

Quarterly Report on the USAID Project:

2012 Q1 Period: January 1-March 31:

This report highlights the accomplishments made during the Q1 2012 Report. The report will include two sets of accomplishment. First, we will refer to the tasks identified per the approved concept. Next we will report on other related activities in preparation for satisfying different deliverables.

1- Task related accomplishments-

Task1:Establish Advisory Board

Objective: Establish an Industry advisory board for geothermal education made up of developers and key service industries.

A letter has been sent to Chveron, PGE, EBTKE, API, Supreme, Schlumberger and Halliburton. Tentative first meeting is scheduled for 3rd week of April 2012.

The Board will have two main focuses of providing strategic advice or guidance on the direction of the project and to develop a .road map for future phases of this projects or new projects.

The established Board will meet regularly (at least once every two quarters) to review the project direction and provide advice and guidance to the project team.

Task 2: Scholarship for Masters Students enrolled at ITB

Geothermal master program has established criteria for students admission at Geothermal Master Program who would the scholarship be granted. The criterias are:

1. GPA minimum 3.25/4.00
2. Institutional TOEFL minimum 550 or equivalent IELTS of 6.5
3. Academic Potential Test, similar to GRE with minimum score of 500
4. All applicants have to provide letter of statement that they will enroll as full time students at ITB Master Program.
5. For applicants that are currently employed, they must provide formal letter of permission from employer to leave the work and study full time at ITB Master Program.
6. All applicants have to pass test and interview.
7. By the time of admission the applicants must be less than 40 years of age.

All applicants must provide two copies of application form (one original copy and one photocopy), completed in English. Each copy of the application form must include:

1. A certified copy of your birth certificate,
2. All applicants have to provide a certified copy of the academic transcript and letter of completion or graduation certificate.
3. The original institutional English proficiency test result, e.g. IELTS or TOEFL. Photocopies will not be accepted. Test results must be no more than 12 months old by the commencement of study.
4. If you are employed, a current job description confirming your position and outlining your responsibilities and duties.
5. For applicants enrolled for exploration option, they must provide medical document that stated that the applicants are free of color blindness.
6. The most recent curriculum vitae - a brief history of your education, work experiences and skills.
7. Minimum of two references (no more than 12 months old) on official letterhead, supporting your scholarship application to study in ITB. References should be provided from your current employer and a former lecturer.
8. A 500 word statement describing the specific skills and knowledge you want to gain from your proposed study and how this will contribute to your current and/or future job.
9. A 500 word statement describing how your proposed area of study will enable you to contribute to the social or economic development of your home country.
10. A 500 word statement outlining your proposed research topic.
11. All statements have to be written in English.

Announcement: will be made available after Advisory Board first meeting.

All the above criterias will be posted through ITB and Star Energy website.

All the candidates will be announced by mid of July 2012 and start the academic program by first week of August 2012.

The detailed application form is provided in Appendix-1.

Task 3: ITB Geothermal Seminar

To satisfy the objective of this task, ITB as the host will organize three seminars per year. The seminar will be organized by ITB and Star Energy. USC and STAR Energy may participate in this seminar through video conference. Prospective speakers of this seminar are from various geothermal industries. Two speakers will be invited to each seminar. Expected participants are up to 150. This seminar is free of charge (sponsored by this program).

The expected results are to increase the number of students enrolled at ITB Master Program in Geothermal Technology, acceleration of geothermal field development initiated by central and/or local government, participation of private sectors in geothermal exploration and development activities. The first seminar

will be conducted in Bandung on the tentative date on 30 April 2012. The second seminar will be conducted in Sumatera island (Lampung/Padang/Medan) approximately in July and the third seminar will be in Jakarta/Surabaya/Manado in early November 2012.

Several major topics will be discussed in the seminars are (TBD):

The topics should be related to:

1. Historical of Wayang Windu geothermal field development
2. Geothermal exploration activities
3. Success story of geothermal development.

