may be significant. By replacing outdated woodstoves with better woodstoves, promoting higher quality installations and peripheral components (e.g. post combustion cleaning of flue gases) and training end users to properly operate their stoves, significant emission reductions can be achieved. Next generation wood stoves may avail of automatic control, probably catalytic walls and CFD optimised combustion chambers.

For policy makers it is important to know how the potential for biomass fired stoves and boilers can be expanded and optimally implemented under changing boundary conditions. For example, biomass boilers are increasingly used in combination with solar collectors or heat pumps. Here the biomass boiler provides heat in the winter time, but can be switched off in summer time when the solar collector and/or heat pump takes over. Optimal equipment sizing and operation strategies in combination with innovative heat storage solutions (e.g. based on phase change materials or integrated buffer systems in the boiler) are essential in this regard. With such measures, biomass boilers may become even further competitive.

With the introduction of well insulated homes and even zero energy houses, the required capacity of wood stoves also decreases to values below 1 kW. This imposes challenges on the technical design, as it is difficult to achieve optimal combustion conditions in a small device.

In 2016-2018, it is planned to target both manufacturers of stoves and policy makers to both support the implementation of technical innovations (in a **workshop**) and examine the perspectives to positively influence user behaviour and the market conditions (in a **strategy study**). Further, Task 32 will contribute to a strategic study on Bioenergy Hybrids, which is currently being planned under coordination of VTT.

Related deliverables:

D1. Workshop on measures for better design of cleaner and smaller stoves (for stove manufacturers).

D2. Strategic study on the potential for renewable heat from biomass boilers (for policy makers and equipment manufacturers).

D3. Contribution to the Strategic Study on Bioenergy Hybrids (Inter Task project).

3.2 WP2. Progress in biomass fired CHP applications

For industrial heat applications and district heating systems, up to about 2-4 MW_{th} capacity, automatically fired biomass boilers are commonly used. On a somewhat larger scale, steam based Rankine cycle and ORC based CHP technologies can be considered proven technologies.

Recent studies on the actual performance of biomass fired CHP projects however indicate that there is still significant room for improved market implementation and utilisation of heat in CHP projects. It is thus important to share insight into the critical design and operation factors that determine the commercial success of biomass fired CHP projects.

In the Roadmap for Biomass Heat and Power, the IEA explicitly recommends that governments should support the development of innovative concepts for small-scale co-generation power plants, including their complete supply chains. This includes innovative micro- and small-scale CHP solutions based on TEE, Stirling, ORC or micro-turbines.

With input from the VGB industry group, a **good practise report** will be prepared that contains **success stories** for decentralised CHP plants. The report will also contain an **overview of new developments** in biomass fired CHP technologies.

Related deliverables:

D4. State of the art report on application of biomass combustion based CHP with case studies and identification and assessment of innovative developments (for potential end users)

3.3 WP3. Reduction of emissions

Small scale biomass fired stoves and boilers are still a major source of aerosols in many countries. For biomass boilers, the increased interest in using agricultural fuels and residues from biorefineries (with typically high nitrogen and ash contents) also imposes significant challenges for NOx and aerosol emissions.

At the same time, more stringent national and European emission limits are being introduced (e.g. the German 1. BImSchV, the ECODESIGN Directive and the EU proposal for a Medium Combustion Plants Directive). NOx is of particular importance, as the options for using existing SNCR and SCR technologies are currently limited for small scale applications using these fuels. There is therefore a clear need for new and cost effective combustion installations and secondary emission reduction technologies. Several national and international research programmes have been recently initiated which are now being implemented by the manufacturing industry. Examples are recently developed small scale electrostatic precipitators and catalytic baghouse filters that can both reduce NOx and dust emission in a single device. It is proposed to assess and disseminate such knowledge in an **expert workshop with research organisations and companies developing such technologies** for biomass boilers and stoves.

Biomass boilers are in practise often operated under part load and varying loads. As a result, much higher emissions can be observed than what is typically measured under full load conditions where appliance testing usually occurs. For this reason **a study is proposed to**

measure and compare typical real life performance of a number of boilers with performance under the conditions of type testing approval. The report will focus on an evaluation of real load cycles that are representative for different climatic conditions (rather than stable operation at part load) and the potential to include this in revised testing procedures. The work should form a good basis for development of a more realistic test method than what is currently included in national and European test methods.

