The Research Council of Norway

Midterm Evaluation of Centres for Environment-friendly Energy Research

Evaluation
Division for Energy, Resources and the Environment

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Preface

This evaluation report presents the midterm evaluation of the eight Centres for Environment-friendly Energy Research, FME, which started in 2009. The FME-scheme is new, but the scheme is based on the experiences from the Centres for Research-based Innovation (SFI), as well as extensive international experience with such models.

The FME scheme seeks to develop expertise and promote innovation through focus on long-term research in selected areas of environment-friendly energy and carbon capture and storage (CCS). The activity will take place in close cooperation between prominent research communities and users. The scheme is also expected to enhance technology transfer, internationalisation and researcher training.

The centres are co-financed by the Research Council, host institutions and the partners in the centre. Enterprises participate actively in a centre's governance, funding and research. The main criteria for selecting centres were their potential for innovation and value creation and the scientific quality of the research.

When the centres were established, they were given a contract for five years. Based on a successful midterm evaluation the contract may be extended for another three years.
Each Centre has been evaluated by a panel of four international experts; two scientific experts with competence to evaluate the research activities of the Centre, and two experts with experience from similar programmes for university/industry research collaboration. These generalist experts looked at the Centre from a general point of view. The two generalists evaluated all eight centres and one of the generalists was chair of the panels.

The report from the evaluation panels has two main purposes:
1. It will form the basis for a decision made by the Research Council about whether to continue the individual centre for the remainder of the overall eight-year term, or to wind it up after five years.
2. The evaluation will give advice to the centres on aspects of their activity that should be improved.

It is the Council's decisions to prolong individual Centres, the Evaluation Committee was asked not to comment specifically on this issue.

The Research Council of Norway wants to express a great appreciation to the international evaluators. Particular thanks go to Per Stenius for his professional leadership of the panels and the process of writing the report. The evaluators have accomplished to communicate well with the centres and have produced a report which will be of great value both for the further activities of the centres and for the Research Council in administration of the FME-scheme.

Arvid Hallén
Director General

Rune Volla
Director

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1. Overall report from generalist evaluators

1. Introduction

Eight of the eleven Centres for Environmentally Friendly Energy Research (FME) supported by the Research Council of Norway (RCN) have been evaluated about midway of the planned eight-year program. The purposes of the evaluation were:

- To form the basis for a decision by RCN about whether to continue financing of each individual centre for the remainder of the eight-year term.

- To give comment and advice to the centres on their activity and possible improvements.

The achievements of the Centres were generally impressive. They have established clearly defined research profiles, and engage highly competent scientists, many of them with international recognition, as well as clever and enthusiastic students. All Centres engage two or more research partners, in several cases also at different sites. In this way they have been successfully fostering increased research cooperation across institutional borders, thus consolidating environmentally friendly energy research in Norway.

2. Evaluation procedure

Each centre was evaluated at one-day site visits by a team of four evaluators in the period Monday, March 4 to Thursday, March 21 2013. Two evaluators were experts that had the competence to evaluate the centre from a scientific point of view. Two "generalists" with experience from similar programs for university-industry research collaboration took part in all evaluations. The generalists evaluated the management, organisation and funding of the centre, and also its interactions with user partners in terms of mutual mobility of researchers, transfer of results and stimulation of innovations.

Before the site visits the evaluators had received extensive annual reports, project descriptions, self-assessments and a SWOT analysis from each centre as well as assessments from the research and corporate partners. We were impressed by the amount of work dedicated by each centre to the preparation of the written material, which was generally of high quality. In particular, we found the self-evaluations highly useful and informative. Indeed, it seems likely that this way of mid-term internal checking of the status of a centre is as useful to the centre members as to the evaluation teams and RCN.

Each site visit followed the same procedure. A two-hour morning session started with an introduction by the Centre Director and was mainly centred on research at the centre. After lunch, there was a one-hour meeting with PhD students and postdocs followed by a two-hour discussion on management and organisation of the Centre. Discussions between the evaluation teams and RCN staff took place before the morning session and during lunch. A first draft of the report was compiled in the evening after the site visit. The report was finalised by email between the members of the evaluation team.

In the opinion of the generalists the evaluation did identify progress, strengths and weaknesses of the centres and the FME program as a whole. We felt that evaluation process was well designed to enable us to provide relevant feedback and advice to both the individual centres and to RCN.

We wish to thank the RCN staff for the efficient organisation of the evaluation scheme. Our particular thanks go to Tone Ibenholt and Dag Kavlie, who represented RCN at all the

evaluations, for their quiet and efficient managing of the arrangements and for being instrumental in creating the open and informative atmosphere prevailing at all our meetings with the centres.

3. Research activities

Of the 28 preliminary applications received in September 2008, 17 were invited by RCN to participate in a second call for proposals. Eight of these seventeen were approved by RCN. This is a relatively large proportion of approved applications, which can imply high quality, but also indicates a strong interest in research on environmentally friendly energy, transport and CO_2 management in Norway. Indeed, an important aspect of the program is that it was initiated because there was strong societal and political wish to enhance research on this topic and to establish Norway as a leading nation in terms of consciousness of sustainable energy and environmental issues.

The expert's assessments show that the research at the centres is largely of high scientific quality, with clear potential to achieve international level and recognition. Publication in scientific journals, participation in international conferences, education of PhD and MSc students and cooperation between research groups are excellent or very good. In terms of fostering stronger long-term research on different aspects on environmentally friendly energy the centre program seems to be developing very successfully.

4. Innovation and value creation

One of the success criteria defined by RCN is that "the centre's research activity has generated or is expected to generate the potential for innovation and enhanced competitiveness among user partners and expectations about ramifications for society over and above the partners' direct participation in the centre's activities". In other words, the centres are expected to conduct relatively long-term research that will have an impact on the Norwegian society, but at the same time they should create innovations and through these attract supporting industries both nationally and internationally.

In a short-term perspective, these two objectives are not that easily reconcilable, in particular as the rapid developments of energy issues worldwide have a strong influence on industrial interests. This is clearly reflected in the present situation. The FME program has already reached one societal goal in that it has resulted in strong consolidation of environmentally friendly energy research in Norway. Also, some results of immediate societal importance (environmental issues, energy savings) have been achieved. Many research reports have received public attention in Norway as well as international scientific recognition. However, this is not reflected in markedly increased industrial participation in the centres. In some cases participation even has decreased.

Important reasons for this lack in industrial interest are general trends on which centre activities have no influence, such as low or decreasing general interest in commercialization (e.g., CO_2 storage, offshore wind power) and unforeseen changes in the market (e.g. solar cells). On the other hand, one reason seems to be that corporate partners when joining the FME centres, have not always fully understood the rationale behind the long-term research, goals and research programme of the centre and/or had not in sufficient detail evaluated what their expectations are in relation to these goals *before* they joined.

Corporate partners should, when joining, define the mechanisms by which they will pick up the results and not expect the centres to be able to spontaneously transmit every result that may be of importance. This is just as important as formal agreements on intellectual property rights (IPR), economic contributions, i.e. the combination of cash and in kind contributions, and specification of projects in which the member should participate. At the same time, of course, the researchers at

all levels must be aware of their responsibility to communicate results to corporate partners, and the Centres must ensure that efficient mechanisms for such communication are in place.

We note that the self-assessments, in particular the response from corporate members as well as interviews with students, indicate that in several cases these issues were not sufficiently clarified from the beginning. This is certainly one source of the rather numerous complaints from user partners that they did not receive enough information or ideas for innovations from the centres.

On the other hand, the evaluation showed that in several centres much more could have been done to achieve efficient transfer of knowledge between centre researchers and user partners.

In some cases it was found that innovation had taken place in projects outside the centre that were based on activities in the centre. This kind of indirect results should be reported in a more structured way in the future.

5. Internationalization

Senior researchers at the centres generally have a considerable number of international contacts, many of them obviously established before the centres were created. Through their host organizations and research partners many of the centres have looked for participation or leadership in European projects, in some cases quite successfully. In several cases, however, these achievements build on contacts that were established earlier. As such, the FME program and its centres have not yet acquired international recognition. Some of the centres are well on their way to do so. This is no surprising, considering the short time that the FME program has been running, but one reason may also be that dominating host institutions or research partners obscure centre visibility.

All centres have established International Scientific Advisory Boards (ISAB). However, the impact and utilization of these boards is very variable. Some centres seem to miss one of the main purposes of an ISAB, i.e. to make independent assessments of scientific achievements and give advice on research objectives and performance, preferably through site visits and joint reports, at least annually. The ISAB can also be utilized for advice and discussions with postdocs and PhD students without being directly engaged in centre projects. We suggest that RCN give improved guidance on the utilization of ISABs, and facilitate exchange of experiences between centres.

6. Board and management

All centres are efficiently managed in terms of organization into work packages/projects, management groups and communication between research partners at different sites. The ways responsibilities are shared between managers and research leaders vary between centres. We note that it was evident that centre directors that were also directly engaged in some centre research project(s) were experienced as very inspiring.

RCN requires the majority of board members to come from corporate partners but leaves the choice of chairman to the centres. In most cases the chairman represents the host institution. We note that, apart from avoiding possible conflicts of interest (of which there, indeed, was no evidence) a good way of enhancing corporate partner engagement in a centre is to choose a chairman from one of them.

Long-term research in Norway is mainly performed at Universities and Research Institutes (RI). The Norwegian RI-sector, with research that is more applied and commercially driven than the research at Universities, is relatively large compared to similar countries. This implies some factual and cultural tensions that can be used advantageously, but also can result in conflicts of interest and undue transfer of research ideas. The Norwegian research structure is also reflected in

the FME. The RIs have taken much of the centre leadership, while our estimate is that the major part of the fundamental research is conducted at the universities. We are not convinced that this situation always is of benefit for the development of the Norwegian research society.

The information material produced by the centres is generally excellent. The centre websites accessible to the public are generally well designed and informative. In a couple of cases they were not quite up to date.

7. Interaction with user partners

Some general aspects on the interaction with user partners and transfer of innovations were discussed above. Direct interactions with user partners involving reporting of research results have mainly taken part through annual or biannual workshops and/or "centre days". This seems in many cases to be the only way PhD students and postdocs have interacted with corporate partners. Part-time professors from industry (professor II) have been appointed in a couple of cases. We saw relatively little evidence of work or even visits by researchers and PhD at industries and vice versa, as well as participation of industrial researcher in the supervision of PhD work.

Exchange of researchers and participation in supervision are two of the most effective ways of ensuring transfer of results to users and creating new ideas. It can be argued that the very short time allocated to PhD research (3 or 4 years) does not allow for much activity outside the home laboratory. However, general experience is that direct interaction and cooperation with possible utilizers of the research results often is highly inspiring and thus instrumental in accelerating research work rather than retarding it.

IPR issues seem to be generally well handled at the centres. Some centres have organised the transfer of innovative ideas from pre-competitive research to development by user partners by creating separate (bilateral) joint projects with users, within or outside the centre. Several centres also mentioned the acquisition of additional projects from RCN and other public sources based on ideas or research results from the centre programme. Such projects obviously represent a very good mechanism of knowledge transfer that avoids undue competition or transfer of proprietary results. We regret that the extent of these projects was not more explicitly described either in the written reports or at the site visits – they are excellent indicators of the success of a centre.

One important aspect brought forward by RCN is the extent to which international companies have joined as corporate partners. The reports and site evaluations indicate that the centres have not been very successful in this respect. We make the reservation, however, that this conclusion might have been different if the extent of spin-off projects had been better reported.

8. Notes on criteria of progress and performance

The criteria of scientific success used by the centres are international and well established. However, with regard to monitoring the progress of research and reference to work plans we found that there in many cases was clear room for improvement. One way that we strongly recommend is more extensive definition of Key Performance Indicators (KPI), which presently is used by only one centre. There are KPI criteria that are common to all centres, but specific individual KPIs for each centre can also be defined. We recommend RCN to take initiative to let all centres share their experiences in this matter e.g. through meetings between centre leaders.

9. Financial aspects

The cash contributions from corporate partners are satisfactorily high. In addition there are obviously substantial in kind contributions, but we find it difficult to assess the importance of them, as they were generally not well accounted for either in economic reports or budgets. The

same is also valid for the in kind contributions from host institutions. In some cases the host institutions seemed to consider the in kind contributions a somewhat heavy burden, but it was not possible for us to evaluate the situation in any detail. In kind contributions from corporate partners should generally be reported more visibly, as they are good indicators of industrial involvement and hence of the general importance of centre research.

10. Planning for the next financing period and beyond

Plans for the next three years are often very detailed, but centres do not always make provisions for possible effects of changes in general and industrial interest in their research areas. There is also a lot of good insight in the self-evaluation from corporate partners that has the potential to act as important input for the final years and beyond.

To continue and acquire new investments after year eight it is important to increase global visibility and utilize all the knowledge built up during the previous years. The centres are recommended to already now increase activities to ensure sustainability of resources after year eight. One strategy in order to strengthen the international visibility and appreciation of Norwegian research would be a stronger cooperation in international activities between centres that are working in similar areas. We recommend RCN to take the initiative to such activities.

11. Conclusions

Norway is a special case in the sense that the country has enormous energy resources in terms of hydropower, petroleum and offshore wind power. From an economic point of view the two first are dominating. Bioenergy, solar energy and zero emission buildings have the potential to contribute significantly to a sustainable energy balance and presently are subject to immediate and tangible public interest. We are impressed by the Norwegian determination to become a leading authority on the very complex technological and societal questions involved in environmentally friendly energy research. Many of them are of great importance for the future and it is certainly very appropriate that emphasis of centre activities should be on long-time fundamental research. At the same time, this seems to imply that many of the corporate partners seem to be hesitant with respect to the possibility to gain economic benefit from supporting the research. The conclusions one can draw from these considerations are

- In the long run, the centres will mainly receive industrial support from large companies that can afford funding research that does not give immediate return on investment,
- Public authorities with responsibilities associated with energy policies and environmental issues should take a stronger interest in joining the centres as user partners.
- When innovative ideas of commercial interest are identified these should preferably be further developed in separate projects within or outside the Centre, with priority for Centre partners.

The FME is a very well managed program. It has resulted in the development of eight centres that are approaching international scientific standard and have significantly strengthened the Norwegian research and cooperation on environmentally friendly research. Not in the least, the schooling of scientific/industrial leaders for the future solar wind/CCS/bioenergy/new solar cell companies/zero emission buildings is important. In all, the FME program is already a very impressive achievement. We believe that in the long run, fluctuations in energy policies and economy notwithstanding, the program has the potential to result in very important applications to the benefit of Norwegian society and industry.

12. Recommendations

In addition to the recommendations to each of the Centres, we wish to recommend RCN the following:

1) RCN should in the future in greater depth evaluate the situation created when initiating programmes involving relatively long-term research, where immediate short-range commercialization and applications are not primary goals and at the same time strong corporate partnership participation is required.
2) RCN should make it clear to the centres that when a new corporate partner joins it is essential to define
   - how the Centre intends to combine the main long-term research with applications in direct cooperation with industries,
   - expected input from the corporate partners in terms of responsibilities with respect to partaking of research results and absorbing ideas for innovation.
3) RCN should instruct the centres to report all in kind contributions explicitly
4) RCN should take measures to clarify the role of the International Scientific Advisory Boards.
5) RCN should to take the initiative to catalyse stronger cooperation in international activities between centres that are working in similar areas,
6) RCN should promote the use of KPIs to monitor the progress of research and fulfilment of strategic goals in the centres
7) RCN should require the centres to appoint their chairman of the board from a corporate partner.
8) RCN should initiate common exchange of experience between centres, e.g. on several of the issues above.

Stockholm, April 9, 2013

Mattias Lundberg Per Stenius

2. BIGCCS, International CCS Centre

Host institution: SINTEF Energy Research

1. Introduction

On March 5, 2013, the evaluation team met with the Director, project leaders, PhD students, Post Docs, representatives of the host institution and representatives of the industrial and public partners of BIGCCS. In the morning, the discussions centred on the research at BIGCCS. In the afternoon there was a meeting with students and postdocs as well as discussion on management and organisation of BIGCCS. This evaluation is based on these interviews as well as on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole BIGCCS team for a well-organised meeting as well as open and informative discussions.

