RP-5 Renewable Energy Project

Quarterly Technical Report

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ABSTRACT

This report is the first quarterly technical report for the RP-5 Renewable Energy Project. The report summarizes the work progress, effort and activities that took place during the period of July 12, 2002 (project inception) to September 30, 2002. The report has been prepared in accordance with the Department of Energy (DOE) Guidelines.

This technical report covers all meetings and discussions that were conducted to identify and analyze potential renewable energy technologies and verify its feasibility and suitability for the project. The report covers the two-day Energy Charrette that was held at the Inland Empire Utilities Agency (IEUA) Headquarters Building on May 8-9, 2002 to brainstorm, evaluate and present all available renewable energy options along with their implementations. Although the Energy Charrette was held prior to awarding of the DOE Grant, the outcome of the Charrette forms the basis of the activities that took place after July 12, 2002. Therefore, the Energy Charrette is frequently referenced and discussed in this report. The report also discusses the Energy Meeting that took place on September 24, 2002 between IEUA and CH2M Hill to follow up on the various presentations and recommendations resulting from the Energy Charrette. It should be noted that no final equipment data or capacities have been presented in the report, as the Conceptual Design has not started yet.

This report covers continuing effort and work to complete the Request for Proposal (RFP) for this project. The Executive Summary Section covers more details on the scope of work, which consists of the conceptual, preliminary and final design, and what has been accomplished during the report period. Tools and methods utilized in this project to identify renewable energy technologies are included in the "Experimental" Section. Finally, Project achievements, implications and importance in improving this kind of technology are summarized in the "Conclusion" Section.

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INTRODUCTION

The RP-5 Biomass Renewable Energy Project is comprised of a series of full-scale demonstration projects with a primary objective of making renewable energy more affordable. The project consists of state-of-the-art equipment and systems for primary and secondary power generation which use methane gas derived from local processing of biosolids, dairy manure and other organic materials. The project is to be implemented and executed within the capabilities and conditions of the electrical mini-grid in the Chino Basin.

The scope of work of this project includes two phases: Phase I, Conceptual Design, and Phase II, Preliminary and Final Design. Phase I activities and scope include Technology Identification, Technology Evaluation, and Report Findings. Experts in innovative power generation systems participate in this program as required throughout the project. The objective of the Conceptual Design is to identify those innovative systems that are to be carried forward into Phase II. Phase II includes the Preliminary and Detail Design, which is to be prepared based on technologies selected in the Conceptual Design.

In order to move forward with this project and to start exploring available innovative technology and renewable energy power generation systems, a two-day Energy Charrette meeting was held at IEUA Headquarters Building on May 8-9, 2002. The Charrette involved experts, scientists, researchers and engineers in the renewable energy field. Participants were divided into three groups; each group worked independently from the others and came up with their own presentation and recommendations. Two groups targeted the RP-5 Biomass Renewable Energy Project; the third group handled Agency-wide Energy Technologies – Current and Future Program. On September 24, 2002, an energy meeting between IEUA and CH2MHILL (Consulting Engineer) was held at IEUA Headquarters Building to follow up on renewable energy system recommendations presented in the Energy Charrette. During this energy meeting, a prominent renewable energy expert partially participated via teleconferencing. It is a goal of IEUA to have a kick-off meeting by the first week of November 2002 with renewable energy application experts to discuss the various energy and systems issues associated with the project.

EXECUTIVE SUMMARY

RP-5 Renewable Energy Project's primary objective is to make renewable energy more affordable. The project involves innovative combinations of primary and secondary power generation systems using methane gas produced from local processing, dairy manure, and other organic materials. The project goal is to achieve system efficiencies of 65% or higher through heat recovery and supplying heating and cooling water to adjacent buildings and facilities.

The reporting period for this project covers three major areas; Request for Proposal (RFP), Energy Charrette and follow up Energy Meeting.