Related deliverables:

D5. Expert workshop to disseminate results of research projects on new emission reduction concepts in stoves and boilers (for research organisations and industry)

D6. Report on consequences of part load operation on boiler performance (efficiency and emissions (for policy makers)

3.4 WP4. Cofiring and full conversion

On utility scale level, there is an increased interest in the replacement of coal by suitable biomass types, as coal has a relatively high CO_2 emission factor per GJ. Cofiring biomass with coal is therefore now a very cost efficient and largely used option for CO_2 mitigation. While the first experiences were gained 20 years ago in Western Europe and North America, several power plants in Australia have performed trials in the early 2000's, and more recently it has spread to countries such as Korea, South Africa and Japan.

Coal substitution rates in pulverised coal fired power plants have increased from typically less than 10% until 2005, to over 40% for a number of plants in 2010 and recently a handful units in UK have even converted some of their units to 100% biomass in view of the higher rewards (e.g. Drax, Ironbridge, Tilbury).

As biomass behaves very differently from coal in many aspects, several important technical modifications are required to mitigate operational and process safety risks to an acceptable level. While up to 5% of coal can typically be replaced rather easily without significant plant modifications or technical risks, significant plant modifications (e.g. modifying unloading, storage and distribution facilities, feeding lines, coal mills, burners, superheater sections, adaptations to flue gas treatment systems and coal fly ash injection,) are needed to cope with the operational risks (e.g. slagging, fouling, corrosion, ESP effectiveness, accelerated SCR deactivation, gypsum quality and quality and outlet channels for fly ash produced.

For new coal fired power plants that are currently being built and will be in operation for several decades to come, conventional pulverised coal fired coal fired power plants face increasing competition from fluid bed furnaces, which inherently carry a higher fuel flexibility as biomass does not have to be pulverised first, and additives might be used. It is important to identify and compare the options.

Wood pellets comprise almost 100% of the biomass used for cofiring today. In some cases however, significant amounts of local residues or opportunity fuels are available that could be used either directly or after pretreatment to replace part of the fuel in a local coal fired power plant. It is important to understand how local non-woody biomass resources could supplement the supply of imported wood pellets, without sacrificing plant integrity or plant economics.

A workshop will be organised with the IEA Clean Coal Centre to share key information on the technical opportunities and limitations of biomass cofiring and repowering cofiring projects between research, the power sector and policy makers. Timing and location to be determined later.

A common barrier for all plants cofiring biomas is the use of fly ash, as it does not comply with existing standards (e.g. the current EN450 standard). As a result, many power plants that have been fully converted to biomass do not have proper outlet channels for their fly ash. **A study is therefore proposed to investigate the options for utilisation of fly ash from high percentage biomass cofiring plants.** This study will be performed in close collaboration with VGB Powertech, ECOBA and the European Dutch Vliegasunie, organisations that are all involved in marketing fly ash from coal fired power plants and involved in various R&D projects on this topic.

Deliverables:

D7. Workshop on options for cofiring in existing and new power plants with IEA CCC (for power producers)
D8. Review of options for fly ash utilisation from high percentage cofiring plants (for policy makers and traders)
D9. Updated cofiring database (for utilities)

3.5 WP5. Low grade fuels and fuel pretreatment

Biomass combustion technologies are exposed to changing boundary conditions. Since biomass represents the only renewable source of carbon, society is heading towards a bioeconomy with closed loops for carbon and nutrients. In a bioeconomy where cascading is optimally supported, biomass with relatively good quality is first used for high value applications (e.g. food, chemicals and liquid biofuels) before the low grade residues become available for energy.

While biomass heat and power technologies are currently very instrumental to mobilise large quantities of high quality biomass resources such as wood pellets, it can be expected that in future these energy applications will increasingly rely on lower grade fuels, which may be either available as a by-product from these higher value operations. Such lower grade fuels may have relatively high nitrogen or ash fractions, low ash melting temperatures, high moisture content or contain unwanted components such as heavy metals. It is important to understand which types of solid biofuels might become available in larger quantities in the coming decades.

