

	EUROPEAN COMMISSION RESEARCH AND INNOVATION DG	Review Report
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Project No: 308952

Project Acronym: OMSoP

Project Full Name: Optimised Microturbine Solar Power system

Review Report

Period covered: from 01/02/2013 to 24/04/2015

Date of preparation: 11/05/2015

Start date of project: 01/02/2013

Date of submission (SESAM): 28/05/2015

Duration: 48

Project coordinator name:
Prof. Abdalnaser Sayma

Project coordinator organisation name:
THE CITY UNIVERSITY

Version: 0

Review Report

General Information

Grant Agreement number:	308952
Project acronym:	OMSoP
Project title:	Optimised Microturbine Solar Power system
Funding Scheme:	FP7-CP
Project starting date:	01/02/2013
Project duration:	48
Name of the scientific representative of the project's coordinator and organisation:	Prof. Abdalnaser Sayma THE CITY UNIVERSITY
Project web site:	
Type of technical review:	Periodic regular/foreseen technical review
Period covered - from:	01/02/2013
Period covered - to:	24/04/2015
Date of review meeting (if applicable):	28/04/2015
Type of review report:	Individual
Name of expert drafting the report:	Peter BREUHAUS
Name of the Project Officer:	Mr Piero DE BONIS

1. Overall Assessment

a. Executive summary: Comments, in particular highlighting the scientific/technical achievements of the project, its contribution to the State of the Art and its impact:

The mid term review of the project showed a mix of milestones achieved ahead of schedule as well as those with delays.

Within the work package 1 of component development was the sub task "choice of suitable heat absorption material" within "Receiver development and analysis" delayed by about 10 month. This might be recovered to some extent as a mitigation process was put in place. However there might still be some impact remaining as it was not completely clear if the delay impacts the test program. Solar dish development turned out to be well ahead of schedule and it was already mounted and demonstrated at the test site. Currently ongoing are some adjustments of the control of the tracking system including some fine tuning. Tasks related to gas turbine component development is progressing according schedule, with the task of assembling and testing the micro gas turbine started ahead of schedule.

Work package 2 "Systems design and integration" proceeds well according schedule, partly being ahead of schedule as was visible due to the already on site assembled solar dish. Besides performing detailed modelling and simulations of the entire system under steady state and transient conditions is test site preparation in focus. In this connection the exchange of information especially on interfaces (mechanical, electrical and IT) across all tasks and teams involved is essential and therefore prioritized by the project management and all partners involved.

Work package 3 "Techno economic analysis" is, except the the sub task "Cost analysis" on track. Cost analysis is delayed by about 13 months as information on receiver material was not available because of the delay of this task. However a major impact on the overall schedule of the project or achieving the objectives of the project is not expected.

Progress

Good progress (the project has achieved most of its objectives and technical goals for the period with relatively minor deviations)

b. Overall recommendations (e.g. on overall modifications, corrective actions at WP level, or re-tuning the objectives to optimise the impact or keep up with the State of the Art, or for other reasons, like best use of resources, re-focusing...).

Based on the discussion and presentations at the review meeting the following recommendations can be made:

- Concerning the delay of the "Choice of suitable heat absorption material", the impact was discussed as it might reduce the test time in the lab. As the receiver will be integrated into the cycle with the micro gas turbine the results of testing are essential for a safe operation and high reliability of the receiver. A failure in the receiver might in consequence result in a severe damage of the MGT. One key issue in this context might be the lifetime of the components inside the receiver especially under cycling conditions as these are introducing thermal stresses. However as the integrated solar dish system is going to have the status of a demonstrator total operational time might be limited which might reduce the overall risk. In terms of risk reduction a continuous risk analysis should be done, supported by, if necessary, additional sensors and monitoring and diagnostics (M&D). Tools developed to simulate the plant and its components might be well suited for M&D.
- During the meeting it was mentioned that the performance of the dish as well as the position of the focal point will be measured. This is planned to be done by means of a sensor mounted at a position of the support beam / arm representing the location of the receiver. As the weight of the receiver and the MGT might have some influence on mechanical integrity issues of the system due e.g. bending, different behavior in terms of vibrations etc, it is recommended to add a similar weight to the arm during the tests. This would exclude uncertainties resulting from the additional weight.
- For the entire system it is recommended to evaluate also scenarios such as the loss of grid connection. This exposes the MGT to the danger of failure as in a very short time the breaking effect of the generator is lost. As a consequence the MGT will speed up, running into the danger of overspeed. In case of overspeed and depending on its level the rotor (most likely the fixation of the permanent magnets) might fail resulting in a sever failure of the MGT. This problem might be overcome by connecting a load bank which could in case of grid loss act as break. However it is recommended to evaluate several emergency scenarios as these might differ from those of stand