Work to prepare and finalize the RFP has started. A draft RFP is being prepared at this time. The RFP includes a project summary, renewable energy systems to be identified and recommended, goals and expectations, design phases including conceptual, preliminary and detailed design, environmental compliance, completion dates for each design phase and project construction. The RFP highlights potential innovative and renewable energy systems that have been presented in the Energy Charrette and discussed in the follow-up Energy Meeting. The RFP has been prepared in accordance with the context of the DOE Contract.

IEUA organized a two-day Energy Charrette, which was held at the IEUA Headquarters Building on May 8-9, 2002. The Energy Charrette involved experts in the renewable energy field including research institutes, universities, power industry and consulting engineers. Participants in the Energy Charrette were divided into three groups; each group worked independently and came up with specific recommendations of potential renewable energy equipment and systems. It should be noted that the above recommendations are still subject to further research and analysis to verify feasibility and suitability for this project, and this will be part of the Conceptual Design Phase.

On September 24, 2002, a follow-up Energy Meeting was held at the IEUA Headquarters Building to further discuss some of the recommendations that were presented in the Energy Charrette, and to determine if there were matching funds from the State of California's Energy Commission's Public Interest Energy Research (PIER) grant. An expert in biogas gasification

processes provided an overview of available technologies. CH2M Hill (consulting engineer) conducted an energy presentation on power generation systems using conventional and renewable energy systems with emphasis on the latter. The following issues were discussed during the meeting:

- Available options and technologies for biogas gasification, implementation and comparison to other technologies such as fluidized bed system;
- Internal combustion engines overview;
- External combustion engines (Rankine Cycle), such as steam and pentane cycles, and comparison between both cycles including feasibility, efficiency, operation and cost;
- Chilled water systems overview, number of chillers and thermal ice storage; and,
- Primary power generation using renewable energy equipment such as Stirling engines and Fuel Cells.

The meeting also went over the Energy Charrette major equipment recommendations, which include the following:

- Internal combustions engines to provide primary power and heat source;
- Fuel Cells for power and heat generation (use of Fuel Cells is still under investigation);
- Stirling engines which run on heat recovered from internal combustion engines;
- Bottoming cycles which include steam and pentane turbines; heat recovered from internal combustion engines is used to heat the cycle fluid media;
- Chilled water system which utilizes heat recovery to heat chiller solution;
- Chilled water/ice storage to store the chill during off-peak hours and use it during peak load periods;
- Dairy manure gasification and treatment systems; and,
- Heating and cooling water systems to supply hot and/or cold water to adjacent buildings and facilities.

Finally, ideas were discussed in preparation for the upcoming kick-off/workshop meeting to commence the Research and Conceptual Design

Phase. It was decided that at the kick-off/workshop meeting, participants would start to narrow down the list of applicable and suitable innovative technology systems for the RP-5 Renewable Energy Project. It was also decided that leading experts in renewable energy systems would be invited to the workshop meeting. The meeting date is tentatively set to take place in early November.

EXPERIMENTAL

RP-5 Renewable Energy Project Conceptual Design and Research Phase uses standard research methods and equipment such as computers, phones, etc. The methods and steps that have been utilized in this project include, but not limited to, the following:

- Manufacturers survey, communications, literatures, catalogues, etc.
- Technical workshops
- Communications with leading experts
- Communications with environmental control agencies
- Manufacturer's plant visits
- Feed back from owners of existing installations
- Economic evaluation
- Life Cycle analysis

RESULTS AND DISCUSSION

RP-5 Renewable Energy Project Period began July 12, 20002 and this is its first quarterly report. Accordingly, this project is in its infancy stage. Information gathering, meetings and input from leading experts are all in progress with a conceptual kick-off meeting starting around the first week of November 2002. A draft Request for Proposal (RFP) has been started and is near completion.

Conclusion

RP-5 Renewable Energy Project is moving ahead as planned and anticipated. Project's main highlights are summarized below:

- Project is on schedule
- Project is on budget
- Request for Proposal (RFP) is in progress
- Plans in process for a kick-off for conceptual design meeting