Task 4: Attendance of ITB faculty and students in conferences, seminars, and workshops

1. API annual meeting November 2012.
2. New and Renewable Energy Conference and Exhibition, Jakarta June 2012.
3. Geothermal Resources Council (GRC) Annual Conference and Exhibition, Reno, October 2012.
4. NZ Geothermal Workshop, November 2012

Task 5: Short Courses

a. Introduction to Geothermal System and Technology

This course is a compressed form of PB5001 (is a core course of Geothermal Master Program at ITB). The main objective of this course is to provide background knowledge on most aspects of geothermal energy resources and technology. This 7-days course includes two days field trip to geothermal area(s). The course will be conducted on the tentative date of 21 – 27 May 2012. The course will be offered to university staff members and local government officials responsible for exploration and development of number of geothermal areas. Number of participants is expected around 30. Half of the participants are funded through this program. The remaining half are professionals sponsored by industry (self-funded participants).

The detailed syllabus of this course is provided at Appendix 2.

b. Detailed Exploration Select a Test Site for Geothermal Resources

Objective of this course is to improve skills in exploration of geology, geochemistry and geophysics for geothermal resources. The course discusses three major topics of various methods of geology, geophysics and geochemistry used during exploration of geothermal or hydrothermal system. This 10-days course will include a day field trip to Wayang Windu Geothermal Field operated by STAR Energy Indonesia.

The course will be conducted on the tentative date of 18-27 June 2012. This program and will be held in the area nearby geothermal green field, such as Tangkuban Perahu (15 miles north of the city of Bandung). The course will be offered to university staff members and local government officials responsible for exploration and development of number of geothermal areas. Number of participants is expected around 30. Half of the participants are funded through this program. The remaining half are professionals sponsored by industry (self-funded participants).

The detailed syllabus of this course is provided at Appendix 3.

Tasks 10- Develop a semester long course on Introduction to Geothermal System and make it available to students from ITB

To satisfy the objective of this task, USC has conducted a thorough evaluation of the key topics to be included in a semester long graduate level geothermal course. Examining the existing text books and curriculum of other universities a course syllabus has been developed for this multidisciplinary course. Appendix 4 gives the details of this course, to be referred to as PTE506.

2- Other accomplishments-

- a. Developed a website for USC Center for Geothermal Studies (CGS): CGS.USC.EDU. We are expecting to receive instructions from USAID to provide directions for branding to report relevant accomplishments of this project and help with the public outreach objectives.
- b. Plans are underway to conduct a talk by ITB to be presented remotely for CGS Distinguished Lecture Program (DLP). This will be done in April 2012.
- c. We conducted an organizational tele-conferencing meeting with the USAID
- d. We conducted two organizational tele-conferencing meeting participated by USC, ITB and Star Energy representatives to discuss the current work plan.

Appendix 1

Application Form for USAID-STAR ENERGY SCHOLAR AWARD

Funded by:



USAID | INDONESIA

&

Star Energy Geothermal (WayangWindu) Ltd



In Agreement with:



USC University of
Southern California

In collaboration with:



Institut Teknologi Bandung (ITB)

USAID-STAR ENERGYSCHOLARS AWARDS

USAID-STAR ENERGY Scholars awards provide a range of opportunities for Indonesian citizens to develop their capacities, knowledge, and skills by performing a study and research at Magister Program of Geothermal Technology, Institut Teknologi Bandung.

GOAL

The objective of this program is to increase the capacity of available professional manpower in the geothermal sector in Indonesia. This includes manpower in the industries, government, and academic.

SCHOLARSHIP ENTITLEMENTS

The scholarships will be given to 10 Master degree students each year. It covers tuition and fees, books, and field trips required for every students during their study (maximum of 4 semesters program).

SCHOLARSHIP REQUIREMENTS

Prior to applying the scholarship, there is a number of requirements to be met:

Scholarship applicants must:

- have a minimum 3.25/4.00 cumulative GPA from previous study (undergraduate program).
- meet the minimum English language requirement from Institutional TOEFL of 550 or equivalent IELTS of 6.5
- meet the Academic Potential Test/TesPotensiAkademik(similar to GRE) minimum score of 500
- provide letter of statement that they will enroll as full time students at ITB Master Program
- provide formal letter of permission from employer to leave the work and study full time at ITB Master Program (for applicants that are currently employed)
- pass test and interview
- be less than 40 years of age by the time of admission (certificate of birth date is required)

For students whom the scholarship are granted, their performance will be evaluated every semester by academic committee.