alone systems and thus require additional actions to prevent severe failures.

- During the meeting the sampling rate of measurement data which shall be used to evaluate the process and its components was mentioned. Based on experience the targeted sampling rate is too low to allow the analysis of fast events. In a previous case when using a larger MGT (100 kW electric) a sampling rate of 1/sec was not sufficient to, in some cases, analyze the root cause of events, because of the low inertia of the rotor. As the MGT of the project is of even smaller size similar effects might be expected. Therefore it is recommended to install a process of e.g. event driven data collection, which is, via a sliding time window, collecting data at high rate (e.g. controller speed), and saving this data only in case of an event. In case of no event it is possible to live with a lower sampling rate reducing significantly the needed storage capacity.

2. Objectives and Workplan

a. Progress towards project objectives: Have the objectives for the period been achieved? In particular, has the project as a whole been making satisfactory progress in relation to the Description of Work (Annex I to the grant agreement)?

Yes

Comments

It is the reviewer's impression that the project as a whole makes satisfactory progress, even though some tasks are delayed. In most cases of delay there is no major impact on other tasks. In one case a delay ("choice of suitable heat absorption material") may cause consequences on other tasks. Mitigation processes are put in place in order to catch up and still target the completion of the project and fulfill the objectives according to the planned schedule.

b. Progress in individual work packages: Has each work package (WP) been making satisfactory progress in relation to the Description of Work (Annex I of the grant agreement)?

Partially

Comments

The overall progress in the project is satisfactory even though some tasks are delayed. This was due to unforeseen problems in test lab building and commissioning. But as mentioned above mitigation processes are put in place to reduce the potential impact on the overall schedule. However as outlined in the section of overall recommendations, some risk analysis and maybe M&D should be implemented to reduce the risk of failure due to shortened component testing.

c. Milestones and deliverables: Have planned milestones and deliverables been achieved for the reporting period?

Partially

Comments

Most milestones and deliverables were achieved in the reporting period, some of them already ahead of the planned schedule. Some are delayed due to unforeseen problems which resulted in a delay of some of the tasks. In all cases mitigation processes are put in place to ensure that the overall objectives of the project are met.

Deliverables						
WP no.	Del. no.	Version	Deliverable name	Reviewed Yes/No	Status	Remarks
1	1	0.0	Report on absorber material testing and evaluation	No		Delayed by 10 months till month 30. As the review was in month 27 was the report not available.
1	2	0.0	Report on short term storage testing and evaluation	No		Due in month 30, but the review was in month 27.
1	3	0.0	Report on receiver testing and evaluation	No		Due in month 48, but the review was in month 27.
1	4	1.0	Report on solar dish selected materials	Yes	Accepted	
1	5	2.0	Optimised dish design	Yes	Accepted	
1	6	0.0	Report on solar dish performance	No		Delayed by 4 months till month 28. due to problems with material which are meanwhile solved. As the review was in month 27 was the report not available.
1	7	0.0	Report on further optimisation of dish system	No		Due in month 48, but the review was in month 27.
1	8	1.0	Optimised radial turbine design	Yes	Accepted	
1	9	1.0	Bearing system selection	Yes	Accepted	
1	10	0.0	MGT control system	No		Due in month 30, but the review was in month 27.
1	11	0.0	A report on further MTG optimisation	No		Due in month 48, but the review was in month 27.
2	1	0.0	Technical Report: System layout	No		Due in month 36, but the review was in month 27.
2	2	0.0	Technical Report on steady state simulations	No		Due in month 36, but the review was in month 27.
2	3	0.0	Technical Report of Demonstration Facility.	No		Due in month 38, but the review was in month 27.
2	4	0.0	Report on calibration of instrumentation	No		Due in month 39, but the review was in month 27.
2	5	0.0	Report on preliminary test data	No		Due in month 41, but the review was in month 27.
2	6	0.0	Technical Report on system demonstration	No		Due in month 48, but the review was in month 27.
3	1	0.0	Report on system cost analysis	No		Delayed by 13 months till month 37. Delay was caused by missing information (D 1.1) and some critical topics are still under discussion within the project team. As the review was in month 27 was the report not available.