2. Research activities

The Centre seems to have the critical size and the discipline competences needed to achieve the tangible, scientific and technological objectives. Based on the documentation provided it is shown that the Centre research program fulfils the scientific objective and the technological objectives, but it is less clear how it is on its way to achieve the tangible objectives. The Centre's strong emphasis on covering the whole CCS chain is very important. The ambitious tangible objective of contributing to 50% cost reduction of the CCS chain makes it necessary to set a baseline for the situation at the time of the start-up of the Centre, to be used for prioritizing research activities and subsequent benchmarking of research results. The Mongstad site could be used to illustrate the chain with transport to and storage on the Norwegian continental shelf. The baseline cost figure could be calculated based on the cost assessment work done by e.g., the Zero Emission Platform and the European Bench Mark Taskforce (EBTF). The Centre has approached research on problems associated with CCS in a comprehensive way, but should now pay more attention to whether the results actually contribute to achieving the ambitious goals set for the Centre in the project description. To the extent that they are not doing so, research priorities should be adjusted in consultation with the user partners so that they are directly focused on achieving these goals

The dissemination through scientific publications and international conferences is working very well, but it is not clearly shown in the listed conference publications that they originate from the BIGCCS research work.

The electronic Newsletter is an excellent way of showing the Centre partners as well as external stakeholders the extensive on-going work and achievements of the Centre. These are also highlighted in the communication plan. The web site today holds only six published newsletters, although according to plans there should have been a least four issues per year. The content of the website leaves much room for overall improvements.

3. Internationalisation

The Centre's profile is enhanced by participation in several international CCS focal groups. The Centre has also forwarded a bid to the IEA greenhouse gas programme to organize the biannual international conference on CCS in 2016, again underlining the strategy to strengthen visibility of the Centre. BIGCCS organizes biannually the international "Trondheim CCS Conference" (TCCS series).

Centre management/members are participating in the EU EERA network on CCS, the ZEP platform, and the ECCSEL networks. BIGCCS is also participating in the Global CCS institute from Australia. In this the Centre is engaged in the setting of the international R&D agenda and contributing to the development of the deployment strategy for CCS worldwide.

The Centre has successfully secured international cooperation with outstanding research groups in Europe and USA. For some of the technologies under development in the Centre this cooperation is essential in order to achieve the ambitious goals.

There is a good exchange of foreign researchers that have been active in the Centre for longer periods. The Centre did not present an overview on the PhD exchange programme so the panel cannot give a good review of this. However, in the meeting with the PhD students not one of them mentioned being abroad for any longer period.

4. Researcher training, engagement in education

The meeting with the PhD students and post docs confirmed in general that they get good support from the staff of the research group where they are doing their research. They also were positive on the annual PhD/post doc seminar in connection with the annual consortium day. However, the students we met during the meeting did not confirm the presence of a so-called "feeling of belonging to BIGCCS". In fact they did not demonstrate a feeling of being part of a lager family that would be working all together on the further development of the CCS technology as one of the important options to reduce CO_2 emissions.

5. Plans for final three-year period

The project description for final three-year period holds no changes in the overall objectives for the Centre, but there is an addition of three additional specific scientific objectives. The roadmap should in an integrated way describe where the Centre is today in relation to the objectives set in the project description, where the Centre should be at the end of the additional three-year period, and the measures needed to achieve this. This is, however, not the content of the existing roadmap, so that more effort seems to be needed on clear focusing of the research rather than on extending the scope of the topics studied. It is not clear how the addition of specific scientific objectives contribute to such focusing.

The industry self-assessment shows a need to strengthen the process of handing over results from the Centre to industry partners. The output in form of scientific papers should be complemented with additional efforts to assist end-users and technology providers/vendors in making use of the produced results, e.g. through suggestions of new products or updates of standards and commercial software. It is then the end-users task to take such recommendations forward trough new technologies, standardization committees or in dialogues with software providers.

6. Organisation and Management of the Centre

The Centre is well established both nationally and internationally as an important research organisation engaged in fundamental research on CCS, including capture, transport and storage, cooperating with well recognised international research partners. An active and enthusiastic director leads the Centre with strong support from the Board.

Centre organisation is straightforward with well-defined responsibilities of board, management group and SP leaders. However, the panel identified weaknesses in communication within the Centre, in particular with regard to communication between PhD students, postdocs and other research groups. This situation needs to be improved, and as a first measure we suggest increasing the time allocated to management of the Centre so that more attention can be paid to ensure better

contacts between all those working in the Centre, a general knowledge and understanding of the goals of the Centre and a sense of community. Creation of a more informative and attractive website would very likely contribute importantly to this.

CCS has for several years been an important research area at NTNU. Interactions with the host institution and NTNU in the area of CCS have been strengthened by BIGCCS, which has made it possible to increase the size of the research groups involved and expand international contacts.

Collaboration with BIGCCS has initiated new Masters level courses on CCS at NTNU but it has not contributed specifically to PhD education except that the number of PhD students engaged in research on CCS has increased. Some concern was expressed with regard to the bureaucracy involved in decisions on projects and transfer of money between SINTEF and NTNU.

7. User partners and other innovation aspects

Centre research covers a broad industrial area with global social and policy implications. Most of the important parts in the potential market value chain are represented among the Centre partners. The absence of a mature market (and business) obviously makes it very intricate and challenging for the user partners to engage strategically in this kind of long term co-operation. The potential market is associated with huge uncertainties due to complex scientific, technological, political and economic challenges. This can, on the one hand, explain some of the criticism on the usefulness of the results expressed by user partners in the self-evaluation. On the other hand, since the industry put in a lot of money, there seems to be continued interest in the Centre.

From the self-evaluation from the users the panel understands that there is great potential for improvements on different issues, e.g. influence on R&D, ideas for new products and recruitment. The user partners have suggested a lot of measures and targeting ideas that would lead to improvement of these issues. The panel would like to see more effort (resources) allocated to increase involvement of all user partners of the Centre, so that they can get a clearer benefit from the Centre. The panel recognizes that this is one of the most difficult challenges during the coming three years.

8. Gender aspects

Questions about gender are handled in the Centre in an acceptable manner. There is a need to improve the situation on leading positions and we encourage the general assembly to pay attention to the gender issue. There is a specific need to improve the gender balance in the board.

9. Financial aspects

The financial situation and reporting of the Centre is in good shape. The only concern of the panel refers to the in kind contribution. In the financial report this contribution appears to be relatively low but it became clear during the evaluation that it is actually substantial.

10. Future activities

The Centre showed evidence of being able to continue after year 8. There is probably a need to mobilize all stakeholders to substantiate this evidence by involving the user partners more in Centre activities during the last period. In addition to this the Centre is encouraged to make a synthesis of the major achievements during the eight years to be better prepared for the following phase.

11. Conclusion and recommendations to the centre

BIGCCS is by now well established, nationally as well as internationally, as an important research organisation engaged in research on the whole CCS chain. Centre research is of high quality, but during the coming years a better focus on achieving the tangible goals defined in the project plan and facilitating implementation of the research results in future full-scale CCS projects is needed.

The evaluation panel submits the following recommendations:

1) The Centre should pay more attention to whether the research results so far actually contribute to the ambitious goals set for CCS in the project description and, if they do not, adjust priorities to directly focus on achieving these goals.
2) The Centre should agree on a value chain that can be used as reference when evaluating to what extent goals have been achieved, particularly with regard to cost reduction and energy penalty reduction.
3) The Centre should, in collaboration with the user partners, for the final years focus the research agenda in greater depth on the possibilities to achieve the goals stated in the project description and the scope of research defined by the value chain.
4) The Centre should require authors to acknowledge the BIGCCS Centre for funding their work in all external publications.
5) The Centre website should be revised and updated.
6) The Centre should pay thorough attention to that the material presented in the newsletters reflects the manifold of on-going research activities, and either increase the rate at which the newsletters are published or revise the newsletter part of the communication plan.
7) The Centre should increase emphasis on deliverables to user partners by other means and in addition to scientific publications.
8) The Centre should as a matter of urgency take measures to improve the interaction, the awareness of what is going on within BIGCCS and the sense of a common goal between PhD students and Postdocs, for example through workshops, seminars, industry visits and more informal meetings.
9) The Centre should allocate more resources in order to improve communication, interactions and awareness of the common goals within the Centre, in particular between SINTEF ER and researchers working at other research partners
10) The Centre should report in kind contributions from industry more carefully so that they show the full power of the centre in terms of user participation.
11) The Centre should, in order to increase the evidence of active engagement of user partners, endeavour to increase the in-kind contributions from industry during the last years.
12) The Centre should, together with all partners, as a matter of urgency initiate a process to implement the measures suggested in the self-evaluations submitted by the user partners.
13) The Centre needs to get more user partners, especially technology providers/vendors to get a critical mass in the (capture) technology development. More resources are needed to make this happen.

3. CenBio, Bioenergy Innovation Centre

Host institution: Norwegian University of Life Sciences

1. Introduction

On March 20, 2013, the evaluation team met with the Director, project leaders, PhD students, Post Docs, representatives of the host institution and representatives of the industrial and public partners of CenBio. In the morning, the discussions focused on the research at CenBio. In the afternoon there was a meeting with students and postdocs as well as discussions on management and organisation of CenBio. This evaluation is based on these interviews as well as on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole CenBio team for a well-organised meeting as well as open and informative discussions.

2. Research activities

The on-going research in the various individual Sub Projects (SP) is generally of high quality, engaging internationally renowned scientists and using state of the art research facilities. This has resulted in a significant number of innovations, publications in peer reviewed scientific journals and media contributions. The research has also significantly improved understanding of parts of the various bio-energy supply chains, particularly related to biomass inventories and cleaner small scale combustion, environmental impacts and the coupling between conventional forestry operations and the availability of forest biomass for energy. While much of this work relates to Norwegian conditions, parts of it are of international significance, e.g. the inclusion of the albedo effect in LCA of forest energy systems and the analyses of multi-tree felling.

On the other hand, it also appears that as a result of a comparatively low level of interaction between researchers in different SPs as well as insufficient coordination and timely adjustment of research actions the potential benefits of the multidisciplinary research team have not been utilised to an extent that would have been possible. The Centre has been important for increasing the mass of relevant research competence in its fields of interest, but there is more potential of achieving synergies between the different research units engaged. The exploitation of such synergies should be a top priority for the final years of the program. An example is the unique possibility in CenBio to use conversion research data (from SP2 and SP3) and sustainability assessments (SP4) to explore new strategies for biomass supply (SP1).

For the valorisation of knowledge gained and to secure competent research professionals in future it would be important to challenge successful PhD students to continue working in their respective bio-energy fields, either within CenBio as Post Doc students, through spin-out companies or with the research and user partners.

3. Internationalisation

There is generally a strong international commitment in the activities of CenBio, as evidenced by international publication, participation in important international research networks, reporting at relevant conferences and the successful recruitment of PhD students of many nationalities. A good international contact network is necessary to increase co-operation and to increase impact, but also to avoid unnecessary overlap with work carried out in other countries. There is evidence of a certain degree of overlap in the ideas investigated by CenBio, including work on advanced woodstoves (significant work on heat retaining stoves has been done in Finland) and torrefaction (the large EU funded R&D programme SECTOR is currently implemented with similar goals as

STOP) and the investigations of bundling as a technique to improve handling and storing characteristics of forest biomass (which has been thoroughly examined in both Sweden and Finland). In some cases, however, it is necessary to repeat research that has been done in other countries since the boundary conditions for application are often country specific.

The Centre has appointed a Scientific Advisory Board (SAB) to assess the quality and relevance of the CenBio research in a national and international context. No written reports from this Board were available and at the site visit by the panel it was stated that Board members had given comments by email. The advisors come from abroad and have evidently also been directly engaged in research projects at the Centre. This is a good way of international cooperation, but misses one of the main purposes of a SAB, i.e. to make independent assessment and advice on research objectives and performance, preferably through site visits and joint reports (at least annually). The SAB could also be utilized for advice and discussions with Post Doc and PhD students without being directly engaged in Centre projects.

4. Researcher training, engagement in education

The Centre has been able to attract a significant number of very talented PhD and MSc students, which have the opportunity to be part of a unique multidisciplinary and high quality research centre. To enhance the inclusion of these students into a "CenBio community" with well-known, common goals and objectives would be a good way to improve efficiency. It is the impression of the panel that the Centre could improve its efforts to include the junior researchers in such a joint activity, e.g. by arranging meetings where the students can discuss their individual work against the CenBio objectives.

It is important that the students are properly introduced into their respective research groups. It appears that the level of tutorship and exposure to other disciplines present within the Centre and with research and user partners could be improved in several cases, leading to more relevant, higher quality output and degree of motivation of the students. Similar gains could also be achieved by extending the exposure of the students to international research, now mainly taking place at in international conferences, to short time visits at the laboratories of international institutions with which the Centre has research contacts.

5. Plans for final three-year period

The panel notes that a low level of co-operation between the different disciplines within CenBio has led to suboptimal performance of certain work packages. The final three-year plan therefore correctly includes a new holistic SP in which the progress achieved in the other SPs is integrated, resulting in a more iterative and effective approach.

Forests constitute the absolute bulk of available biomass in Norway and there is strong evidence that high demand for roundwood from the conventional forest industry is an efficient facilitator for making biomass for energy available at reasonable costs. Thus, to work with "forest energy supply chains" without considering its implications on the industrial roundwood flows misses important aspects. So far, only a fraction of the research activities have a strong relevance for practical forestry (WPs 1.1, 1.2, 4.2 and 4.3). It would strengthen the relevance of the research activities and, most likely, also the commitment of industrial forestry partners if this perspective could be added. In general, a stronger focus on encouraging implementation of identified innovations during the final three-year period would also strengthen the partnerships built by CenBio for the future.

Considering the low energy prices, uncertainties about available biomass volumes and difficult economic times, research on conversion technologies should predominantly be led by the urge to make bioenergy applications more sustainable, rather than holding on to the set goal of doubling

the energy production in 2020. Research on improved stoves with higher efficiencies and lower emissions fits into this strategy. Diversification of the industrial fuel portfolio from increasingly scarce clean wood fuels to cheaper but more challenging fuels, such as bark, agrifuels and wastes, through improved combustion and the use of suitable additives is another justifiable and laudable effort.

6. Organisation and Management of the Centre

Centre Management is divided between UMB and SINTEF, so that the Centre Director and Centre Manager are located at SINTEF ER in Trondheim with a Deputy Director at UMB. As the Chairman of the Board and two of the SP leaders are also from SINTEF ER the dominance of SINTEF in the Centre leadership is rather strong. User partner representatives form the majority of the Board. The user self-evaluation made available to the panel indicates that there is a need for stronger communication with partners in the planning, evaluation and utilization of research and Centre management. The Board should make efforts to increase user participation in Centre work both at researcher and leadership levels. The panel submits that one measure to consolidate user partner engagement in the Centre would be to appoint a representative of the user partners as Chairman of the Board.

The Centre is run efficiently as the management has considerable earlier experience of running large projects. However, the panel clearly identified a need for improvement of the cooperation and communication between the SPs and the contact between management and researchers at all levels.

The active publication of articles in scientific journals and reporting at international conferences will have rendered the Centre international visibility and identity, as also demonstrated by participation in international (EU) projects. Some of the results from Centre research have been reported to the general public through numerous articles and also by interviews in public media. This also provides opportunities to influence user behaviour, e.g. in using woodstoves and making bioenergy use more sustainable. This active and extensive reporting of Centre activities to the outside is very commendable.

The Centre has consolidated research on bioenergy at UMB, Bioforsk and Norwegian Forest and Landscape Institute at the Ås campus. The possibility to complement research at UMB with engineering aspects offered by NTNU and SINTEF has been of great value to the university. All research partners corroborated that CenBio has created collaboration between them and strengthened their research in a way that would not have been possible without the Centre. MSc education on bioenergy at NTNU and UMB has also been strengthened, but on the PhD level the contributions to education, which is based on more specialized courses, are not so evident, due to the rather different approaches to bioenergy represented by the two universities.

7. User partners and other innovation aspects

The Centre is commended for its good efforts in innovation management. The panel also enthusiastically acknowledges the implementation of a “Bioenergy Innovation Award”.

From the start the group of user partners covered the most important parts in the value chain of bio-energy. The Centre has lost five partners during the first four years. Discussions are going on with new partners (and one “old”). The panels realizes that the risk and reasons of missing important parts of the value chain by losing partners is partly due to reasons beyond control of the Centre. On the other hand, the fact that the self-evaluations from user partners were rather critical indicates that the Centre needs to take serious action to sustain and increase interactions with user partners. There is a risk that the research will suffer from this situation if no action is taken.