SCHOLARSHIP CONDITIONS

Scholarship Awardees must:

- commence the study in academic calendar by the time the scholarship is offered
- complete the full study program in maximum 4 semesters during their scholarship program
- agree for a scholarship termination or cancelation at any time due to specific reason as follows: failure to make satisfactory academic progress or failure to complete scholarship award within the period as stipulated under contract between students and academic committee

- be in charge of being present in all lectures and tutorial, including fulfill the assignments (task and essay) and sit for the examinations
- actively participate in all activities related to the academic program held by Geothermal Technology Magister Program, including seminars, course, field trip or field camp
- be permitted from the employer to leave their work temporarily to be a full time student (for applicants that are currently employed)

DOCUMENTS REQUIRED

To help you ensure that you have fulfilled all the documents required, it is important to have all the lists below checked with thick mark (v) before you submit your application. All applicants must provide TWO copies of application form (**one original copy and one photocopy**), completed in English. Each copy of the application form must include:

- A signed application declaration
- A certified copy of birth certificate
- A copy of Identification Card (Passport or KTP – KartuTandaPenduduk)
- The most recent Curriculum Vitae (including brief history of study, work, competencies or skill)
- A certified graduation certificate
- A certified academic transcript
- TOEFL or IELTS test results
- TPA – Test Potensi Akademik, similar to GRE
- A current job description (confirming your position and outlining your responsibilities and duties) – If you are currently employed
- Two references on official letterhead from former lecturers or employer
- Medical document of color blindness for applicants enrolled for exploration specialization
- A 500 word statement describing the specific skills and knowledge you want to gain from your proposed study and how this will contribute to your current and/or future job.
- A 500 word statement describing how your proposed area of study will enable you to contribute to the social or economic development of your organization.
- A 500 word statement outlining your proposed research topic.
- A copy of your doctor's assessment
- All statements have to be written in English

FURTHER INFORMATION

Further information on the USAID-STAR ENERGY Scholars award, regarding eligibility, including the application process is available in the Magister Program in Geothermal Technology of ITB website at www.geothermal.itb.ac.id and Star Energy website: www.starenergy.co.id

Information as depicted below is important and required for applying application. Section A contains your personal details and ended with Section K with a declaration of validity and legality of all the information you have stated. Please be sure to complete all the fill-in form correctly for any misleading information is a serious offence under law of ITB and will result in the ITB withdrawing a scholarship, if offered.

<u>SECTION A: PERSONAL DETAILS</u>		
Name(s) <i>as stated in your birth certificate</i>		Attach a recent photograph of yourself (3x4)
Full Name(s) <i>as stated in your birth certificate</i>		
Gender (male or female)		
Date of Birth (DD-MM-YYYY)		
Place of Birth		
Please ensure you include your personal phone number and personal email address, so that ITB can contact you if required.		
Home Address		
Postal Number		
City/Province		
Home Telephone Number		
Mobile Telephone Number		
Email Address		
Work Address (if you are employed)		
Job Title		
Work Telephone Number		

<p>Name someone whom we can ask regarding to your intentions in applying the scholarship program. Make sure that someone listed below is he/she who can give answer regarding your application. You can name your former lecturer, employer, or relative families.</p>	
Name of Your Reference	
Relationship	
Telephone Number	
<p><u>SECTION B: PROPOSED STUDY PROGRAM</u></p>	
<p>Magister Program in Geothermal Technology of ITB has two field of study, specialization in Engineering and Exploration. To ascertain which fits to your qualification and interests, please visit our website at www.geothermal.itb.ac.id to have more detailed information related each specialization offered as there is a specific requirement regarding previous educational background (undergraduate background).</p> <p>Please tick the appropriate boxes (Note: You are not permitted to make changes if your application is accepted).</p> <p><input type="checkbox"/> Exploration</p> <p><input type="checkbox"/> Engineering</p>	
<p><u>SECTION C: ENGLISH LANGUAGE PROFICIENCY</u></p>	
<p>If you have completed an IELTS or TOEFL (no more than 12 months ago), please attach the certified test result.</p>	
IELTS/TOEFL Test Total Score	
IELTS/TOEFL Test Date	
<p><u>SECTION D: ACADEMIC POTENTIAL TEST</u></p>	
Academic Potential Test Score	
Academic Potential Test Date	

SECTION E: ACADEMIC BACKGROUND

Please state your academic background history from high school level.