Deliverables

WP no.	Del. no.	Version	Deliverable name	Reviewed Yes/No	Status	Remarks
3	2	0.0	Report on potential markets for small scale solar-dish microturbines	No		Delayed by 4 months till month 28. As the review was in month 27 was the report not available.
3	3	0.0	Final report on the economic appraisal of a 5-10 kWe dispatchable power generator	No		Due in month 30, but the review was in month 27.
3	4	1.0	Report on state-of-the-art dish-engine applications	Yes	Accepted	
3	5	1.0	List of the available models and their main characteristics	Yes	Accepted	
3	6	0.0	Report on optimum dish-MGT performance	No		Due in month 48, but the review was in month 27.
3	7	0.0	Life Cycle Assessment of Solar Dish System (DEMO)	No		Due in month 40, but the review was in month 27.
4	1	1.0	Consortium Agreement	Yes	Accepted	
4	2	1.0	Project website	Yes	Accepted	
4	3	0.0	Publications, project folder, presentations (Updated at each indicated delivery month)	No		Due in month 48, but the review was in month 27.

d. Relevance of the objectives in the coming periods: Are the objectives for the coming period(s) i) still relevant and ii) still achievable within the time and resources available to the project?

d.i) still relevant?	Yes
d.ii) still achievable?	Yes

Comments

Given the mitigation process put in place and the commitment of all partners to catch up in areas where a delay occurred, is it possible to assume that the objectives will be achievable.

3. Resources

a. Assessment of the use of resources: To the best of your estimate, have resources used, i.e. personnel resources and other major cost items, been (i) utilised for achieving the progress, (ii) in a manner consistent with the principle of economy, efficiency and effectiveness. Note that both aspects (i) and (ii) have to be covered in the answer.

a.i) utilised for achieving progress	Yes
a.ii) in a manner consistent with the principle of economy, efficiency and effectiveness	Yes

Comments

As mentioned above some tasks are delayed due to technical reasons but others are also achieved ahead of schedule. The overall impression is that the project is well balanced and executed as efficiently as possible. Delays caused are somehow typical for projects of prototype and demonstrator character as these always contain the danger of upcoming unforeseen events or problems which might have an impact on the schedule. this happened also in this project. It would have been a greater surprise if all tasks and sub-tasks had run smoothly and according schedule.

b. Deviations: If applicable, please comment on large deviations with respect to the planned resources.

For the time being there are no large deviations to the planned resources visible.

4. Implementation of the Project

a. Management: Has the project management been performed as required?	Yes
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Comments

The project is managed well and in case of deviations from the plan corrective actions are put in place at an as early as possible point in time to ensure an as small as possible impact on the overall project and the progress.

b. Collaboration between beneficiaries: Has the collaboration between the beneficiaries been effective?	Yes
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Comments

Collaboration seems to effective even though there was no need for intensive collaboration so far. This was due to the fact that the project activities were mainly focusing on component and tool development. However needed information was transferred between the teams. In future the need for close collaboration will significantly increase, as components now need to be integrated, assembled and tested in joined effort.

c. Beneficiaries' roles: Do you identify	No
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evidence of underperforming beneficiaries, lack of commitment or change of interest of any beneficiaries?

Comments

For the time being no underperforming beneficiaries were identified. The commitment of all partners to achieve the objectives of the project is very high.

5. Use and Dissemination of Foreground

a. Impact: Is there evidence that the project has/will produce significant scientific, technical, commercial, social, or environmental impacts?