The panel finds that the Centre management and board can increase their efforts to get new industries into the Centre. These efforts will also be of great strategic importance for sustaining CenBio activities after eight years.

The Centre's efforts to define "innovation" and to identify innovations are commendable. There is still a need to connect these innovations more directly to user partners. Examples of possible or realised innovations could be used to advertise CenBio both to attract the attention of potential new partners and for a broader audience.

There seems to be room for improvements of the commitment from user partners. This is absolutely necessary to develop the way CenBio should evolve to the benefit of bio-energy in Norway. There was some evidence of real co-operation between user and research partners but there seems to be too little effort from the Centre to make this mutual mobility grow to an acceptable level.

8. Gender aspects

CenBio has been successful in attracting female Master's and PhD students in a traditionally male-dominated area of R&D, but "tradition" prevails at the senior levels of the organisation. This is an issue that still needs serious attention on all levels. It is important to have strategies, resources, gender knowledge and clear goals in place to improve the situation.

9. Financial aspects

The financial administration of the Centre is efficiently organised, leading to timely input on financial performance including evidence of in kind contributions. During the site visit it became clear that not all in kind contributions where explicitly or sometimes even fully reported in the documentation. These contributions are of great importance and value as they act as indicators of the total extent of industrial and research commitment and relevance. The in kind contributions also give evidence of the knowledge/technology transfer to and from industry. Reporting the full value of in kind contributions will probably also improve Centre attractiveness to new partners by demonstrating how useful the Centre has been to its partners.

10. Future activities

The panel recognizes that the Centre has been successful in attracting new projects on specific topics closely related to research within the Centre program. The Centre plans to encourage further development of the opportunities offered by this kind of co-operation to fully utilize the full capacity of research for all partners in the Centre. It is also important to include the user partners in this development. This is important to find a solid base for the future activity after year 8.

11. Conclusion and recommendations to the Centre

CenBio is active at two rather distant sites but the management has developed an efficient organisation that enables effortless communication between the research partners. This has resulted in productive scientific research. There does, however, seem to be a need for more intense cooperation between researchers in different SPs to improve the sense of working towards a common goal.

The challenge of CenBio is to implement an industry driven approach for optimal application of bioenergy in Norway, where practical questions are ideally addressed with fundamental research, followed by applied research. As of yet, however, it appears that the prioritisation of research

topics is often insufficiently endorsed by industry, e.g. due to differences in time perspectives between researchers and industry. This forms a risk for ultimate valorisation of the results.

The panel submits the following recommendations:

1) The Centre should engage all those involved in Centre work in joint formulation of goals and planning of the research programme, providing a rationale for the co-operation within CenBio.

2) The Centre should define quantifiable criteria to be used in the assessment of the extent to which goals, joint planning and cooperation has been achieved.

3) The Centre should, when formulating the research to be conducted in the new SP6, carefully consider the implications on the biomass value chain of the on-going drastic changes in the forest industry.

4) The Centre should strive to increase the number of postdoc students.

5) The Centre should enhance their assessment of on-going research in an international perspective, so as to avoid duplication of research work.

6) The Centre should complement the Scientific Advisory Board with renowned scientists not directly involved in Centre research and utilize the Board as an independent body of scientists that may give advice on and evaluate research plans and results.

7) The Centre should encourage short time visits by PhD students and other researchers at foreign laboratories and *vice versa*.

8) The Centre should intensify its efforts to increase cooperation and communication between researchers in different SPs at all levels.

9) The Centre should make strong efforts to increase communication and cooperation between user partners and researchers in the Centre at all levels when planning research and reporting results.

10) The Centre should take measures to increase the contacts of PhD students with user partners through site visits, presentation of results etc., and strongly encourage the students to maintain such contacts.

11) The Centre should strengthen the user/partner articulation by appointing a user partner representative as Chairman of the Board.

12) The Centre should try to attract additional and strongly committed user partners.

13) The Centre management and SP leaders should, when jointly planning of research programme and cooperation and formulating goals, also take into account the continuation of research after the end of the 8 year RCN financing period.

4. CEDREN, Centre for Environmental Design of Renewable Energy

Host: SINTEF Energy Research

1. Introduction

On March 7, 2013, the evaluation team met with the Director, project leaders, doctoral students, post docs, representatives of the host institution and representatives of the research, industrial and public partners of CEDREN. In the morning, the discussions centred on the research at CEDREN. In the afternoon there was a meeting with students as well as discussions on management and organisation of CEDREN. This evaluation is based on these interviews as well as on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole CEDREN team for a well-organised meeting as well as open and informative discussions.

2. Research activities

Given the total budget of approx. 250 MNOK over a period of eight years CEDREN seems to outline a reasonable ambition level in terms of the listed success criteria. Overall these ambitions are successfully pursued up to now, though it is difficult to evaluate the progress in e.g. publication over the eight-year period and some international exchange criteria like foreign visits as well as NTNU researchers staying abroad.

Currently 17 PhD students are enrolled in the PhD education at NTNU (Trondheim), University of Tromsø, Harriot-Watt University and University of Exeter, of which three have graduated. At this point, 36 master theses have been performed within CEDREN, which is close to the final objective (40). The total number of researchers involved according to the self-evaluation is 33, including 4 professors and several senior researchers, distributed mainly on the three organisations SINTEF ER, NTNU and NINA. However, SINTEF ER states that the actual number of involved researchers is considerably higher. In addition, 15 international collaborators are engaged in the projects and in the three-year plan there is a statement on 50 scientists from research teams in 20 countries. In the first phase of the project 6 guest researchers have visited CEDREN of the planned 20 in total.

The active participation and cooperation of CEDREN researchers is manifested in terms of a wide distribution of authors to all kinds of publications, from peer-reviewed journals to technical reports.

Overall this indicates a sufficient personnel platform both for research and the PhD education.

Most of the user partners are satisfied with the results of CEDREN so far. Primarily these partners confirm the importance of the competence building and availability as well as excellence of the CEDREN staff, but express some doubt with regard to the extent to which the research results so far have contributed to commercialised innovations or new business concepts. A few partners state that e.g. procedures of hydropower operation have been improved due to research results from CEDREN. The CIC committee can probably aid the identification of ideas with potential for commercialization and the CEDREN managing team seems to have undertaken new procedures to strengthen this aspect.

The scientific publication so far accounts for 27 peer-reviewed papers (of planned 100) and 190 conference presentations (of totally planned 300). 58 of the latter are associated with a proceedings paper (46 national and 12 international). Even when taking into account the time

taken to build up PhD projects and the expectation that publication rate probably increases with duration of the project it seems that the produced 27 of the planned 100 journal papers is a bit on the lower side. It would be useful to clarify the correspondence of the overall publication plan with the responsibility of individuals (mainly PhD students) for that deliverable. The panel notes that broad conference participation, in particular by students, can serve as an incentive for submitting papers in reviewed journals.

The thematic focus is currently mostly on environmental effects of hydro- and wind power as well as transmission lines, which is also reflected in the publications. A positive aspect is the obvious interdisciplinary collaboration between PhD projects of different focus.

The assessment of the scientific committee on the research activities is very positive. It states that CEDREN clearly demonstrated its leadership at the national and international levels through the excellence of its research.

3. Internationalisation

From the fact sheets (part B of the self-evaluation) one can count 103 international conference presentations. CEDREN has been present at the relevant conferences related to their research topics and has gained high visibility in these communities. CEDREN has 15 international collaborators whereof six have been guest researchers at NTNU. Further, senior researchers of CEDREN have been invited to 16 international committees, but none has spent time as guest researcher abroad. As mentioned, CEDREN also has active collaboration with 50 scientists in 20 different countries. The evaluation panel note the ambition and work done to influence future research calls from the European Union, but also that only few efforts have been done to connect to existing themes and participate in research proposals within existing framework programmes.

4. Researcher training, engagement in education

CEDREN involves 33 researchers, including four professors and several senior researchers, distributed mainly on the three organisations SINTEF ER, NTNU and NINA. SINTEF ER states that about 100 employees are involved in the projects. This personnel basis is sufficient for supervision of the planned PhD students and scientific production. 17 PhD students and five Post doc students have so far been recruited, which seems to be a sufficient number at this point.

The students were well aware of and had utilized the possibilities for obtaining guidance in their work from CEDREN. They also expressed an awareness of the importance of scientific publication. There appeared to be reasonably good contacts between the students, but they were looking for more common activities to foster the sense of community.

5. Plans for final three-year period

The work plan defines “deliverables” for the seven (7) sub-projects and the overarching activities “Centre management” and “Common Centre Activities”. This gives a good overview of the direction of the activities and how the plans correspond to the set up success criteria. Overall the plan for 2013 looks good, 11 articles are already submitted to peer-reviewed journals and a considerably higher number of papers are in the pipeline. During 2013 the aim is to finalize 5 PhD studies. This is probably reasonable considering that 18 students are currently enrolled in the programme. According to initial plans three more students need to be recruited, but the recently stated target is to engage ten new students.

The three-year plan stresses the urgent need for innovation in the energy sector in order to achieve success in the future energy market. Therefore, there will be a shift of resources towards a more application-oriented research. This is probably a wise direction considering the fact that the

contacts with user partners could probably result in more concrete innovations in the future. The challenge will be to keep up the ambition to publish results in peer-reviewed journals, but there should be no contradictions between these objectives.

6. Organisation and Management of the Centre

Due to the socioeconomic and environmental importance of research at the Centre, it has become highly visible in Norway; media and politicians have consulted centre researchers on environmental and other aspects of hydropower technology. The Centre has extensive international contacts and is on its way to an internationally recognised identity, for example by arranging well attended international conferences on renewable energy in Trondheim.

A dynamic Director leads the Centre with strong and very active support from the Board. It seemed that the management team was working well. The panel would have appreciated a more substantial participation of project leaders in the evaluation to substantiate this impression and to get some hands-on information regarding the progress of and interaction between the projects.

The Centre is well organised with the tasks of board, management and the different committees clearly defined. During the first three years the research programme was divided into six different projects. Some projects have been added and some have ended. In 2011 there were ten projects, and now there are seven. At the same time emphasis of the programme has been shifted towards more applied research. This implies a commendable focusing and consolidation of the research activities.

The Centre has designed a setup of qualitative and quantitative success criteria that can be followed systematically and are demonstrably helpful in monitoring the progress of the Centre. The panel wishes to commend the Centre for this initiative, which could serve as a model for other similarly organised research centres. The way the Centre has utilised SWOT analysis as a tool when formulating the work plan for the last three years is also commendable

CEDREN has made a very substantial effort to improve communication within the Centre, through e-room, workshops, seminars, conferences and project meetings with user partners. Measurements have also been taken to ensure efficient and comprehensive documentation and dissemination of results, beyond the usual reporting through journals and technical reports. In particular, measures have been taken to systematically identify results that may give rise to innovations at an early stage.

The Centre interacts intensely with research and education on hydropower at NTNU. 17 PhD students and 5 post doc students at NTNU, University of Tromsø, Harriot-Watt University, University of Exeter and the Austrian University for Natural Resources and Life Sciences, are directly financed by CEDREN, but the work of at least twice that number of students at NTNU is associated with research at the Centre. The interest in research on hydropower related topics shown by students at both the Masters and PhD levels has increased substantially during the last few years, and it is felt by NTNU that the change in the public image of hydropower resulting from work at CEDREN has contributed substantially to this. The evaluation meeting gave clear evidence that the partnership between NTNU, NINA and SINTEF is fruitful and works smoothly.

7. User partners and other innovation aspects

The group of user partners covers the most important stakeholders in Norway. Since the topics of the Centre have such a high visibility in society the broad range of partners is commendable. The panel observed intense efforts in the Centre to get all partners involved in the research program.

However, due to the number and type of user partners, the challenge to make all partners involved should not be underestimated.

Attempts to add international user partners to the Centre to the extent given in the success criteria have so far not been successful. We believe that these efforts need to be increased as one important means to secure the long-range existence of CEDREN. For example, the Centre may consider involving international hydropower consultant firms. This might be one way of creating an international interface for knowledge transfer.
There is a potential for improving mobility of people in the centre, including user partners. This would have a positive effect on the visibility, attractiveness and idea generation of current and new projects.

8. Gender aspects

The awareness in the Centre of Gender issues seems appropriate. However, this is an issue that still needs serious attention on all levels. It is important to have strategies, resources, gender knowledge and clear goals in place to improve the situation, especially on the senior levels.

9. Financial aspects

The budget for the remaining years of Centre financing by RCN is a matter of some concern. From the economical reporting it was not quite clear how serious this problem is, but it is obvious that obtaining a more substantial funding for the last three years is of essential importance, not only for the present CEDREN research, but also for the possibilities to continue Centre activities after year 8. The panel notes that CEDREN leadership is very aware of this situation and taking measures to alleviate it.

It appears that the total budget of the Centre is larger than reported in the financial statements, because the in kind contributions are underestimated. There also seems to be in general too little effort to report the in kind contributions to the Centre work. It is important to show the total value of the Centre to gain more attractiveness and attention in Norway and internationally.

10. Future activities

The Centre considers that due to the importance of integrating technical, environmental and societal aspects of hydropower, wind power and transmission lines development, prospects for the future after year 8 should be good. For the Centre to sustain its activity it is important to gain international attention during the last years. There is probably also a need to involve the user partners more during the last period in order to mobilize all stakeholders to solidify the possibilities to continue. The Centre is encouraged to make a synthesis of the major achievements during the eight years, which would help to make Centre become more competitive for continued financing.

11. Conclusion and recommendations to the Centre

CEDREN is a well-functioning research organisation that produces research results on renewable energy-related topics of scientific and technical as well as environmental and socioeconomic importance. The Centre falls somewhat short on some of the success criteria, but in general makes very good progress. The Centre outreach into the Norwegian community is considerable and has contributed to changes in societal attitudes towards hydropower. The Centre has extensive international contacts and should look for more support from organisations abroad.

The panel submits the following recommendations:

1) The Centre should increase focus on publication in well-recognized scientific journals, including more explicit emphasis on such publications in the work plans.
2) The Centre should consider including more research on the balancing capacity of hydropower when integrating renewable energy sources into the electricity production system.
3) The Centre should increase the efforts to obtain leadership or participation in EU projects.
4) The Centre should enhance the communication and cooperation between students by arranging meetings for all students at least biannually.
5) The Centre should arrange an annual course open to all PhD students that gives an overview of progress in all aspects of hydropower (technology, environmental aspects, networks, socioeconomics, innovations etc.).
6) The Centre should encourage more presentations of research at international conferences by PhD students.
7) The Centre should clarify the correspondence of the overall publication plan (100 peer-reviewed papers) with the responsibility of individuals (mainly PhD students) for the papers.
8) A detailed publication planning should be agreed upon with each PhD student and Post-doc defining preliminary title, submission deadline and potential journal.
9) The extensive information material published by the Centre could be further improved by explicitly showing the interconnection between the different research topics and their relationship to the overall vision of the Centre.
10) The Centre should engage more user partners outside Norway.
11) The Centre should enhance mobility between PhD and user partner.
12) The Centre should increase the visibility of in kind contributions in the financial report.

5. NORCOWE, Norwegian Centre for Offshore Wind Energy

Host: Christian Michelsen Research AS

1. Introduction

On March 14, 2013, the evaluation team met with the Director, project leaders, PhD students, representatives of the host institution and representatives of the industrial and public partners of NORCOWE. In the morning, the discussions centred on the research at NORCOWE. In the afternoon there was a meeting with students and postdocs as well as discussions on management and organisation of the Centre. This evaluation is based on these interviews as well as on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole NORCOWE team for a well-organised meeting as well as open and informative discussions.

2. Research activities

NORCOWE's research includes the most urgent meteorological and oceanographic topics as well as some engineering aspects of design, installation and operation. Initially, the environmental (biological) impact of wind farms was also investigated, but this research was discontinued because the funds were not considered to be sufficient to seriously pursue this field. Also, the Centre does not consider these aspects to be of relevance for Norway, at least not in the near future. Except for this, the research activities reflect the profile laid out in the Centre's original proposal. If one considers that NORCOWE started less than four years ago with excellent scientists in geosciences and maritime engineering but with little experience in wind energy (except for the Danish Partner) the Centre has successfully developed its profile and has obtained international recognition. Seen from the outside, the Centre is mainly perceived through its research in meteorology and oceanography (modelling and field experiments). The other areas of activity and the locations in Stavanger, Agder and Aalborg are also well recognized, but because of the diversity of their topics a mutual profile is not as clearly seen from the outside.