Fuel pretreatment through additives, leaching or thermal pre-treatment may provide an alternative approach for utilisation of such residues. For example, recent research findings indicate that torrefied fuels are not only better in terms of energy density and storability than raw biomass, but also significantly improve the corrosion behaviour through a reduction of Cl concentrations up to 90%. This can avoid significant costs for adapted furnace and boiler designs.

Various tasks have indicated their interest in this topic. In addition to a particular joint workshop with Task 36 on SRF, an inter-task project is therefore proposed to evaluate the cost effectiveness of fuel pretreatment methods in the supply chain. Various tasks have already committed themselves to this project, for which cofounding will be solicited from the ExCo Strategic Fund.

Deliverables:

D10. Workshop with Task 36 and 42 on options for use of solid recovered fuels, residues from biorefineries and other challenging biomass fuels

D11. Inter task project to evaluate the costs/benefits for fuel pretreatment of biomass residues in the supply chain for thermal conversion (with task 33, 34, 36, 40 and 43)

3.6 WP6. Bio-CCS and CCU

According to the IEA, biomass fired systems with carbon capture and storage (BIO-CCS) or utilisation (BIO-CCU) might become of increasing relevance in the future, as policy ambitions to limit the global temperature increase to 2°C (the 2DS scenario) would require that energy related CO_2 emissions to be cut by more than half in 2050 (compared with 2009) and ensuring that they continue to fall thereafter. BIO-CCS systems are regarded as one of the few options for actual reduction of atmospheric CO_2 concentrations. There are already some niche some markets for utilisation of the captured CO_2, e.g. for greenhouse fertilisation or production of sodium bicarbonate. It is relevant for policy makers to be aware of the techno-economic aspects of the options for both BIO-CCS and BIO-CCU, as well as the potential that can be harnessed.

At ExCo75 it was agreed that a proposal for a strategic project on BIO-CCS/CCU should be prepared between the tasks interested where the potential for such technologies and the following policy implications are further assessed. Task 32 will join this activity.

Deliverables:

D12. Inter task study under coordination of VTT with T32, T33, T38, and IEA GHG to identify options for bio-ccs. (for policy makers)

3.7 WP7. Dissemination and outreach event

The dissemination of knowledge generated through the above actions is performed through conference workshops, journals, publications, databases, etc. The task 32 website www.ieabioenergytask32.com is instrumental in this, with about 500 visitors per month. In the next triennium, the website structure and layout will be completely redesigned to include the opportunities of sharing task 32 generated information through social media and obtain user feedback. The existing cofiring database structure and user interface has been upgraded in 2015 by Bioenergy2020+, and new information will continuously be added in the new triennium.

Sharing knowledge is also important in cases where common problems faced have been successfully addressed. With the increasing demand for woody biomass (wood pellets in particular) by Japan and South Korea, these materials are exported by Canada, Vietnam, Malaysia, China and other countries across the Asian rim (India, Thailand), often also with long transport distances. The options will be explored for a particular outreach in the form of a meeting with Task 40 in an Eastern Asian country outside of the current implementing agreement with large potential for biomass export/import and modern biomass combustion technologies. This also creates opportunities for export of already developed combustion technologies.

This workshop should on the one hand provide information to Asian industries on possibilities for biomass trade and end-use, but should also be an outreach of IEA Bioenergy to countries such as e.g. Malaysia and China to join the implementing agreement. Cooperation will be sought with policy makers and local biomass associations (preliminary contacts with Biomass-SP/Malaysia have already been laid / the possibility of a 2016 workshop discussed).

Deliverables:

D13. Website upgrade and update (industry, policy makers)
D14. Task outreach meeting to a non-IEA Bioenergy member in Asia (policy makers, industry)

4. Activity structure

The proposed work in Task 32 consists of task meetings, workshops and Task projects, in addition to the 'usual' Task management and ExCo support actions. A more detailed description follows below.