Yes

Comments

It is expected that there will be significant, technical and positive environmental impacts produced by the project. For the time being the impact was limited as the main part of integrating the components into one system is still ongoing. However some impact might already result from the components development and their integration into other applications (e.g. use of the MGT outside the solar dish system ...).

a.1. Is there an impact on participating Small and Medium Enterprises (SMEs)?

Yes

Comments

Impact on participating SMEs is expected as most of the core components (MGT and dish) are owned by SMEs. In addition the receiver, which is currently developed by a university, might be transferred to a spin of company which by its character again would be a SME. Given the interest of e.g. a group from China, an impact on their business needs to be expected.

a.2. Is there an exploitation potential for the participating SMEs?

Yes

Comments

As indicated above under a.1. a delegation from China showed already interest in the project, the system and the components. It can be expected that the interest and number of interested parties will further increase as soon as components are assembled, the system is commissioned and demonstrates its performance. As this is the key part of the project any interest in the product at such an early point in time is even more interesting and underpins the potential for all participants and especially the SMEs.

b. Use of results: Is the plan for the use of foreground, including any update, appropriate? Namely, please comment on the plan for the exploitation and use of foreground for the consortium as a whole, or for individual beneficiary or groups of beneficiaries and its progress to date.

Yes

Comments

Even though at this early stage in the project, which targets a demonstrator being up operational during the last year of the project, it is already now visible that there is a high level of interest of making use of the foreground know how and technology developed within the project. The exploitation plan is well structured and as mentioned several times, its already in progress opening a lot of opportunities for the group as well as the individual partners.

c. Dissemination: Have the beneficiaries disseminated project results and information adequately (publications, conferences...)?

Yes

Comments

Dissemination is already now ongoing via the project web site as well as via papers and presentations at conferences. The leader of the task 4.2 "Dissemination" is ETN, an organization with a large network several connections inside as well as outside Europe. Resulting from these activities are for example the early contacts to and the interest from the delegation from China.

d. Please identify potential information that should be disseminated to

Policy makers:

For the time being it might be of interest to policy makers that the Chinese delegation showed interest in the project already now.

The scientific community:

There is nothing special to be mentioned here, as the information is transferred via papers, conferences etc.

The general public:

It might be of interest to inform general public on the ongoing activities. However this will be more interesting at a later point in time when the demonstrator is in the phase of assembling, commissioning and testing. This might support the awareness of public towards also smaller, decentralized and renewable energy based technologies as most information to public is related to large plants and technologies.

A specific group of end users:

Not currently. End users might be informed at a later stage as they are expected to be mainly interested in a reliably working demonstrator as well as in performance data resulting from a "real" application rather than simulation.

e. Involvement of potential users and stakeholders: Are potential users and other stakeholders (outside the consortium) suitably involved (if applicable)?

Yes

Comments

Project members cover almost the whole value chain. Missing are end users, but these are mostly interested in the result of the project (i.e. a working demonstrator and its performance) rather than in the development process. End users are planned to be approached closer to the end of the project when the demonstrator is installed and up and running. This is, from the reviewer's point of view is fine, as the ups and downs of a normal development process might be difficult to understand by non-experts which the end users might be.

f. Links with other projects and/or programmes: Is the consortium interacting in a satisfactory manner with other related Framework Programme projects or other Research and Development national/international programmes, standardisation bodies?

Yes

Comments

Due to the involvement of ETN but also based on other personal connections the project exchanging is information with others. One example might be the interaction with the Ad-Pow-Gen project

which is running under the ERAfrica project.

6. Other Issues

a. Have policy-related and/or regulatory issues been properly handled (if applicable)?	Not Applicable
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Comments

b. Have ethical issues been appropriately handled (if applicable)?	Not Applicable
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Comments

c. Have safety issues been properly handled (if applicable)?	Yes
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Comments

Safety issues are addressed during the development process and the standards are applied. This covers given design rules, handling issues etc.

d. Has progress on Gender Equality Actions been satisfactory (if applicable for this reporting period)?	Yes
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Comments

At the review meeting held there was a, for this type of project, well balanced share between female and male project members.

7. Flag the Project - Not related to the 'certified as correct'

Flag(s) for the project	No
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Comments

Attachments	
Name	
Date	

This declaration was visaed electronically by Peter BREUHAUS (ECAS user name nbreuhpe) on 28/05/2015