All working groups publish at international conferences and also in peer-reviewed scientific journals.

As of the start of 2013 NORCOWE reorganized its structure by reducing the number of WPs from five to three. The panel concurs with the new WP structure. WP1 and WP2 seem to be quite coherent and the centre structure more manageable. This can be especially important in light of the major infrastructure investments such as EFOWI and NOWERI. The ability to do the reorganisation reflects that the Centre has an active and responsible leadership.

The panel took note of NOWERI no longer being a joint facility of NORCOWE and NOWITECH. It has been split into two separate facilities. The panel acknowledges the reasons given. The intended change from a stationary measuring mast to mobile equipment provides the wanted flexibility. A Lidar on a bouy, however, carries a risk with regard to accuracy. The research work by WP3 with a Stewart platform on this topic could prove to be helpful.

WP1, with its emphasis on Met-Ocean Data, has a very strong team and advanced infrastructure, as rarely any other geophysical group working in the field of wind energy. The facilities will be further extended, and one can be confident that the expectations toward the WP will be fulfilled.

The group is strongly encouraged to make field data available in such a way that other scientists, not only in Norway but also worldwide, can use them. This would place NORCOWE and its data sets permanently on the global scientific map.

WP2 with its emphasis on numerical modelling has possibly more competition in the world than WP1. The group excels in wind resource assessment, wind farm modelling, forecast for wind farm operation and marine operations. One of the fundamental topics in which the group is at the forefront is the interaction of sea state and atmospheric boundary layer. Another strength could be the model reduction approach, which has the potential to contribute to the core subject of reducing energy costs. It forms a link between time consuming but hardly affordable CFD calculations and engineering models that don't capture the flow field of a large offshore wind farm with the necessary accuracy. Validation of the approach is crucial and has already begun in the joint workshop/benchmarking with NOWITECH, which has taken place in 2010.

In terms of establishing an overall collaboration the topic of wind farm modelling forms a bridge between the work packages. In the future WP2 should more than until now concentrate on model validation, supported by the field tests of WP1. The reduced model should also be tested against real wind farm measurements.

The model should be considered to form a software tool, which could be made available to the worldwide scientific community, including documentation. This could also lead more attention to the work of the NORCOWE group.

WP3 includes a variety of important engineering aspects, such as wind farm operation, control and maintenance, associated marine operations. More than the other WPs it is spread over several locations, i.e. Aalborg, Grimstad and Stavanger. While the importance of the addressed topics is clearly seen and also crucial for the overall goal of supporting cost reduction, there is some concern that the subjects are too spread over the whole area and no "light house" topic is visible that puts the work to the forefront of the scientific community.

Some topics need the link to an actual farm project to prove their applicability and benefit. The connection to the on-going offshore industry should be strengthened.

Environmentally friendly design has not been addressed so far but could be important to improve the access of Norwegian technology on an international market. With the lack of an own working package that considers environmental studies, this information should be taken into the project from research results of European neighbour states. An example is the minimising of pile driving noise during the installation process or the noise reduction that could achieved by an optimised operation strategy that minimises the presence of maintenance vessels.

3. Internationalisation

With a Danish university as a member and with many students and staff from several countries, NORCOWE is in itself international. In addition the Centre has actively pursued building up an international network. Formal MoUs were signed with Fraunhofer IWES, NREL and DTU Wind, which are three leading European and American institutions. The participation at international conferences is also remarkably high. A particular link seems to have been built up with German Institutions in Bremerhaven, Oldenburg and Hannover and two bilateral workshops have been organized. Staff exchange has been with Institutions in the US, Netherlands for short duration and with Sweden for seven months.

The Centre participates in some international working groups but it was not yet very successful in acquiring financial support in EU or other international projects. This should be pursued with more ambition.

A few partners have their own strong networks and are very visible internationally. It would be beneficial, if their affiliation with NORCOWE were more apparent.

4. Researcher training, engagement in education

The Centre can be commended for an excellent training of the doctoral students. These emphasized that the summer school in particular is very supportive, and they feel very positive about the interaction among themselves. Some feel that they are already at the limit and further obligations for socialisation activities are out of their time capacity.

Being part of NORCOWE and the host institution at the same time seems at least for some of the students lead to a double charge, for instance reporting has to be done for both parts. It should be considered if reporting can be harmonised and therefore be less time consuming.

The possibilities for Centre PhD student to get access to industrial know-how are commendable. On the other hand there appears to be less mobility and interaction from industry into the research environments. The Centre should strive to increase this mobility in the future.

5. Plans for final three-year period

It is recognised that the Centre already made very detailed plans for the near future. With the time scale that is usually necessary to establish a working network in such widely spread area (measurements have to be designed, purchased and installed, access to wind farms has to be made possible) it is assumed that the continuation of the work for the next three-year phase can harvest the efforts of the first period.

While the overall track is good for the future planning the recommendations made in this report should be included in the working plans.

6. Organisation and Management of the Centre

Although the Centre has been active for less than four years it has already created considerable international visibility. In this respect the Centre is well on its way to receiving identity and recognition. Awareness of the Centre among potential user partners and in the on-going Norwegian debate on offshore wind power has been increased, for example through cooperation with the industrial cluster Arena NOW, but needs to be further developed in order to increase attractiveness of the Centre to potential user partners and national recognition of its research results.

The Centre has recently been reorganised by reducing the number of work packages. The new organisation has created conditions for efficient management, well supported by the Board, as well as internal and external scientific committees. The Committee for Innovation and Commercialization (CIC) has not been active for the last eight months.

Communication within the Centre works well in spite of the location of research on four different sites that are geographically quite distant from one another. This has been achieved through work package meetings, workshops, summer schools, e-room and video conferences. From the interview with the PhD students the panel concludes that although the contacts between these are extensive there seems to be some need for further developing a “culture of cooperation” and a true feeling of belonging to a NORCOWE community.

The information material produced by the Centre is excellent. In particular, the panel wishes to commend the quality of the annual reports and the attention paid to the PhD students in these.

CMR has a long tradition of cooperation with UiB that is also reflected in the way the Centre operates. The task of the internal scientific committee is to develop education and it is evident that the Centre has contributed substantially to PhD education at the participating universities and also to MSc courses at UiB. An important contribution to education is also that Statoil has made a senior scientist available for a Professor II position in offshore wind power.

7. User partners and other innovation aspects

Offshore wind technology is a new market. Today, the commercial driving forces to develop it in Norway are limited, but in a longer time perspective there is a clear need for scientific research into the several technical challenges to be solved. A substantial part of Centre research addresses fundamental understanding of phenomena connected to offshore wind power, while the user partners in NORCOWE are in the start-up phase to articulate the needs.

Until now there is limited evidence in the industry of technology transfers and other innovations coming from the Centre. The Centre has suffered from this fact in terms of lowered user partner engagement, evidently also connected to times of economic recession. The fact that several partners have left the Centre makes it even harder for the Centre to utilize the full potential of its research environment.

On the other hand, strong commitment from current industrial partners in the Centre activity was demonstrated at the evaluation. Even taking this into account the panel thinks that the Centre management and board can increase their efforts to get new industries into the Centre. It should be possible to involve both industrial and research partners in the efforts, to which the board and management of CMR and the Universities should give further strategic support and involvement. The efforts will also be of great strategic importance for the sustainment of NORCOWE activities after eight years

The panel commends the Centre for documentation of possible innovations, but also submits that awareness of these possibilities can be further enhanced both inside and outside the centre.

The Centre self-evaluation document is an important resource for further analysis. There are several good insights and suggestions that need to be further discussed among all partners in the Centre to get a good basis for the future development of the Centre and the involvement of its user partners. The panel encourages the Centre to start a structured dialog on this topic among all partners.

8. Gender aspects

The awareness in the Centre of gender issues is appropriate. However, this is an issue that still needs serious attention on all levels. It is important to have strategies, resources, gender knowledge and clear goals in place to improve the situation.

9. Financial aspects

During the site visit it became clear that not all types of in kind contributions where explicitly or even fully reported in the documentation. These contributions are of great importance and value as they act as indicators of the total extent of industrial and research commitment and relevance. They also give evidence of the knowledge/technology transfer to and from industry. Reporting the full value of in kind contributions will probably also be instrumental in improving Centre attractiveness to new partners by demonstrating how useful the Centre has been to its partners.

10. Future activities

Some discussions have apparently already been conducted with regard to the best way to develop NORCOWE in the future. The suggestions described in the project description for the final three-year period are adequate. To ensure continuation it will probably be of great importance to ensure that the user partners represent the whole value chain encompassed by the NORCOWE research programme. This implies an additional incentive to put strong emphasis on recruiting new user partners.

11. Conclusion and recommendations to the centre

NORCOWE has developed a scientifically highly valuable and productive research program well on its way to receive international recognition and covering an important value chain related to offshore wind power. Communication between CMR and the geographically separated research partners is remarkably good and students at different locations were strongly supportive of the Centre. The low number of user partners is a matter of concern; the Centre is well aware of this and taking measures to resolve the situation.

The panel submits the following recommendations:

1) The Centre should endeavour to increase the public availability of field data gathered through the research projects.
2) The Centre should further focus the research projects in WP3.
3) The Centre should try to prove the potential of wind energy cost reduction within applicable projects.
4) The Centre should continue its efforts to achieve stronger international recognition and European projects as a matter of high priority.
5) The Centre should endeavour to further develop the culture of cooperation and feeling among students and researchers of belonging to a NORCOWE community.
6) The Centre should continue the efforts to make its corporate identity more visible to potential user partners and the general public.
7) The Centre should urgently increase the efforts to attract additional partners to the Centre.
8) The Centre should report all in kind contributions to the Centre work. It is important to show the total value of the Centre to gain more attractiveness and attention in Norway and internationally.
9) The Centre should, in spite of having functioned for only three years, already now take specific measures to realize the ambitions described in the work plan to continue after the end of the RCN financing period.

6. NOWITECH, Norwegian Research Centre for Offshore Wind Technology

Host institution: SINTEF Energy Research

1. Introduction

On March 6, 2013, the evaluation panel met with the Director, project leaders, doctoral students, representatives of the host institution and representatives of the industrial and research partners of NOWITECH. In the morning, the discussions centred on the research at NOWITECH. In the afternoon there was a meeting with doctoral students as well as discussions on management and organisation of NOWITECH. This evaluation is based on these interviews as well as on the extensive written reports and self-assessments supplied to us beforehand. The panel thanks the whole NOWITECH team for a well-organised meeting as well as open and informative discussions.

2. Research activities

The scientific goals of the Centre were well defined from the start and they did not have to be changed significantly. Most of them have a long-term perspective. This gives the Centre a clear profile and the working packages are chosen to support this. The size of the Centre seems to be appropriate. The research program includes challenging theoretical model developments as well as demanding experimental studies. Some of the experimental activities are designed to provide data for model validation; other activities are independent research. Offshore wind energy can only become successful if significant cost reduction can be achieved. NOWITECH sees this as the key to the success of its research.

The research work is of highest international standard. The number of publications has increased significantly from year to year and has reached a remarkable level, including numerous refereed articles. For the future one would expect an increasing number of journal publications with a more lasting impact than conference papers.

In less than four years the Centre has become a well-recognized member of the scientific community, seen as being in the front with regard to deep water wind technology, in particular floating systems. This is a remarkable achievement. However, the scope of the work is even wider and includes topics like grid connection, superconducting generators and others. Several of these topics are also relevant for near-shore or even on-shore wind energy, and there is a temptation to put increasing emphasis on near-shore topics. Though at present this might warrant more commercial interest, the centre is well advised to pursue its profile as a centre for deep water installations. This feature makes it unique and it accounts for a long-term perspective. The commercial interest in deep water wind energy is already starting to increase and worldwide it will be the topic of the future.

All topics are all well represented in the extensive list of publications.

One sign of international success is that NOWITECH participates in eleven EU projects related to offshore wind.

The Centre is well aware of the need for model validation and has looked actively for relevant data. Still, the emphasis on validation could be stronger. In particular, the NOWERI facility could be further ahead than it is. The panel regrets that in this facility, which was jointly applied for by

NOWITECH and NORCOWE, will in principle be two separate facilities; the wind data for NOWITECH will now be measured using a Lidar mounted on top of the nacelle. The panel questions whether this will provide the same accuracy.

The panel finds the current work on a 10 MW reference turbine on a lattice tower laudable. NOWITECH is encouraged to use this reference turbine in the corresponding approach for a floating support structure analysis.

Because of the adverse economic situation NOWITECH lost some industrial partners and with them also scientific and technical competence. The panel recognizes that NOWITECH seriously attempts to fill the gap, especially by finding wind turbine manufacturers that wish to become a user partner.

3. Internationalisation

NOWITECH has become an internationally recognised organisation for research on offshore wind power, with relevant participation in several European and international entities, such as EERA, TPWind, EAWE, IEAWind and IEC TC88.

The Centre is well connected with some of the more relevant international research centres active in offshore wind research. Thus, NREL, MIT, Fraunhofer IWES, DTU and ECN are associated partners participating in the Scientific Committee.

The annual offshore wind R&D conference arranged by the Centre in Trondheim has become an international event. DeepWind'2012 had about 200 delegates from 14 countries, mainly Europe, but also from USA, China, Singapore and Japan.

The participation of foreign PhD-students and postdocs in NOWITECH is an important achievement. The Scientific Committee has organised a mobility programme with funds for travel and housing that has been applied mainly for visits of associated research partners.

4. Researcher training, engagement in education

An excellent scientific programme has been established between SINTEF, IFE and NTNU with 54 PhD & post doc students, 64 peer-reviewed publications, 67 conference papers and 19 invited keynotes. The work of the PhD students and postdocs is a well-integrated part of the work packages.

According to the self-evaluations and information supplied by the PhD-students, education on wind energy has been enhanced at NTNU through NOWITECH. Some of the PhD-students have extended their three-year program into four years by assisting in education of MSc students. During the meeting with the panel the students expressed their satisfaction with opportunities offered by NOWITECH to exchange information with their fellow students through participation in the regular meetings of the work packages and in specific workshops.

It should be emphasized that the doctoral students felt that supervision of their work is good and that they are integrated in both NOWITECH and their university departments. However, only a few of the students had spent some time or even visited user partners.

5. Plans for final three-year period

The ambitious plan presented for the final thee-year period is a well-defined and consistent continuation of the current work. Milestones and deliverables are well presented and seem to be realistic.

The well-established team and the extended infrastructure give promise of significant achievements, even more so than during the past years.

6. Organisation and Management of the Centre

The Centre has developed into a highly visible research organisation with broad international contacts and international research partners. The comprehensive research platform on offshore wind power in deep water is internationally unique and contributes essentially to the identity and international recognition of NOWITECH.

The Centre is well organized and led by a highly competent and deeply engaged Director, supported by an efficient management group. The majority of the Board members come from user partners. The Board participates actively in the attempts to increase the number of Centre partners. Board and management closely monitor and discuss the progress and directions of the research programme. This activity is supported by utilization of the TRL method. The management is open to taking up new ideas that do not fall immediately within the research plans, but only very limited resources are allocated for exploratory research.

Interaction between the host and the research partners appears to be smooth and seamless, with WP leaders recruited from SINTEF ER, NTNU and IFE and researchers from the three institutions working together in the research projects. The panel notes, however, that representatives from University leadership were not present at the evaluation

NOWITECH is essential to the research on offshore wind at SINTEF ER and has consolidated its research and international visibility in this area. At NTNU, NOWITECH is an integral part of the strategic research agenda and has strengthened offshore wind research, which is one of the focus areas at the Faculty of Engineering Science and Technology. The creation of NOWITECH has fostered increased visibility of offshore wind research also at the university.

7. User partners and other innovation aspects

Offshore wind technology in deep water is a new market and today the commercial driving forces to develop it are limited. The time estimate for the market to mature is 10-20 years. There are several technical and scientific challenges to be solved. With this given, the user partners in NOWITECH find it difficult to articulate immediate needs or applications, and the research is more directed towards fundamental science in several topics connected to large-scale deep water wind power. Until now there is limited evidence of technology transfer into industry and innovations coming from the Centre. The Centre risks suffering from this fact in terms of lowered user partner engagement, in particular in times of economic recession. On the other hand, industrial partners present during the evaluation meeting demonstrated intensive commitment to Centre activities.