4.1 Task meetings

Twice every year a formal Task meeting will be held to discuss progress in the various Task projects, plan new actions, provide feedback from ExCo meetings and exchange news from national R&D programmes in individual member countries. These meetings are usually held in combination with a Task organised workshop and often include field trips for Task members.

4.2 Workshops

Part of the task budget is used to exchange results of national R&D programmes in expert workshops. This is a proven concept to both gather and disseminate information in a structured and effective manner. On an invitation basis, selected speakers present latest insights in one aspect of biomass combustion and/or co-firing, which results in high quality workshops. These workshops are usually organised as part of high profile bioenergy conferences, in order to attract an as wide as possible audience. The results of the workshops are reported and published on the Task's internet website, and key results are fed back to both the individual member countries and the ExCo for evaluation and further actions.

4.3 Task projects

Apart the collection and exchange of information in existing national R&D programmes, a number of Task funded, strategic activities have been defined to reach the aims of the Task are co-funded by the Task management. The available budget for this kind of support is highly dependable on the number of member countries (i.e. available budget).

At the upcoming Task 32 meeting (Oct 30 2015), final agreements will be made with individual Task members on mentioned Task (co)funded projects to detail the costs for the various activities. Depending on country participation and available budget, this action list can hopefully be expanded further. Such additional actions are based on proposals with measurable milestones, a timetable, a total budget and specified efforts of individual task members.

4.4 ExCo interaction and support

In order to promote effective communication between the ExCo and the Task, all ExCo meetings will be attended by the Task Leader. At these meetings the TL can clarify information provided in the submitted progress reports and effectively receive feedback.

To strengthen the relationship between individual Task members and ExCo, the ExCo member representing the host country will be invited to participate in the Task meeting.

Furthermore ExCo members will be provided access to the section of the task 32 website section secured for Task members. In this way ExCo members are able to follow Task progress apart from progress reports and biannual ExCo meetings.

Collaboration with other IEA Bioenergy Tasks in joined actions will be monitored through direct mutual contact and at ExCo meetings.

In addition, the Task management will reserve 10% of its budget to support specific ExCo initiated actions, including the Technology Coordinator.

4.5 Task management

The Task Leader will, with assistance of his secretary, facilitate effective implementation of the different Task activities, mainly by:

- Planning, organising and minuting Task meetings;
- Organising and reporting on workshops;
- Facilitating specific Task projects;
- Dissemination of knowledge through conferences, in magazines and on the Task internet site;
- Providing interaction with the ExCo.

In addition to his management role, the Task Leader will be responsible for the technical direction of the Task. He will plan and co-ordinate all work for the entire Task, with assistance of three topic leaders:

- Thomas Nussbaumer (Verenum, Switzerland) will provide a strategic link with the producers of wood stoves and small scale biomass boilers.
- Claes Tullin (SP, Sweden) will provide strategic input related to industrial biomass combustion and CHP technologies
- Marcel Cremers (DNV-GL) will provide strategic input in the areas of torrefaction, biomass cofiring and ash utilisation.

The technical results of the deliverables will become available in draft, after which they will be reviewed by the NTLs and finally endorsed by the Task Leader and Operating Agent before being published.

The Task Leader is also the contact person for the ExCo. Twice a year a Task progress report will be produced for the ExCo, containing information of the progress achieved in the various activities, potential delays, unresolved issues, and so on. This information will be communicated with all Task members and presented at ExCo meetings.

5. Information dissemination and knowledge flow

Within the proposed Combustion and Co-firing Task, key information is generated and compiled in the following manner:

- By obtaining results from national R&D programmes from country representatives, as well as other international networks (e.g. VGB Powertech, ERANET, etc.);
- Through Task organised workshops in which (invited) speakers present latest insights;
- Through strategic Task initiated projects/studies.

The knowledge generated will be digested and summarised by either the Task Leader or a Task member responsible for a specific activity (usually both in easily readable summaries and detailed reports) and disseminated either directly to the member countries or indirectly through the ExCo. The internet site has proven to be an efficient aid in knowledge transfer.