It is evident that global economy has influenced the possibility for some industries to maintain their support of this kind of important environment. The panel commends the Centre management for the efforts to get new industries into the Centre. It will be a good investment for the future to increase these efforts, in which it should be possible to involve both industrial and research

partners. The panel submits that the board and the management of both SINTEF ER and NTNU could give further support to these efforts.

8. Gender aspects

The Centre does not score well with respect to gender balance. The absence of a strategy and concerted actions to overcome this problem was obvious. The panel believes that the Centre can raise awareness, increase knowledge, prioritize concrete actions and set clear achievable goals to change this situation.

9. Financial aspects

During the site visit it became clear that in kind contributions from industry were not explicitly or even fully reported in the self-evaluation document. These contributions are of great importance and value as they act as indicators of the total extent of industrial commitment and give evidence of the knowledge/technology transfer to and from industry. Reporting the full value of in kind contributions will probably also be instrumental in improving Centre attractiveness to new partners by demonstrating how useful the Centre has been to its partners.

10. Future activities

We commend the Centre for having already actively started the development of plans to meet the challenge to continue after the 8 year financing from RCN comes to an end. We believe that maintaining and utilising the full power of continued offshore wind research in Norway should involve also other FME and other R&D environments.

11. Conclusion and recommendations to the Centre

NOWITECH has progressed well towards becoming an internationally recognised organisation for research on deep sea wind power, with a uniquely comprehensive research agenda on this topic. The Centre is a well-managed unit in which communication and exchange of experience between all partners seem to run smoothly. A need to increase the number of user partners is evident. The Centre should pay more attention to the gender balance at all levels.

The panel submits the following recommendations:

1) The Centre should strive to accelerate the installation of the NOWERI facility so that field data for model validation can be obtained at the earliest possible date.
2) The Centre should endeavour to increase the international mobility of scientists in a structured way.
3) The Centre should substantially increase mutual mobility between user partners and scientific partners.
4) The Centre should set aside a limited amount of funds specifically allocated to exploratory research on new and high-risk topics.
5) The Centre should as a matter of urgency continue their efforts to attract additional user members to the Centre.
6) The Centre should as a matter of urgency strive to increase gender awareness and the number of women engaged in Centre activities at all levels.
7) The Centre should make the total in kind contributions from user partners more visible in their financial report.

7. SUCCESS, Subsurface CO2 Storage – Critical Elements and Superior Strategy

Host: Christian Michelsen Research AS

1. Introduction

On March 13, 2013, the evaluation team met with the Director, project leaders, PhD students, Post Docs, representatives of the host institution and representatives of the industrial and public partners of SUCCESS. In the morning, the discussions centred on the research at SUCCESS. In the afternoon there was a meeting with students and postdocs as well as discussions on management and organisation of SUCCESS. This evaluation is based on these interviews as well as on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole SUCCESS team for a well-organised meeting as well as open and informative discussions.

2. Research activities

The Centre has successfully and in a laudably short time gathered the competence and critical size required to conduct the research work needed to achieve the main objectives and associated sub-objective. The results disseminated through scientific publications and international conferences show that the overall quality of the research performed by the Centre is excellent and of high international calibre. The team has been able to focus on the main knowledge gaps related to geological storage of CO2 and take advantage of the existence of Norwegian pilot and demonstration storage projects.

On the other hand, it was not made completely clear to the review panel how the work-package activities are linked to the objectives described in the work plans. The Centre should make sure that all sub-objectives are sufficiently covered by the work done in the work packages. Each work package can be given main responsibility for some of the sub-objectives. Research results should be more distinctly assessed with the objectives given in the project description and work plans in mind.

The Centre has made strong efforts to link the research to external CO_2 storage projects. This enables the Centre to identify challenging and application oriented research tasks that are asked for by industry partners. The Centre is encouraged to continue these efforts and make use of the opportunities to further strengthen the integration of work between the individual work packages.

The dissemination through scientific publications and international conferences is working very well, but it is not clearly shown that the reported publications primarily originate from the SUCCESS research work.

The panel recommends that the Centre evaluate the research results and the overall quality of the research carried out by the Centre by performing a benchmarking exercise in which its achievements are compared with results of research groups and entities active in similar fields of research worldwide.

3. Internationalisation

So far, the international research cooperation has mostly been based on connections and relationships of individual partners rather than of the Centre as a whole. Cooperation activities have occurred with several international institutions and centres from leading countries in CCS

research (USA, UK, France, Germany, Spain), but the potential of the Centre in this respect has not been fully exploited. There are apparently no formal agreements between SUCCESS and international research partners yet. This leaves considerable room for improvement in future stages of the project.

The Centre has coordinated and participated in several international workshops and the researchers have presented their results at leading international conferences. Publications in renowned international scientific journals are reported as well.

The visibility of SUCCESS on the European research scene should be improved. Even if a few partners are involved in EU projects (ECO2, CO2Base), there is definitely a big potential of using the research competence of the Centre to become more involved on the European level. Possibilities of interaction and liaison with European research entities and initiatives like, e.g., the European Energy Research Alliance (EERA) or the CO2GeoNet Asscociation should be explored. This would be strongly connected with efforts to obtain future funding from European funding schemes like the Horizon 2020 programme.

Engagement of foreign senior researchers has been limited to one visiting professor from the U.S. at UiO and a joint supervision of three PhD students with Universities of Stuttgart and Durham. On the other hand, the panel highly appreciates the participation of leading international research personalities in the Scientific Advisory Committee. People from outside Norway prevail among PhD students and postdocs, which creates a really international environment.

4. Researcher training, engagement in education

Achievements of the Centre in the area of researcher training, engagement and education are excellent. Indeed, the Centre has organized a separate WP on education. The figures of 2012 show that 10 Master students, 26 PhD students and eight post docs are engaged. This is impressive, even though one has to take into account that these figures include not only the SUCCESS centre itself but also all the associated research projects. So far, all the PhD positions have been funded by public money. It would be desirable to complement this by a few industrial PhD positions allowing the students to do their research, partly or completely, at the industrial partners' facilities.

The international dimension of the PhD programme in the Centre has been rather weak so far. This should be improved, e.g. by preparing and executing an exchange programme with international partners.

There have been activities focused on interaction among the students working in various work packages and at various locations, which definitely strengthens the fellow feeling between them and their relationship to the Centre. These activities should be further developed by, e.g., organising special workshops on topics that are common for all the students participating in SUCCESS, such as project management or the CCS value chain and its importance for climate change mitigation.

5. Plans for final three-year period

The Final three-year period is 18 months into the future. The Centre can thus not be expected to have the project description for the final work fully in place. It is declared that the existing objectives on fundamental research are readjusted to objectives that better support large-scale deployment. The Centre plans to reduce the number of WPs from the present seven to five. It is expected that the European CCS-directive will be implemented in Norwegian law. Thereby the four non-binding guidance documents that support coherent implementation of the CCS Directive across EU are also of concern in relation to large-scale storage projects on the Norwegian

continental shelf. Project developers need to be able to define Storage Complex for sites and their associated Monitoring Plans, and as well outline Corrective Measures and Contingency Plans.

6. Organisation and Management of the Centre

The Centre has focused on both offshore and onshore storage of CO_2 and has reached international visibility and identity as a Centre that conducts uniquely comprehensive research of world-class quality on this topic. The Centre is led by a visionary and highly dedicated Director, with support by two scientific leaders and an efficient administration, in addition to the WP leaders. The majority of the Board members come from user partners, including the Chairman. The user partners present at the evaluation voiced strong support of the long-term value of the fundamental research conducted at the Centre to users.

Centre research is located at several different and geographically quite distantly separated locations. Research and education is spread out over seven work packages. The Centre considers this as a weakness. Strong efforts have been made to create close connections and integration between the different research groups through seminars, focus on field pilots, common datasets, and an e-room. Of special interest is the launching of an advanced virtual laboratory that would involve state-of-the art visualization techniques and common access to relevant databases and would be accessible to partners in Oslo and Bergen.

From the interviews the panel concludes that those working within the Centre put high value on the broad access to different expertise and research directions in the Centre, but that there is still room for improvement with regard to the integration between work packages and the feeling of everyone working for a common purpose.

The host institution, CMR, contributes mainly with leadership, administration and access to advanced instrumentation and measurements. Cooperation between the host and the partner universities in terms of both research and administration seems to work smoothly. The Centre clearly has strongly improved interaction, awareness of research activities and cooperation in projects between the groups at UiO and UiB and UNiS.

7. User partners and other innovation aspects

The Centre has some strategic user partners. They show great interest in getting access to the broad knowledge capacity by being part of the SUCCESS. Due to the fundamental nature of the research and the absence of a mature market for CCS it is challenging to involve user partner through in kind contributions to the research projects. Hence, there is a clear need to fill the gap between research and innovation. There is a strong challenge to render the research projects more attractive to the user partners and the partners more interested in becoming directly involved in the projects. The panel is convinced that the Centre, together with user partners, has the capacity to find ways to overcome this weakness.

It will be an important investment for the future to increase the efforts to attract more partners to the Centre. It should be possible to involve both industrial and research partners in these efforts. Direct involvements of user partners in the research work and more interaction in the Centre can be used as an incentive to attract new partners. The panel submits that the board and the management could give further support to these efforts.

The Centre self-evaluation document is an important resource for further analysis by all partners in the Centre. There are several good insights and suggestions that need to be further discussed among the partners to get good basis for the future development of the Centre and the involvement of its user partners. The panel encourages the Centre to start a structured dialog on this topic among all partners.

8. Gender aspects

The awareness in the Centre of gender issues is appropriate. However, this is an issue that still need serious attention on all levels. It is important to have strategies, resources, gender knowledge and clear goals in place to improve the situation, especially on the senior levels.

9. Financial aspects

The Centre is commended on reporting the in kind contributions in a structured way. During the site visit it also became clear that not all types of in kind contributions where explicitly or even fully reported in the self-evaluation document. These contributions are of great importance and value as they act as indicators of the total extent of industrial commitment and relevance. They also give evidence of the knowledge/technology transfer to and from industry. Reporting the full value of in kind contributions will probably also be instrumental in improving Centre attractiveness to new partners by demonstrating how useful the Centre has been to its partners. It is important to show the total value of the Centre to gain more attractiveness and attention in Norway and internationally.

10. Future activities

The Centre has been running for only three years. As the number of user partners is low, while the number of research partners is high, the panel encourages the Centre to at an early stage initiate planning for activities after the eight year financing by RCN. The Centre should also consider bringing stakeholders outside the Centre together to muster scientific expertise and the industrial needs for future activities in Norway.

11. Conclusion and recommendations to the centre

SUCCESS has been running for only three years but already has established an impressive research organisation with active and coordinated research at several geographically different locations. The scientific achievements are impressive. The Centre needs to improve their understanding of how these achievements can be implemented in innovations and should, to this end, increase the number of user partners and plan for activities beyond the eight-year RCN financing period. Efforts are also needed to further improve the integration of the many diverse work packages, with focus on achieving the objectives set out when SUCCESS was started.

The panel submits the following recommendations:

1) The Centre should implement a system for checking to what extent the research result actually contribute to achieving the objectives as stated in the SUCCESS project description.
2) The Centre should benchmark research results relative to similar research in leading research environments internationally.
3) The Centre should strive to increase their visibility and cooperation with European initiatives such as EERA, CO2GeoNet, etc.
4) The Centre should increase its efforts to obtain funding from European funding schemes such as Horizon2020.
5) The Centre should require authors to acknowledge the SUCCESS Centre for funding their work in all external publications, and to map the deliverables towards SUCCESS and associated KMB projects.

6) The Centre should increase the efforts to organise a student exchange program with international partners.

7) The Centre should strive to strengthen the interaction of all PhD students associated with the Centre by arranging workshops on topics of common interest to all researchers, like, e.g., project management, the whole CCS value chain, etc.

8) The Centre should aim at creating at least two industrial PhD positions.

9) The Centre should allocate more resources to fostering Centre building activities.

10) The Centre is encouraged to assess to what extent stipulations in EC guidance documents supporting the implementation of the CCS Directive leads to deployment related research efforts, and take the results into account when readjusting the scope of the Centre.

11) The Centre should continue the efforts to use external storage projects as a means to link the research within different WPs to deployment related issues.

12) The Centre should complement the plans for the last three-year period with a strategy and road map for the continuation of Centre activities after the eight-year financing by NRC.

13) The Centre is encouraged to continue the improvements of the integration between WPs.

14) The Centre should report all in kind contributions to the Centre work.

15) The Centre should improve the user partner/researcher interaction so that the potential of research results to yield innovation is better understood and direct involvement of user partners in the research project is encouraged

16) The Centre should urgently increase their efforts to get new user partners.

8. Solar United, the Norwegian Research Centre for Solar Cell Technology

Host: Institute for Energy Technology

1. Introduction

On March 21, 2013, the evaluation team met with the Director, project leaders, PhD students, Post Docs, representatives of the host institution and representatives of the industrial and public partners of Solar United. In the morning, the discussions centred on the research at the Centre. In the afternoon there was a meeting with students and postdocs as well as discussions on management and organisation of the Centre. This evaluation is based on these interviews as well as on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole Solar United team for a well-organised meeting as well as open and informative discussions.

2. Research activities

WP1, WP2 and WP5 are clearly the strength of the Solar United Centre. Crystallisation of mc- and Cz-Si, its simulation with the software "SiSim" developed in house, and detailed characterisation by various dedicated techniques is the main competence of the Solar United consortium. The Centre has developed a detailed knowledge and understanding of possible defects formed during and after crystallisation. This resulted in the fabrication of crystals with highest quality using p- but also n-type material.

WP3, however, is a bit disconnected, as there is a lack of a clear commitment of an industrial partner in solar cell exploitation. REC was the partner in this WP who could benefit the most from the achieved results, but was the only remaining industrial partner not to join the evaluation assessment. The solar cell efficiencies from the established baseline up to now were communicated to be 18% on Cz-Si solar cells, which is acceptable for standard devices. This baseline is good enough to test e.g. SoG-Si material from Elkem regarding its quality and usage in standard solar cell lines. However, to be competitive in solar cell R&D, efficiencies for improved concepts on Cz-Si material (p- or n-type) should already today approach 20%. The plan is to achieve this in 2017 only.

WP4 presents a variety of possibilities for improvement for solar cell efficiencies on c-Si material with some good reported results. However it does not show a clear focus, which would be needed for high quality research in this field with a limited number of researchers.

In the project description, the Centre was to provide the materials and cell production industry with fundamental knowledge along the entire value chain. This is exactly what has been pursued over the last five years. However, as the major cell manufacturer has decimated its partnership in the Centre, the Centre might want to consider refocusing its activities.

The list of publications is impressive and moving towards what was actually planned at the beginning (150). Very good publications in refereed journals are reported, as well as contributions to international material-related but also solar cell-related conferences and workshops.

3. Internationalization

All partner research institutions as such are well known international players with good reputation. However the Solar United Centre is, to the evaluation team's best knowledge, not yet clearly visible internationally.

At the academic level there is international cooperation, e.g. with prestigious institutes in Japan (Tohoku U.) and USA (MIT). The Centre has generated participation in a number of FP7 EU projects and is participating in networks such as Sophia and EERA. Participation in international R&D is good, though bilateral collaborations with foreign companies outside the Centre should be developed.

The Centre has been able to attract a large fraction of foreign PhD students and postdocs. Also staff researchers often originate from foreign countries. The job advertisements are attracting a huge number of candidates.

The Scientific Advisory Board (SAB) has been installed only recently and has had one meeting with work package leaders and the management. The SAB could also be utilized for advice and discussions with Postdoc and PhD students.

4. Researcher training, engagement in education

The Centre attracts bright PhD candidates and postdocs, both nationally and internationally. In addition, a large number of Master students is working on their MSc thesis projects. There are a number of relevant and focused courses that the students can choose from. It is very positive that these courses also attract industrial researchers who can benefit from the knowledge base. The PhD candidates and postdocs receive training in a broad scope of characterization techniques. The interaction between PhDs 'along the value chain' could be improved. The panel also observed that the students perceive that each PhD project is quite isolated within the Centre. On the other hand they highly value the networking events (conferences, workshops…).

The Centre engages effectively in educational efforts and in this way fulfils the popular demand for training in solar cell technology. The courses offered are embedded in the Physics and Chemistry disciplines of the Universities. The quality of the training and education is considered good. International mobility of students for interaction with collaborating laboratories should be more encouraged.

5. Plans for final three-year period

The progress plan up to 2017 does not show ambitious goals. The development of SiSim v2.0 along with a user manual for external use/licensing in 2014 is a strong activity. However, the milestone in 2017 of a 20% efficient crystalline cell from the baseline process is too modest. If the Centre wants to be attractive to Si feedstock manufacturers to qualify their material or if it wants to provide a baseline for equipment manufacturers to test their processes, then a 20% baseline should already be offered right now and the objective in 2017 should be well beyond 20%.

Further, all but one deliverable is only due in the final year of the Centre, which rules out any intermediate steering. The goals for the activities in WP4 could be defined in a more quantitative way. On the other hand, the Centre is already developing project applications in Horizon2020 and has new contacts internationally that can stimulate this.

If the industrial participation stays at the present reduced level, the Centre may not be able to fully utilise the funding from the Research Council, which would mean also a reduction of future

activities with respect to the original plans. In that case, a sound selection should be made that helps to maintain critical mass in specific areas rather than spreading it too thin.

6. Organization and Management of the Centre

A dynamic and intensely engaged Director leads the Centre with support by a management team consisting of the Centre coordinator and the five WP leaders, all of them also strongly committed to the Centre. Administratively, the Centre is run as a department within the host institution, IFE, and administrative matters are taken care of by IFE. It is obvious that management has been successful and has fostered true cooperation and generally efficient communication within the Centre. Thus, there was unanimous and convincing evidence that Centre has been instrumental in improving interaction between the four research partners in a decisive way. The WP leaders represent all of the four research partners, which is very commendable and indicative of the synergy achieved by joining forces in the Centre. Some concern was expressed with regard to the extent of direct communication between students and postdocs in the different work packages.

The ways of evaluating and supporting new ideas are also well defined. Decisions to take up new ideas that require re-allocation of resources are taken by the Board, but no special funds have been reserved for exploratory research that would fall outside the defined work plans.

The Board members from user partners present at the evaluation voiced strong support of the Centre policy to focus strongly on pre-competitive research. They also were ready to accept engagement of partners with competing business goals as a way to enhance the planning and evaluation of the research programme by the Board. The panel submits that the Board could increase its support of the management in the efforts to engage new user partners.

The international visibility of the Centre is promoted by scientific publications, extensive participation in international conferences and considerable engagement in European research projects. The Centre has also endeavoured to disseminate knowledge about solar cells and results to the general public and has been active in public debates.

Research on solar cells at IFE, SINTEF, UiO and NTNU has been strengthened in a way that would not have been possible without the Centre. This is visible not only in research results and the recruitment of PhD students and Post Docs, but also in a considerable number of MSc theses (mainly at NTNU) and specialized courses on solar cell technology.

7. User partners and other innovation aspects

The Centre has been severely affected by the global turbulence in the solar industry sector. The excess solar cell production capacity, leading to unhealthily low prices (below actual production costs) makes relevant industries go out of business. Due to this economic downturn, also newly arising local companies do not have sufficient resources to contribute to the Centre.

Nevertheless, the panel strongly encourages the Centre and its current partners to put more effort in affiliating new strategic partners with main interests in WP1, WP2, WP3 and WP 5. In this context it would be useful to attract international user partners with the already existing core competence (crystallization, modelling, characterization). This would sharpen the industrial view on the R&D work and increase the equity contribution. In addition to this the Centre should urgently append a cell or machine manufacturer or, if this is not possible, engage other research partners and modify the overall goals of WP3 accordingly. The Centre management should get support from the highest management from all research partners and user partners as a matter of urgency to execute this process. This process can be seen as a strategic tool to capture the essence of activities beyond year eight.

During the site visit it became clear to the panel that the Centre activities have given rise to a considerable number of indirect results (patents, innovations, projects with individual user members). The panel encourages the Centre to display this evidence of activities as a tool to increase the true value of the Centre. This activity might also be instrumental in increasing the attraction of new partners.

Parts of the self-evaluation from industries and partners can be considered as a valuable input to strategic discussions of how to prioritize the Centres activities. It is important that all partners are involved in those discussions.

8. Gender aspects

Even if there were arguments and some evidence of good gender balance, the Centre does not score high on gender equality perspectives. The Centre is encouraged to take concrete actions within this issue. One example is to invite a gender advisor to suggest a practical methodology that can be used to improve the situation in the long term.

9. Financial aspects

The Centre is commended on its reporting of in kind contributions from user partners. However, there was some evidence that not all in kind contributions were reported. The Centre is encouraged to improve the reporting to increase the overall value of the Centre.

10. Future activities

The Centre is well aware of the efforts needed to ensure appropriate continuation after 8 years and is taking this issue into account in the planning of future activities. The panel submits that the Centre could take the initiative to a broad discussion of the future of solar cell activities in Norway. The Norwegian solar cell conference can be a good meeting place for such discussions. Part of this discussion should aim at creating a road map for sustaining the activities originating from the Centre after year eight.

11. Conclusion and recommendations to the Centre

The creation of Solar United has strongly enhanced cooperation, communication and utilization of research equipment between the four main Norwegian groups of scientists (at IFE, SINTEF, UiO, NTNU) presently engaged in research on solar cells. Scientifically, the research programme is very productive and essentially pre-competitive. However, it has given rise to several projects based on innovations and patents that are not directly visible as parts of the Centre research. The most important tasks of the Centre is presently to engage new user partners to ensure continuation of the research programme without having to reduce the research programme during the last three years as well as continuation of essential parts of the research thereafter.

The panel submits the following recommendations:

1) The Centre should develop clear road maps for the research in WP3 and WP4 in order to facilitate a sharper focusing of research on selected solar cell concepts within these packages.
2) The Centre should strive to reach more international attention through the elaboration of its R&D strengths and with this portfolio act more as a centre and not as the single partner institutions.
3) The Centre should endeavour to attract new international companies with core competence in crystallization, modelling and characterization.

4) The Board, Centre Director, WP leaders and senior scientists should engage more intensely in joint efforts to engage new user partners.
5) The Centre should urgently append a cell or machine manufacturer or, if this is not possible, engage other research partners and modify the overall goals of WP3 accordingly.
6) The Centre should, in order to make the Centre more attractive to potential user partners, explicitly document indirect results from the Centre's activities, such as patent applications, bilateral projects, international cooperation, mobility etc.

9. ZEB, the Research Centre on Zero Emission Buildings

Host institution: Faculty of Architecture and Fine Art, NTNU

1. Introduction

On March 4, 2013, the evaluation team met with the Director, project leaders, doctoral students, post docs, representatives of the host institution, NTNU and representatives of the research and industrial partners of ZEB. In the morning, the discussions centred on the research at ZEB. In the afternoon there was a meeting with students as well as discussions on management and organisation of ZEB. This evaluation is based on these interviews as well as on the extensive reports and self-assessments supplied to us beforehand. We thank the whole ZEB team for a well-organised meeting as well as open and informative discussions.

2. Research activities

The research focus is very relevant and with the right timing. It reflects the needs of both society and of the building sector. This is documented by the strong interest and engagement from most of the user partners. The multidisciplinary research profile of the Centre is unique in the world and the size of the Centre and the on-going activities have the potential to enhance the knowledge, competence and innovation level of the Norwegian building sector considerably, a process that has already started.

However, multidisciplinary research is a very fragile competence that requires continuing attention to ensure achievement of the full potential of the research activities. It is important both internally and externally to articulate the multidisciplinary activities and to encourage cross-cooperation between work packages, research projects, PhD students and user partners. On the other hand multidisciplinary research involves the risk of loosing the research focus that is important in order to achieve the necessary depth and research quality. The work plan should reflect this, ensuring a carefully assessed balance between research topics and adequate allocation of resources necessary for their realization.

Publication of research results in international journals and at international conferences is important for improving research training, for benchmarking research results at an international level and, eventually, for the competitiveness of new products and solutions. It seems that there has been a high focus on publishing at international conferences during the first years and less focus on producing articles for scientific journals. To reach an international level - qualitatively as well as quantitatively - and disseminate results to a wider audience publication in peer-reviewed scientific journals is essential. Productivity in terms of the number of articles in such journals is low in relation to budget and person-years. Productivity does, however, seem to be increasing and higher than historically in the field.

3. Internationalisation

ZEB shows a high and commendable level of internationalisation through publications and conference participation, participation in projects initiated by IEA Implementing Agreements, engagement in EU-FP7 projects and proposals, and through recruitment and exchanges of staff.

The International Advisory Group is well composed in terms of representing high-level experts from different fields. In its 2012 review the group delivered valuable comments and suggestions that are well aligned with the observations made by this panel. Climatic conditions are similar and

many construction companies work across the Nordic countries, so the Centre could benefit from increasing collaboration with these countries.

4. Researcher training, engagement in education

The Centre appears to have been successful in transferring and integrating knowledge into MSc-level education through the supervision of numerous MSc-theses and the establishment of an MSc programme in Sustainable Architecture. During the meeting with the panel the PhD students described an open atmosphere and a well-functioning research environment. They found that getting attention to and subsequent handling of new ideas and important results was easy and informal.

The Centre may consider increasing their engagement in and developing continuing education programs. An increasing need for this may be expected as interest and market demand develops as expected in long-term visions for zero energy/emission buildings.

5. Plans for final three-year period

The Centre is wisely planning to focus its efforts in the final three-year period and also signals greater attention to systems and interaction of building components technologies. The Centre is also striving for stronger planning and integration across WPs and with regard to the work of PhD students.

As the program draws to an end, it also becomes important to think about comprehensive synthesis of the research results, in particular in view of the need to communicate key results and findings to a broader audience. ZEB has established itself as a leading centre in terms of technical expertise on buildings with very low or zero emissions of greenhouse gases, taking into account their production, operation and demolition. Hence the Centre may also have a responsibility to engage in public policy and debate.

6. Organisation and Management of the Centre

The Centre has a clear and transparent organisation with the roles of the different levels of organisation well defined (general assembly, board, management group, reference group, international advisory group). The role of the reference group is to ensure the dissemination of results to user partners; it is not clear to what extent this overlaps with the workshops, seminars and the obvious obligation of WPs to transfer result as efficiently as possible. The reference group could also be utilised by giving advice to the board on the relevance of new research projects to user partners. The Board and Centre management appear to work efficiently and with enthusiasm, demonstrating a clear vision of the Centre mission and the ways this should be implemented.

The multidisciplinary research agenda has been of great importance for the creation of high visibility of the Centre, not only as an internationally recognized research group, but also in connection with the policy and legislation on construction of buildings in Norway. Societal visibility and acceptance of results from Centre projects are important aspects of its mission. Considerable efforts have been made to enhance this by articles written for the general public and organisations.

In their assessments the user partners express some concern about the communication between the different work packages. On the other hand the students, in particular, were satisfied with the open and easy contacts between all those engaged in the centre. Of great importance is that the Centre has reserved special funds for evaluating new ideas and exploratory projects. The panel concludes that communication within the centre already works well and that commendably extensive efforts have been made to maintain and improve it through regular meetings, workshops

and conferences where results are reported and discussed, and plans for future research are formulated.

The Centre research agenda falls well within the thematic strategic research area Energy at NTNU. In addition to the Faculty of Architecture and Fine Art at NTNU, the faculties of Engineering Science and Technology and Humanities participate in the Centre. This has consolidated the Centre as a strong multi-disciplinary research effort at NTNU, further enhanced by the extensive cooperation with SINTEF. It is evident that this has been of great importance to the national and international visibility of the Centre, resulting in several new EU projects and extensive cooperation with research institutions abroad. The Centre has also played an important part in the development and construction of six laboratories.

7. User partners and other innovation aspects

The partners in the Centre represent most of the actors in the value chain of the building sector. The extent of involvement in the Centre varies between partners, but it is very clear that their involvement in the activities of several of the projects is intense. The number of partners is meritoriously high and the panel believes that this could be further increased in areas of strategic importance. The efforts to achieve efficient knowledge transfer to industries are commendable. Still, the panel believes that there is potential to improve the dissemination of knowledge, especially outside the core interest group of the Centre.

The internal mobility in the Centre can be improved, e.g. by longer visits by the students at industry and longer periods spent by industry R&D personnel at the Centre (laboratories, pilothouse etc.). This will increase the capacity and intensity of knowledge transfer in the Centre and probably also increase the potential recruitment of PhDs to industry.

8. Gender aspects

The gender balance at the Centre is acceptable, but the situation at management and board level could still be improved.

9. Financial aspects

The financial situation is good and the Centre is attractive to new partners. The Centre works in an attractive research area that receives public attention and into which the partners put in considerable resources, both in kind and as cash contributions. It is also commendable that the Centre receives EU funding and is active in finding more funding.

10.Future activities

The Centre has created very good conditions for a potential continuation of activities after eight years. When all planned infrastructure has been developed it will represent world class standard and open up for meeting future challenges in the building sector. The Centre presented several different strategic areas that could be developed after year eight – e.g. pilot house, research labs, EU-funding, international collaboration. The laboratories could be used for future research and there will be a need to follow up on pilots and demonstrations. As the consciously chosen strategy during the first eight years is to locate the system boundary just outside the building, it would be of interest to expand this boundary to include energy systems analysis and the building as part of a broader system. The Centre could also engage more in the field of policy and innovation systems analysis, thinking about how to implement transition to a sustainable building sector in the next few decades and policy strategies that could work in Norway. These are some examples of the

possible directions of development in which this kind of Centre could evolve, which could be analysed during the final period.

11. Conclusion and recommendations to the centre

ZEB has developed into an efficient research organisation covering all aspects of construction from materials research to planning, building and societal aspects on developing minimized or zero emission buildings. The cooperation within ZEB is unique and is well on its way in achieving national and international recognition. Full evaluation of the importance and impact of the results, in particular of the many pilot buildings under construction will not be possible within the period of co-financing of ZEB by RCN. It is of great importance that measures be taken to ensure continuation of Centre activities in this aspect.

The evaluation panel submits the following recommendations:

1) The Centre should articulate and formulate more clearly the strategy for multi- and interdisciplinary activities and how it creates added value for ZEB and Norway.
2) The Centre should include in the plans for the final three-year period a scientific synthesis of the results of the multidisciplinary research as a whole, as well as an assessment of future research needs and priorities.
3) The Centre should consider possibilities to extend in the future the research agenda to include systems analysis, transition and innovation system research, and policy analysis.
4) The Centre should give higher priority to publication of articles in scientific journals
5) The Centre should pay explicit attention to task 5.5. in the Project Description: Strategies for implementation of ZEB from pilot buildings to volume markets in the 2025-2030 perspective and beyond.
6) The efforts to increase mobility should be stepped up by student visits at user facilities for longer periods and participation of user personnel in work at Centre laboratories.
7) The role and mandate of the Reference Group should be clarified and consolidated.
8) The Centre should consider ways of contributing to stronger Nordic collaboration and integration in its research area.
9) The Centre should consider increasing their engagement in and developing continuing education programs.
10) The Centre should consider engaging in public policy debates through position papers and policy briefs.
11) The Centre should require active participation from industry partners in project generation and in implementation of projects, including activation of partners that do not presently participate in research projects.
12) The Centre should consider how to handle the expressed industry need for an independent source of knowledge and expertise to support various market actors in the transition to low/zero energy buildings (within NTNU/SINTEF or in some other form).
13) The Centre should start to make a strategic plan for how to sustain after year eight.

Appendix

Appendix 1 Terms of Reference

The Research Council of Norway
Division for Energy, Resources and the Environment

Midterm Evaluation of the Centres for Environment-friendly Energy Research (FME)

1. Framework for the evaluation

1.1 Introduction
The primary objective of the Centres for Environment-friendly Energy Research is to develop expertise and promote innovation through focus on long-term research in selected areas of environment-friendly energy and CO_2-management in close cooperation between prominent research groups at universities and research institutes and private and public users.

The Research Council uses a wide definition of innovation. In addition to new or significantly improved goods, services, processes, it includes organisational forms or marketing models that are developed to enhance value creation and/or for the benefit of society. Innovative forms of private/public interaction are also included. The FME-scheme is an important part of the national strategy – Energi21 - to promote environment-friendly energy.