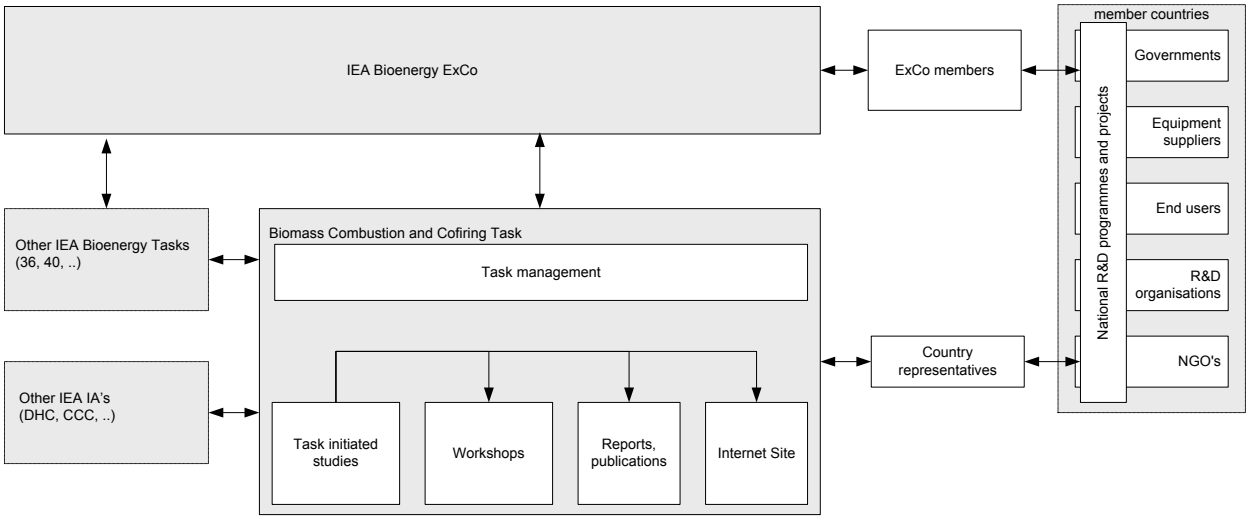

Figure 5.1: A graphical depiction of information flow in the Task

5.1 Country Representatives

The Task members in this proposed Task are responsible for effective dissemination of the knowledge generated through the target groups in their home countries. Usually, task members participate in national bioenergy platforms in which the various stakeholders are already represented so that this knowledge exchange occurs naturally.

The Task initiated actions are complementary to national programmes and projects but can strategically add on to these results. It needs to be emphasised that the success of the running Task 32 can be largely attributed to the large extent of cooperation and involvement of Task members in the implementation of Task initiated actions and studies.

5.2 ExCo Members

The Task Leader will attend every ExCo meeting so as to provide maximum interaction between the Task and the ExCo. In return, the ExCo member of the country where Task meetings are held will be invited for every Task meeting. ExCo members again have good linkages to their respective government organisations and can thus forward strategic advice provided by the Task. Key outputs generated by the proposed Task will be published in the IEA Bioenergy newsletters.

5.3 Task Internet Website

With approximately 500 visitors and 4000 pageviews per month , the existing internet website for the Biomass Combustion and Co-firing Task (www.ieabioenergytask32.com) has proven to be an important vehicle to disseminate information to the target groups. Main products that are now being downloaded from the website are publications and meeting reports, the database on experience with biomass co-firing in different power plants and the databases on the composition of biomass and ash from actual combustion plants. In 2016 the existing website will be completely restructured to include options for sharing task output in social media and obtaining user feedback, while the content will be kept up-to-date with news items, reports etc.

ExCo members can obtain access to the section of the task 32 website section secured for Task members. In this way ExCo members are able to follow Task progress apart from progress reports and biannual ExCo meetings.

5.4 Newsletter

A digital newsletter will be produced and distributed at least twice every year to provide information on recent developments related to the work of this Task and biomass combustion and co-firing in general. Interested stakeholders can subscribe to the newsletter through the website.

5.5 Handbooks

Another key means to disseminate the information generated by the Task is by comprehensive handbooks aimed at a professional, technical audience. Examples are the Handbook on Biomass Combustion and Co-firing, the handbook on Pellet Production and Utilisation and a comprehensive review on health and safety issues in handling solid biofuels which was recently produced.

6. Deliverables

The following deliverables are foreseen for the triennium 2016 – 2018 (planning is not yet decided). In addition, internal task meetings with typically a workshop and/or field trip will be organised at least twice every year.

#	title	Coordination
D1.	Workshop on measures for better design of cleaner and smaller stoves (for equipment manufacturers)	Øyvind Skreiberg, SINTEF, Norway
D2.	Strategic project on the potential for renewable heat from biomass boilers (for policy makers and equipment manufacturers).	Claes Tullin, SP, Sweden
D3.	Contribution to the Strategic Study on Bioenergy Hybrids (Inter Task project).	VTT, Finland
D4.	State of the art report on application of biomass combustion based CHP with case studies and identification and assessment of innovative developments (for potential end users)	Ingwald Obernberger, TU Graz, Austria
D5.	Expert workshop to disseminate results of research projects on new emission reduction concepts in stoves and boilers (for research organisations and industry)	Thomas Nussbaumer, VERENUM, Switzerland
D6.	Report on consequences of part load operation on boiler performance (efficiency and emissions (for policy makers)	Hans Hartmann, TFZ, Germany
D7.	Workshop on options for cofiring in existing and new power plants with IEA CCC (for power producers)	Marcel Cremers, DNV-GL, Netherlands
D8.	Review of options for fly ash utilisation from high percentage cofiring plants (for policy makers and traders)	Marcel Cremers, DNV-GL, Netherlands
D9.	Updated cofiring database (for utilities)	Jaap Koppejan, Procede, Netherlands
D10.	Workshop with Task 36 and 42 on options for use of solid recovered fuels, residues from biorefineries and other challenging biomass fuels	Jaap Koppejan, Procede, Netherlands
D11.	Strategic project to evaluate the costs/benefits for fuel pretreatment of biomass residues in the supply chain for thermal conversion (with task 33, 34, 36, 40 and 43)	Jaap Koppejan, Procede, Netherlands
D12.	Strategic project under coordination of VTT with T32, T33, T38, and IEA GHG to identify options for bio-ccs. (for policy makers)	VTT, Finland
D13.	Website upgrade and update (industry, policy makers)	Jaap Koppejan, Procede, Netherlands
D14.	Task outreach meeting to a non-IEA Bioenergy member in Asia (policy makers, industry)	T32 + T40

7. Schedule and milestones

The preliminary planning of activities for the triennium 2016-2018 is provided below. Due to the collaboration with other IEA Bioenergy tasks and external organisations, changes in planning may occur.

		2016				2017				2018			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
D1	Expert WS on cleaner and smaller stoves											D1	
D2	Strategic study on renewable heat from biomass boilers										D2		
D3	Strategic Study on Bioenergy Hybrids										D3		
D4	Best practise report of biomass combustion based CHP						D4						
D5	Expert WS on new emission reduction concepts for boilers						D5						
D6	Report on part load operation of boiler					D6							
D7	Expert WS on biomass cofiring			D7									
D8	Review on fly ash utilisation from high percentage cofiring				D8								
D9	Updated cofiring database												
D10	WS with T36+42 on challenging biomass fuels		D10										
D11	Inter task project on fuel pretreatment of biomass residues									D11			
D12	BIO-CCS/CCU intertask-study											D12	
D13	Website												
D14	Task outreach meeting									D14			

8. Linkages with other IEA Bioenergy Tasks and Implementing Agreements

For the implementation of the work to be done within the proposed task, linkages with other Tasks within the Implementing Agreement Bioenergy as well as with other IA's are foreseen. This is secured through enhanced interaction with individual industries and industry groups such as VGB PowerTech. At least 5 of the 14 planned Task 32 actions will be performed in corporation with other groups, such as Task 33, 34, 36, 40, 43, VGB , IEA CCC and IEA GHG. Through a recently updated MoU with VGB, it has been arranged that the coordinator of the VGB Biomass working group regularly participates in T32 meetings and contributes to T32 studies, and vice versa. Several of the T32 members are also represented in other relevant platforms such as the RHC-TP.