The FME scheme will:

- Foster innovation among user partners within the relevant thematic priority area through increased investment in long-term research and make Norway an attractive location for international companies to establish their R&D activities;
- Stimulate active cooperation between innovative industry, public administrative bodies and prominent research organisations;
- Promote the development of application-oriented research groups which lie at the forefront of international research and which participate in dynamic international networks;
- Enhance researcher training in areas of importance for user partners and generate research-based knowledge and technology transfer.

The FME scheme features a higher level of ambition, a longer term perspective and a more intense concentration of efforts than other innovation-related instruments in the Research Council of Norway. The FME-scheme offers enterprises the opportunity to take a longer term perspective, ensure a continuum and reduce the risk associated with research initiatives.

For research-performing institutions, the FME scheme offers opportunities for long-term competence development by engaging in research of a high international standard in close collaboration with industry.

The FME scheme is administered by the Research Council of Norway, Division for Energy, Resources and the Environment and is funded by the budgets of the Ministry of Petroleum and Energy. Each of the centres may receive funding for maximum eight years; five years plus a final three year period provided a positive outcome of a midterm evaluation.

1.2 Background for the evaluation
The midterm evaluation is outlined in the document "FME Requirements and guidelines". Under the auspices of the Research Council, roughly 3 1/2 to 4 years after the centres are established;

there will be an evaluation of each centre. The evaluation will be based on a uniform scheme involving the Research Council's governing bodies. The elements to which the evaluation will devote special attention are listed in the enclosure: Success criteria for 'Centres for Environment – friendly Energy'. In particular, the evaluation will assess the scientific results the centres have achieved relative to the original project description, and consider whether the scientific results achieved and the competence accrued have helped corroborate the vision that the centre's activities will lead to innovation and value creation for the private and public partners and additional emphasis on long-term research in the participating enterprises and ventures. Further, the evaluation is to assess the plans for the centre's activities in the potential final three-year period. In addition to this evaluation, the Research Council of Norway will evaluate the administrative conditions at each centre.

1.3 Purpose of the evaluation
The evaluation will form the basis for a decision about whether to continue the individual centre for the remainder of the overall eight-year term, or to wind it up after five years. The evaluation will also give advice to the centres on aspects of their activity that should be improved.

The Executive Board of the Research Council of Norway, or a party authorised by the Executive Board, make the decision based on recommendations made by the Board for the Division for Energy, Resources and the Environment, or a party authorised by the Board for the Division for Energy, Resources and the Environment.

1.4 The evaluation team
Each Centre will be evaluated by a team of international experts. Two of the experts in the team will have the competence and the task to evaluate the Centre from a scientific point of view. Two persons in the team will have experience from similar programmes for collaboration between research institutions and industrial and public partners . These "generalist" experts will look at the Centre from a general point of view. This means that the scientific experts will participate in the evaluation of one or two specific Centres while the "generalist" experts will participate in the evaluation of several centres. Each Centre will suggest up to 5 suitable scientific experts. The Research Council will decide whom to invite.

1.5 Organisation of the evaluation
The evaluation team itself decides on the distribution of work among its members. The composition of the evaluation team will differ from day to day since the scientific experts are to evaluate specific Centres. The basic documentation, in principle the Centre report to the evaluation team, from the Centres to RCN, will be distributed by RCN to all members of the evaluation team not later than one month prior to the evaluation. The evaluation of the 8 Centres will be carried out during the period December 2012 – March 2013.
The evaluation report is due within 6 weeks after the interview sessions.

During the site visit the evaluation team should meet:
- The Centre Leader
- The Chair of the Centre Board
- Representatives from the industrial and/or public partners
- Representatives from collaborating research institutions
- host institution staff incl. representatives from the top management
- Research leaders active within the Centre
- Doctoral students.

RCN staff will be present at the site visits. The staff will act as administrators and should not take active part in the evaluation, but can add information during work sessions.

Each evaluation session will be divided into two sessions, one where the scientific experts meet parties from the Centres and one session where the "generalist" experts together with the scientific experts meet parties from the Centres. During lunch, i.e. between these two sessions, the evaluation team will also meet with PhD students in the Centre.

1.6 Basis for the evaluation assignment

The evaluation will review progress of scientific and industrial efforts, recognising it is early to expect conclusive results. The evaluators will form an opinion concerning the approach and measures taken so far by individual Centres to judge the potential for their long-term development towards a successful FME. Evaluators may offer suggestions for remedial action to enhance the prospects for Centre success.

The basic reference for the evaluation is provided for by the criteria on which the centres were originally selected:

- Scientific quality
- The potential for innovation and value creation,
- Relevance with a view to the call for proposals, including relationship to the host institution's research strategy.

RCN has formulated a number of success criteria for FME (see Appendix 1). These criteria are the main basis for the evaluation report.

1.7 Background material for the evaluation

The following written material will form the background for the evaluation:

- *Report from Centres* according to a standardised outline, from the individual centre featuring relevant information, including:
  1) research plan for the first five-year period including an overview and justification for changes, if any, in the research plan
  2) revised research plan for the second three-year period, including a plan for the winding-up period;
  3) a self-evaluation of the centre including sections on research accomplishments, important industrial or social results and potential for innovation, network, internationalisation, recruitment, financial aspects and organisation. What additional effects has been accomplished through establishing a FME?
  4) a report and self-evaluation from the host institution
  5) a short report and self-evaluation from each of the user partners
  6) a short report and self-evaluation from each of the research partners
  7) fact sheets according template including CV for the management team, data for the staff working in the centre, list of publications, PhDs. candidates, financial data and selected indicators
  8) Report from Scientific Advisory Board/Scientific Committee (for centres which have established this)
  9) Annual reports from the centres
- *The Centres for Environment-friendly Energy Research Scheme. Description of the scheme.*The Research Council of Norway, Oslo 2008
- *The Centres for Environment-friendly Energy Research - Requirements and guidelines*
- *The Centres for Environment-friendly Energy Research. Information to applicants*

2. Mandate for the Evaluation Panel

2.1 The task of the evaluators

The evaluation team will make the evaluation in the context of the success criteria (Appendix 1). The evaluations of the individual centres are to emphasise the following elements:

The scientific experts on the evaluation team will review:

1) Research activities performed including competence profile and critical size, and research program. The scientific achievements and activities will be compared to that presented in the research plan; however, well-founded adjustments in the plans will be accepted.
   The success criteria to be considered are:
   - Long-term industrial research of at a high international level in the field outlined in the project description,
   - Scientific publications and papers at recognised international conferences
   - A distinct research profile and successful at the international level,
   - Researchers from the host institution and partners participate actively in the centre's research
   - The centre's user partners have increased their research activities
2) The plans for research activities for the centres' final three-year period. The assessment will include the plans for the centres when their FME status and RCN funding expire.
3) Internationalisation
   - The centre is successful in international research cooperation,
   - The centre engages in active collaboration with international research groups
   - The centre attracts good foreign senior researchers, postdocs and phd students
4) Recruitment
   - The centre attends to researcher training effectively
   - The centre is actively engaged in education, especially at the master's level, with emphasis on increased recruitment of women.

The "generalist" experts on the evaluation team will review the following aspects:

5) Involvement of user partners and other innovation aspects
   - Partners are active in projects and a knowledge basis for innovation related to the partners business areas is created
   - Expectations to social ramifications over and above the partners' participation
   - Mutual mobility of personnel and other joint activities
   - Research results are effectively transferred to the partners.
   - Results that fall outside user partners' core areas are attempted commercialised

6) Organisation and Management of the Centre
   - The centre has good visibility and a strong identity
   - The centre is organised in a way that fits well into the host institution's organisation.
   - The centre has a Board and management that ensure that the plans are followed up.
   - The centre has an administration with high professional and administrative skills
   - Cooperation between centres when relevant (two or more centres within the same thematic area)

7) Financial aspects
   - The host institution and partners increase their funding (both cash and in kind)
   - Active efforts are made to attract new partners
   - The centre has been successful in securing other external funding

8) Impact beyond the centres and their partners
   - Influence on energy policy and the public debate and opinion
   - The centres possible long term contribution to reach the national climate goals

The evaluation team will also comment on the self-evaluation reports and the site visit. Although the individual Centres will be the main focus, the evaluators should also comment on the organisation of FME-scheme and the role of RCN.

To avoid giving a premature indication of the Council's decisions to prolong the individual Centres, the Evaluation Committee is asked not to comment specifically on this issue.

Each evaluation report should be written in consensus by the evaluation team and sent to RCN. The report will be openly circulated to all Centres, host institutions, relevant ministries and to any other agency or person who have expressed interest for this kind of information.

Attachment:
Success criteria for the Centres for Environment-friendly Research (FME)

In addition to fulfilling the formal requirements, a successful Centre for Environment-friendly Research will be characterised by the following:

Research activity

- The centre conducts long-term, thematically relevant research of high international caliber in the field specified in the project description, and demonstrates this through its production of doctorates, scientific publications, papers for presentation at recognised international conferences and other measures of scientific excellence
- The centre has a distinct research profile and has been successful in achieving recognition at the international level (e.g. researchers associated with the centre have received awards or been invited to be keynote speakers at international conferences).
- Researchers from the host institution and partners participate actively in the centre's research.
- The centre's user partners have increased their research commitments both through participation in the centre's activities and their own R&D activities on topics of relevance to the centre.

Innovation and value creation

- The centre's research activity has generated or is expected to generate the potential for innovation and enhanced competitiveness among user partners and expectations about ramifications for society over and above the partners' direct participation in the centre's activities.
- The centre has achieved reciprocal mobility of staff between the centre and user partners. Researchers from partners work at the centre, and research fellows and researchers from the host institution are seconded to the user partners for periods of time.
- The centre has implemented measures to ensure that the expertise and results achieved by the research activity are effectively transferred to and utilised by the partners.
- The centre paves the way for results that fall outside the user partners' core areas to be commercialised by other means, e.g. through establishing new research-based enterprises.

Internationalisation

- The centre is successful in international research cooperation, e.g. as a player under the EU's framework programme.
- The centre engages in active collaboration with international research groups and has contributed in other ways to the internationalisation of Norwegian research and trade and industry.
- The centre attracts outstanding international researchers, including research fellows and senior staff, as visiting researchers.

Research training and recruitment

- The centre has an effective framework in place for researcher training, and helps to train highly skilled personnel in the centre's areas of specialisation.
- The centre is actively engaged in education, especially at the master's degree level, and promotes recruitment to the centre's subject areas with special focus on increased recruitment of women.

Partners and funding

- The centre receives long-term funding from the host institution and partners, and the company partners have increased their funding to exceed the minimum requirements.
- Active efforts are made to attract new partners, and industry-oriented centres have partners that also include small and medium-sized companies with a high technology and innovation profile.
- The centre has been successful in securing other external funding.

Organisation

- The centre has a visible profile, a strong identity and a successful collaboration with its partners.
- The centre is organised in a manner that is well adapted to the host institution's organisation.
- The centre has a board and management which ensure that the intentions and plan for the centre are followed up.
- The centre has a common administration with a high degree of scientific and administrative autonomy.

Appendix 2
Evaluation panel members

Generalists
Per Stenius, prof emeritus, Sweden/Finland, chair
Mattias Lundberg, VINNOVA, Sweden

Scientific experts
BIGCCS
- Daan Jansen, ECN, Netherlands
- Christian Bernstone, Vattenfall, Sweden

CenBio
- Jaap Koppejan, BioForte BV, Netherlands
- Rolf Björheden, The Forestry Research Institute, Sweden

CEDREN
- Anton Schleiss, Ecole polytechnique fédérale de Lausanne (EPFL), Switzerland
- Anders Wörman, KTH, Sweden

NORCOWE
- Werner Zielke, prof emeritus, Germany
- Thomas Neumann, DEWI GmbH, Germany

NOWITECH
- Werner Zielke, prof emeritus, Germany
- Felix Aranda, CENER, Spain

SUCCESS
- Christian Bernstone, Vattenfall, Sweden
- Vit Hladik, Czech Geological Survey, Czec Republic

Solar United
- Ruud Schropp, Energy research Center of the Netherlands, Netherlands
- Radovan Kopecek, International Solar Energy Research Center Konstanz, Germany

ZEB
- Per Heiselberg, Aalborg University, Denmark
- Lars J. Nilsson, Lunds University, Sweden

Appendix 3 Written material as background for the evaluation

- Present project description
- Budget tables from RCN project data base
- Work plan for 2012 and 2013 including detailed tables for funding and cost
- Annual reports 2009, 2010 and 2011 from the centres
- Reports from Centres according to a standardised outline:

    A. A self-evaluation of the centre
    B. Fact sheets according template including CV
    C. A short report and self-evaluation from the host institution.
    D. A short report and self-evaluation from each of the partners.
    E. Project description for final three-year period, including a plan for the winding-up.

Appendix 4
Templates for reports from centres and partners

The Research Council of Norway
Division for Energy, Resources and the Environment

Midterm Evaluation of the Centres for Environment- friendly Energy Research (FME)

A - The Centre Self-evaluation

……
(Name of centre)

……..
(Project number)

To be prepared by the centre and signed by the Centre director and Chair of the Board.
*Maximum length **12** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

Background

This Self-evaluation should devote special attention to the items listed in "Success criteria for Centres for Environment- friendly Energy Research (FME)". The main sections below are the same as in this document. In addition to the Self-evaluation for the centre, each of the partners should submit a report.

Brief summary (max. ½ page)

Progress of the centre wrt the main objectives of the centre, (main achievements, breakthroughs etc).

Write here….

..

1. Objectives

Primary and secondary objectives of the centre as stated in the contract/ project description.

Write here….

..

2. **Research** (max. 2 pages)

- *Main research achievements wrt thematic areas of the centre*
- *Provide an overview of the research activities*
- *Core competence of the research team*
- *Comment on new types of research collaboration since establishing the centre (within core group and between host institution and research/user partners)*
- *Research facilities of the centre*
- *Comment on the centre wrt critical size*

Write here….

..

3. Innovation and relation to Centre user partners (max. 3 pages)

For the centre as a whole describe:

- *Definitions of and strategies for innovation*[1]
    - *What steps are taken to stimulate innovation processes?*
- *Cooperation and communication with centre user partners:*
    - *The way key issues are identified by partners*

[1] See the terms of reference for a definition of innovation.

    - *Measures for establishing links and integration between research institutions and user partners and between the different user partners*
    - *How has the centre ensured that the competence and results achieved by the research are effectively transferred to and utilised by the partners*
    - *The participation of user partners in research projects*
    - *Describe steps taken to stimulate mutual personnel mobility between user partners and research institutions.*
- *Has the centre research generated additional concurrent R&D projects between research institutions and companies?*
- *Describe expectations of value of the centre for society at large over and above the partners' participation in the centre's activities.*
    - *Has the centre dissemination activities directed towards other than the partners in the centre including the public at large*
    - *Are efforts made to secure that results that user partners' are not interested to implement are commercialised or made available for other users?*

Write here….

..

4. **Internationalisation** (max. 1 page)

- *Describe how international research cooperation is attended to(including if the partners have engaged in the EU's framework programme based on research projects in the centre)*
- *Describe collaboration with international research groups and other ways of international collaboration both with academic researchers and industry*
- *Describe international exchange of researchers, both centre staff going abroad and visiting foreign researchers to the centre, including post docs, research fellows and senior scientific staff from other institutions*
- *Describe the role of the centre staff in international strategic fora*

Write here….

..

5. **Recruitment** (max. 1 page)

- *Describe how the centre have organised researcher training at PhD level.*
- *Describe how the centre has engaged in education, especially at the master's level. Examples are researchers taking part in teaching, thesis of master students related to the research topics in the centre and summer jobs for students on projects in the centre.*
- *In particular how increased recruitment of women is given attention.*

Write here….

..

6. **Funding** (max. 1 page)

- *Discuss concerns regarding financial matters. Note that numbers (budget tables) will be submitted by RCN*
- *What have been done to attract new partners including small and medium-sized enterprises? (It is realised that some centres from the start have a rather complete set of partners, while others have a greater potential to attract additional partners)*
- *Has the centre been able to obtain other external funding, including infrastructure ?*
- *Describe sources of non-centre funding supporting related research.*

Write here….

..