8.1 Cooperation with Other IA Bioenergy Tasks

The work in the proposed Biomass Combustion and Co-firing Task is closely related to other IEA Bioenergy activities, in the coming triennium this especially relates to Biomass Gasification (Task 33), Biomass Pyrolysis (Task 34), Energy Recovery from MSW (Task 36) and Biomass Trade (Task 40) and Biomass Feedstocks for Energy Markets (Task 43). This concerns two inter-task workshops (D10 and D14) plus three strategic projects (D2, D11, D12) of which one is coordinated by Task 32.

8.2 Cooperation with Other Implementing Agreement's

Of all 39 Implementing Agreements within the IEA, five are currently considered to be of particular interest to the proposed Task. These are:

- IEA Clean Coal
- IEA Fluidised Bed Conversion.
- IEA Combustion
- IEA Greenhouse Gas programme
- IEA District Heating and Cooling

Contacts have already been established with coordinators of several of the mentioned IA's. During the course of the next triennium, regular communications and information exchange is foreseen to maximise synergy in specific areas that are considered useful and of mutual interest, e.g. by establishing joint meetings.

The first three Implementing Agreement's (IA) are considered relevant mainly in relation to co-firing optimising biomass combustion in various end use applications. In the past, Task 32 has already organised various joint seminars on biomass co-firing with coal with IEA CCS and the VGB industry group (2002, 2012, 2014, 2015). In the upcoming triennium, a cofiring workshop will be organised with IEA CCC (planning and location to be decided). For various studies described in this workplan, involvement of VGB has been recently agreed. At the next task 32meeting, two ExCo members of the IEA Combustion agreement will participate to explore options for collaboration.

Collaboration with the IEA GHG agreement will be solicited for the planned intertask study on BECCS. The IA on Fluidised Bed Conversion is considered of relevance to Task 32 through the increased importance of fuel flexibility and will be involved in the organisation of the workshop on fuel flexibility and challenging fuels (no firm commitment yet).

Recently a study was finished with input from IEA DHC on the options to optimise biomass fired district heating networks.

9. Task membership and budget

9.1 Key Partners

Currently, 12 IEA Bioenergy members (indicated in the table below) are participating in the Combustion and Co-firing Task. Because of their expertise, potential for combustion technologies and/or interest in the indicated areas it is expected that these members will continue their participation. From a few other IEA Bioenergy member countries (also listed in the below table) it is anticipated that they might be interested as well, considering the local potential for application of the technology.

In the past, several individual organisations from non-OECD member countries (China and India) have indicated their interest in participation in a Combustion and Co-firing Task, however it is known to the proposers that these countries then first need to become member of the ExCo. To facilitate and stimulate this process, an outreach meeting is planned in the next triennium.

	Member now?	Small scale	Industrial scale / power generation	Co-firing
Australia	No		X	X
Austria	Yes	X	X	
Belgium	Yes	X	X	X
Brazil	No		X	
Canada	No	X	X	X
Croatia	No		X	
Denmark	Yes	X	X	X
European Commission	No	X	X	X
Finland	No	X	X	X
France	No	X	X	
Germany	Yes	X	X	
Ireland	Yes	X	X	
Italy	No	X	X	X
Japan	Yes			X
Korea	No			X
Netherlands	Yes		X	X
New Zealand	No	X	X	
Norway	Yes	X	X	
South Africa	Yes	X		X
Sweden	Yes	X	X	
Switzerland	Yes	X	X	
Turkey	No		X	
United Kingdom	Yes		X	X
U.S.A.	No		X	X

9.2 Annual Budget and task budget for triennium

The work programme described above is based on the assumption that a budget of 180,000 US$ is available, funded by 12 member countries. This is equivalent to an annual contribution per country of 15,000 US$. About half of the task budget directly spent on workshops and studies will go to joint activities with other tasks and IA's. For 3 inter task projects, it is currently assumed that they will be partially funded through Strategic Funds (this is yet to be confirmed).

This figure of 15,000 US$ is a maximum contribution per country per year. In case more than 12 countries participate, the requested annual contribution will be lowered accordingly. In case there are less than 12 member countries, the programme might have to be revised.