7. **Management and Organization** (max. 2 pages)

- *Describe role and activities of the:*
    - *Board*
    - *Centre director*
    - *Management team*
    - *International Scientific Advisory Board (if relevant)*
- *Comment on the scientific leadership of the centre.*
- *Describe the process of idea generation, project selection, project planning and project review (including processes of cooperation when geographically distributed).*
- *Describe status and role of the Centre in relation to different organisational levels of the host institution.*
- *What steps are taken to develop cooperation with the other centre in the same thematic area(Centres on CCS and Offshore wind will be asked to submit a special report on cooperation)?*

Write here….

..

8. **Communication** (max. 1 page)

- *Link to centre home page*
- *Communication activities both within the centre and to the public at large*

Write here….

..

9. SWOT analysis

Based on the previous self-evaluation of the centre, a SWOT analysis should be performed. This is considered to be a useful way to present the highlights of the status of the centre and may constitute a basis for the plans for the final three years of operation for the centre.

This SWOT analysis should include the following steps:

- ***Describing internal factors:***

The strengths and weaknesses of the organisation. These are related to the organisation's resources (people, knowledge, financial means, and activities). The sources for this are the analysis mentioned above.

- ***Describing external factors:***

The opportunities and threats in the environment that have an effect on the organisation. These include changes in the policy domain, technological developments and economic factors. The analysis of the environment provides input for this.

- ***Confronting internal factors (strengths, weaknesses) with external factors (opportunities, threats):***

It is important to weigh the strengths, weaknesses, opportunities and threats by using a point system or a qualitative specification.

- ***Developing ideas on strategic options:***

Strategy development often occurs on the basis of a matrix in which the factors are presented in four cells based on strengths, weaknesses, opportunities and threats.

Example of SWOT table:

Strengths	**Opportunities**
• Advanced knowledge development; • The research is demand driven; • The partners are closely involved; • The activities have a clear effect; • A wide and active network, both nationally and internationally.	• Extra attention and resources from public agencies for innovation in the sector; • New technological breakthroughs in strategically important fields; • Opportunities of interaction with innovation programmes • Position to attract funding from EU framework programme
Weaknesses	**Threats**
• Transfer of knowledge not adequately addressed • Resources are not prioritised well • Number of partner companies too low	• The partner companies is under pressure by the economic crisis; • The end of centre funding will come before company partners are ready to implement results

Signatures

Place and date

……..	…….
Centre director (Signature and name in print)	Chair of the board (Signature and name in print)
……..	…….

The Research Council of Norway
Division for Energy, Resources and the Environment

Midterm Evaluation of the Centres for Environment-friendly Energy Research (FME)

B - Fact sheet for the centre

……
(Name of centre)

……..
(Project number)

To be prepared by the centre and signed by the centre director.
*Maximum length (Excluding title page) **5** A4 pages. Word format, Times New Roman, 12 pitch font, single line spacing*

Contents

1. ***General information***

The centre

Name of centre
Name of centre director (Short CV, Enclosure 1)
Management team (Short CVs, Enclosure 1)
Address
Host institution
Partners
(Indicate if the partner has joined the centre after the start or has left the centre)

- Research partner(s)
- Company partners
- Public partner(s)

Governance

Board members
Scientific Advisory Board/Scientific Committee (if relevant)

Additional comments to General information

2. ***Staff***
   a. List senior staff members that spend more than 10 % of their time working in the centre in 2012 (name, affiliation, university degree, sex, position within own organisation, % of full time in centre).
   b. List Administrative and Technical staff (name, position)

Own hard and soft indicators
The centre is requested to come up with their own hard and soft indicators in addition to the sub-items in 3-6. These should be the indicators that they find relevant to give a good documentation of the results of the centre.

3. ***Research***
   a. List publications for the whole period of operation-(Journal papers, Published conference papers, Books and Reports) Enclosure 2.

4. ***Innovation***
   a. List patent applications and patents (for the centre so far).

5. ***International cooperation***
   a. List organisations in other countries that are taking active part in centre projects (name of organisation, country, time period of project).
   b. List researchers in other countries that are taking active part in centre projects (name, position, organisation, country, time period of project).
   c. List visiting senior researchers from other countries with a stay of more than two weeks(name, position, organisation, country, duration of stay).
   d. List researchers from the centre with a visit of more than one month to other countries (name, position, organisation, country, duration of stay).

6. Recruitment

a. List PhD students working in the centre in 2012, both those financed by the centre budget and those that work in the centre and receive funding from other sources (name, affiliation, source of funding, sex, nationality, period worked in the centre).
b. List Post docs working in the centre in 2012, both those financed by the centre budget and those that work in the centre and receive funding from other sources (name, affiliation, source of funding, sex, nationality, period worked in the centre).
c. List PhD thesis completed on projects in the centre so far (name, sex, title of thesis, adviser, institution granting degree).
d. List M.Sc thesis in centre in 2012 (name, title of thesis, sex, adviser, institution granting degree). A master student in the centre is writing his/her thesis on a topic within the research agenda of the centre and is supervised by one of the senior researchers in the centre.

Signatures

Place and date

……..

Centre director
(Signature and name in print)

……..

Enclosures

1. Selected CVs for the core team of the Centre (max. 10 pages for the whole team).
2. Publications (Journal papers, Published conference papers, Books and Reports)

The Research Council of Norway
Division for Energy, Resources and the Environment

Midterm Evaluation of the Centres for Environment-friendly Energy Research (FME)

C – Host institution assessment

Please return the completed assessment directly to
Tone Ibenholt, The Research Council of Norway (ti@forskningsradet.no)
as an attachment to an E-mail
Deadline 30 Nov 2012

……
(Name of host institution)

……
(Name of centre)

……..
(Project number)

To be prepared by the host institution and signed by the Project administrator
*Maximum length **4** A4 pages. Word format, Times New Roman*
12 pitch font, single line spacing

Contents

1. *What is the total research activity of the host institution in the form of personnel and volume within broad thematic area of the centre?*

Write here….

..

2. *Describe how the thematic area of the centre relates to the research strategy of the host institution*

Write here….

..

3. *How do you evaluate the importance of the centre to realise the research strategy of your institution?*

Write here….

..

4. *How has the centre stimulated collaboration between researchers from different disciplines internally within the host institution and with researchers from research partners?*

Write here….

..

5. *How has the centre stimulated establishing leading national research groups across institutional boarders, i.e. collaboration between university and research institute?*

Write here….

..

6. *How has the centre's activities benefited your international reputation as a research institution?*

Write here….

..

7. *How has the centre strengthened international cooperation?*

Write here….

..

8. *What potential do you see in the results from the centre in addition to benefit for the partners*

Write here….

..

9. How is the centre organised within your own organisation?

Write here….

..

10. How are the administrative and economic matters handled?

Write here….

..

11. Are there any other topics you want to report?

Write here….

..

Host institution

…….

Place and date

……..

Signature and name in print of project administrator

……..

The Research Council of Norway
Division for Energy, Resources and the Environment

Midterm Evaluation of the Centres for Environment-friendly Energy Research (FME)

D1 – Corporate partner assessment

……
(Name of partner)

Please return the completed assessment directly to
Tone Ibenholt, The Research Council of Norway (ti@forskningsradet.no)
as an attachment to an e-mail
Deadline 30 Nov 2012

……
(Name of centre)

……..
(Project number)

To be prepared by the partner and signed by the contact person of the partner
*Maximum length (excluding front page) **2** A4 pages. Word format, Times New Roman, 12 pitch font, single line spacing*

1. *Describe the focus of own R&D in thematic area of the centre, within and outside the centre (strategic platform)*

Write here…. ..

2. *What is total volume of R&D within company in thematic area of the centre.*

Write here…. ..

3. *What is the motivation for joining the centre and what expectations do you have being a partner?*
Do you have any suggestions on how the centre concept could be improved?

Write here…. ..

4. *How has the partner interacted with the centre?*

	Yes	No
Membership in board		
Participation in workshops for project plans and idea generation		
Participation in research projects in the centre		
Mechanisms for technology transfer		
Mobility of personnel		

5. *What opportunities have been created that would not have existed without the centre?*
Has the participation improved your competitiveness and strengthened your position within the
value chain?

Write here…. ..

6. *Has the centre contributed to specific innovations within your company?*

	Yes	No
Patents		
New products		
New processes		
New services		

7. *Can you give any estimate of potential for increased income or reduced cost in net present value as a result of being a partner in the centre?*

Write here…. ..

8. *On a scale from 1 (Low) to 6 (High), please give your score for each of the following questions:*
   If not relevant write N/A

	Score
Has the participation in the centre influenced the R&D and Innovation strategy of your company?	
How do you evaluate the centre wrt:	---------
Level of competency of centre staff	
Project management of centre	
Communication between centre and partners	
The usefulness of research activities as seen from the company	
How has the centre's activities benefited the partner?	---------
Ideas for new products, processes and/or services?	
New or improved methods/models developed by the centre	
Improvement of products, processes and/or services	
Strengthened knowledge base of the company	
Improved access to competent personnel and knowledge institutions	
Recruitment of qualified personnel	
Improved network to other partners	

Company partner

Place and date

……..

Signature, position and name in print of reporting person from partner

……..

The Research Council of Norway
Division for Energy, Resources and the Environment

Midterm Evaluation of the Centres for Environment-friendly Energy Research (FME)

D2 – Research partner assessment

……
(Name of partner)

Please return the completed assessment directly to
Tone Ibenholt, The Research Council of Norway (ti@forskningsradet.no)
as an attachment to an e-mail
Deadline 30 Nov 2012

……
(Name of centre)

……..
(Project number)

To be prepared by the research partner
*Maximum length **3** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

1. *What is the total research activity of your institution in the form of personnel and volume within broad thematic area of the centre?*

Write here….

..

2. *Describe how the thematic area of the centre relates to the research strategy of the your institution*

Write here….

..

3. *How do you evaluate the importance of the centre to realise the research strategy of your institution?*

Write here….

..

4. *How has the centre stimulated collaboration between researchers from your institution and from the host institution and other partners?*

Write here….

..

5. *How has the centre stimulated establishing leading national research groups across institutional boarders, i.e. collaboration university and research institute?*

Write here….

..

6. *How has the centre's activities benefited your international reputation as a research institution*

Write here

7. *How has the centre strengthened international cooperation?*

Write here….

..

8. *What potential for innovation and value creation do you see in the results from the centre which is not expected to be commercialised by the company partners?*

Write here…. ..

9. *Has the centre contributed to investment in research infrastructure?*

Write here…. ..

10. *Has the centre contributed to improvement in study programmes at Master level (only relevant for universities)?*

Write here…. ..

11. *Has the centre contributed to improvement in doctoral education (only relevant for universities)?*

Write here…. ..

12. *Are there any other topics you want to report?*

Write here…. ..

Name of Research partner

…….

Place and date

……..

Signature, position and name in print of contact person

……..

The Research Council of Norway
Division for Energy, Resources and the Environment

Midterm Evaluation of the Centres for Environment-friendly Energy Research (FME)

D3 – Public partner assessment

Please return the completed assessment directly to
Tone Ibenholt, The Research Council of Norway (ti@forskningsradet.no)
as an attachment to an e-mail
Deadline 30 Nov 2012

……
(Name of partner)

……
(Name of centre)

……..
(Project number)

To be prepared by the partner and signed by the contact person
*Maximum length **2** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

9. *Describe the focus of own R&D in thematic area of the centre, within and outside the centre (strategic platform)*

Write here…. ..

10. *What is total volume of R&D within your organisation in thematic area of the centre.*

Write here…. ..

11. *What is the motivation for joining the centre and what expectations do you have being a partner?*
Do you have any suggestions on how the centre concept could be improved??

Write here…. ..

12. *How has the partner interacted with the centre?*

	Yes	No
Membership in board		
Participation in workshops for project plans and idea generation		
Participation in research projects in the centre		
Mechanisms for technology transfer		
Mobility of personnel		

13. *What opportunities have been created that would not have existed without the centre?*

Write here…. ..

14. *Has the centre contributed to specific innovations within your organisation?*

	Yes	No
New services		
Other		

15. *Can you give any estimate of potential for increased income or reduced cost in net present value as a result of being a partner in the centre?*

Write here…. ..

16. *On a scale from 1 (Low) to 6 (High), please give your score for each of the following questions:*
If not relevant put N/A

	Score
Has the participation in the centre influenced the R&D and Innovation strategy of your organisation?	
Has the participation in the centre influenced your agency strategy?	
How do you evaluate the centre wrt:	---------
Level of competency of centre staff	
Project management of centre	
Communication between centre and partners	
The usefulness of research activities as seen from the organisation	
How has the centre's activities benefited the partner?	---------
Ideas for new processes and/or services?	
New or improved methods/models developed by the centre	
Improvement of processes and/or services	
Strengthened knowledge base of the organisation	
Improved access to competent personnel and knowledge institutions	
Recruitment of qualified personnel	
Improved network to other partners	

Name of public partner

…….

Place and date

……..

Signature, position and name in print of reporting person from partner

…….

The Research Council of Norway
Division for Energy, Resources and the Environment

Midterm Evaluation of the Centres for Environment-friendly Energy Research (FME)

E – Project description for the final three-year period and further plans

……
(Name of centre)

……..
(Project number)

To be prepared by the centre and signed by the Centre director and Chair of the Board. Maximum length (Excluding front page) ***8*** *A4 pages. Word format, Times New Roman, 12 pitch font, single line spacing*

Background

Each centre has a current project description for the whole period of the centre and a work plan for each year. During the four to five years since the original project description was written, many things may have changed. Even if some centres have made revisions through the first years, it is expected that the centre now should perform a more in depth review of the different sections of the project description. ***This report should focus topics that, as a result of this review, is going to be changed in the project plans for the final years. Those items where the centre will continue to follow present plans need not be commented upon.***

The centres may not have budget plans for the complete eight year period. In any case the budget for the next four years should be presented.

Objectives for the centre and background for changes in the project description

Write here….

..

1. Status

National and international state-of-the-art of the relevant technologies and research topics for the centre.

Write here….

..

2. Research methodology

Describe the methodology and theories planned used, and explain why they are suitable for generating relevant knowledge in the field and promoting future value creation. Describe plans for publication in scientific peer-reviewed journals as well as plans for conferences and any patents.

Write here….

..

3. Research tasks

Identify and describe the research questions that will be examined. Define key research tasks and research-related targets and explain their significance for future innovation and value creation.

Write here….

..

4. Researcher training and recruitment

Describe plans for researcher recruitment. Specify the number of doctoral degrees planned within which research areas. Provide a target figure for the percentage of women fellowship-holders (cf. Point 8).

Write here….

..

5. Significance for the business sector

Describe how the knowledge developed by the centre will be important to future innovation and value creation for the user partners. Describe the potential that the centre's results may have for generating innovation and value creation in other segments of the Norwegian business sector. Describe the centre's relevance and benefit to society.

Write here….

..

6. Organisation

Describe how the cooperation at the centre will be organised and why this structure has been chosen. Describe how knowledge acquired through research activities at the centre will be transferred to the individual partners to stimulate innovation and value creation.

Write here….

..

7. International cooperation

Describe plans for international cooperation at the centre.

Write here….

..

8. Gender equality

Describe how gender-related considerations will be incorporated into the centre's activities as well as plans for increasing recruitment of women. Provide a target figure for the percentage of women fellowship-holders (cf. Point 4).

Write here….

..

9. Progress plan with milestones

The plan should provide a timeline for and describe the main activities and milestones, including project deliveries associated with the given milestones.

Write here….

..

10. Budget

General comments on budget situation. Action plans for the final three year period.

Write here….

..

11. Costs distributed among the individual partners

An overview of how the project costs will be distributed among each of the R&D-performing partners is to be presented in table form.

Cost	2013	2014	2015	2016	2017
Host institution					
Consortium partner A					
Consortium partner B					
Consortium partner C					
Consortium partner N					
Total					

12. Financial contributions from the individual partners

An overview of the partners that will contribute financing to the centre and their individual contributions are to be presented in table form.

Funding	2013	2014	2015	2016	2017
RCN FME-grant					
Host institution					
Consortium partner A					
Consortium partner B					
Consortium partner C					
Consortium partner N					
Other public funding					
Total					

13. Environmental impacts

Describe whether and how the research conducted by the centre or the use of the results will have environmental impacts of significance (positive or negative).

Write here….

..

14. Plans for further activities after the eight year period of financing from RCN

Write here….

..

Signatures

Place and date

……..	…….
Centre director (Signature and name in print)	Chair of the board (Signature and name in print)
……..	…….

The report can be ordered at:
www.forskningsradet.no/publikasjoner

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