	Budget (US$)		
	Task 32 funds	Strat Funds	Total
D1 Expert WS on cleaner and smaller stoves	15.000		15.000
D2 Strategic study on renewable heat from biomass boilers	20.000		20.000
D3 Strategic Study on Bioenergy Hybrids (50% from SF)*	10.000	10.000	20.000
D4 Best practise report of biomass combustion based CHP	35.000		35.000
D5 Expert WS on new emission reduction concepts for boilers	15.000		15.000
D6 Report on part load operation of boiler	30.000		30.000
D7 Expert WS on biomass cofiring	15.000		15.000
D8 Review on fly ash utilisation from high percentage cofiring	30.000		30.000
D9 Updated cofiring database	15.000		15.000
D10 WS with T36+42 on challenging biomass fuels	15.000		15.000
D11 Inter task project on fuel pretreatment of biomass residues (67% from SF)	10.000	20.000	30.000
D12 BIO-CCS/CCU intertask-study (50% from SF)*	10.000	10.000	20.000
D13 Website	10.000		10.000
D14 Task outreach meeting	15.000		15.000
Task meetings 6x	30.000		30.000
ExCo travel costs 6 x	20.000		20.000
End-of Task report	10.000		10.000
Task management and administration	181.000		181.000
Total required budget	486.000	40.000	526.000

Total membership fee (3 years x 12 countries x 15.000 US$)	540.000	
Contribution to Strategic Funds (10%)	-54.000	-
Available task 32 budget excl. strategic fund contributions	486.000	
Requested T32 budget from Strategic Funds (see above)	40.000	+
Total available budget	526.000	

*final budgets and requested task contributions of these joint projects were not yet final by the time of proposal submission

10. Task Management

The proposed Combustion and Co-firing Task will be co-ordinated by Ir. Jaap Koppejan of Procede Biomass BV. He has been coordinating the Task 32 since 2010, before this he served as task secretary for several years. This makes that he is fully equipped with the right experience for managing the task. In the management of the task, Jaap Koppejan will be assisted by three specialists (see below).

The Operating Agent for the proposed Task is the Netherlands RVO, represented by Kees Kwant. Alternate Operating Agent is the Ministry of Economic Affairs, represented by Wouter Schaaf.

10.1 Jaap Koppejan

Proposed Task Leader is Jaap Koppejan, who has been previously involved in Task 32 as task leader and task secretary. This will be his third and last term acting as task leader of Task 32.

Jaap is managing director of Procede Biomass BV, a contract R&D company involved in development and market introduction of bioenergy technologies, however with a clear focus on biomass combustion and gasification. He has extensive experience in management of remote teams and has a large track record in managing international projects, for instance with FAO, EC, etc. Jaap is also technical director of Bio Forte BV, a renewable energy service company using advanced biomass combustion technologies to sell heat and eventually power. The focus of this company is on innovative biomass combustion technologies and small scale biomass fired CHP technologies.

10.2 Marcel Cremers

Proposed topic leader for cofiring issues within the Task is Marcel Cremers. Marcel Cremers is consultant at DNV-GL and has a PhD in combustion technology. Marcel has been involved in international co-firing scans, repowering studies and cofiring feasibility studies. DNV-GL is able to serve the entire value energy chain, with consulting services from business and strategic consultancy until technical consultancy, has an extensive record on biomass combustion and cofiring, and is one of the key partners in the Dutch Research Program on Cofiring.

10.3 Claes Tullin

Proposed topic leader for industrial combustion is Claes Tullin. He is Innovation Manager and assistant head of Dept of Energy and Bioeconomy at SP Technical Research Institute of Sweden. He is responsible for the area of combustion technologies.

10.4 Thomas Nussbaumer

Thomas Nussbaumer is topic leader in task 32 for small scale combustion. He is a lecturer at ETH Zürich for energy technologies and has a long background in small scale biomass utilisation.

10.5 Kees Kwant

Kees Kwant has ample experience in development and commercialisation of bioenergy technologies and is currently chairman of the ExCo. Kees will continue to act as operating agent, through regular bilateral meetings with the TL and attendance in task meetings.