Title of Program (e.g. Petroleum Engineering or SMU or SMK)	Awarding Institution (e.g. ITB, UI, etc.)	Period of Enrollment	Completed, Yes or No? When?	GPA (min. 3.25)	Academic Degree (e.g. Ir, ST, or S.Si)

List any scholarship you have previously received, including the donator/organization name, duration of qualification/course undertaken, and the date completed.

Donator/organization name	Name of qualification/course undertaken (including the city/country the course took place)	Duration and the date completed

SECTION F: PRIOR RESEARCH

Have you undertaken any research or has any of your work published?

- Yes
- No

<u>SECTION H: ORGANIZATIONAL EXPERIENCE</u>		
Organization	Role or type of involvement	Start date (month/year)
<u>SECTION I: WORK HISTORY (IF YOU ARE/WERE EMPLOYED)</u>		
This section covers your work history and current work situation.		
Current position title		
Organization/Category		
Start Date (month/year)		
Brief Description of your current job		

Will you return to your current job after your study?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Work History 1	
Position title	
Name of the Company/Category	
Start Date (month/year)	
Specific Responsibilities	
Work History 2	
Position title	
Name of Company/Category	
Start Date (month/year)	
Specific Responsibilities	

SECTION J: EMPLOYER ENDORSEMENT

If you are still working by the time the application submitted, you must complete this section. This section must be filled in by your employer.

Endorsed by Company	
Telephone Number	
Email Address	
State the reasons why you recommend this applicant	
Describe the specific qualification or skills you expect this applicant to gain from studying Magister Program in Geothermal Technology of ITB	

SECTION K : USAID – STAR ENERGY AWARD APPLICANT’S DECLARATION

1. I confirm and declare that the information submitted with this application is true and complete.
2. I acknowledge that giving false or misleading information is a serious offense under the criminal code and will result in the ITB withdrawing a scholarship, if offered.
3. I understand that at the time of enrollment I will be required to supply originals of all documents used to support this application.

Full Name	
Signature	
Date	

Appendix 2

Course Syllabus of Introduction to Geothermal System and Technology

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time	Mon. 21/5	Tue 22/5	Wed 23/5	Thu 24/5	Fri 25/5	Sat 26/5	Sun 27/5
8.00 – 9.00	1)Opening (15') 2) Introduction: geothermal as renewable energy and its role in Indonesia and the world	Manifestation and Geothermal fluid	TRIP TO TANGKUBAN PERAHU	Hydrothermal System and its Utilization	Geothermal Drilling	Power Plant Facilities (Production Facilities)	TRIP TO WAYANG WINDU
9.00 – 10.00	1) Geothermal System: occurrence genesis, manifestation 2) Definition and Classification	Concept, Method and Target in Exploration Geochemistry		Regulation and Geothermal Business Activities			
10.00 – 10.15	Coffe Break			Coffe Break			
10.15 - 11.00	Exploration Concepts and Methods	Estimation of reservoir fluid characteristics		Geothermal Fluid Characteristics and Steam Table	Geotehrml Well testing and Well Completion	Feasibility Studies	
11.00 – 11.45	1) Exploration Stages and Calculation of Speculative and Hypothetical Resource. 2) Possible, Probable-Proven Reserve	Gas and stable isotope in geothermal					
11.45 – 12.30	Lunch Break			Lunch Break			
12.30 – 13.15	Concept, Method and Target in Exploration Geology	Rock Physical Properties in a Geothermal system		Physical and Thermal Characteristics of Reservoir Rocks	Fluid Flow in Geothermal Well and Surface Facilities	Geothermal Field Management and Environmental Issue	
13.15 – 14.00	Remote Sensing Method	Concept, Method and Target in Exploration Geophysics					
14.00 – 14.45	Geological Field Mapping	Gravity – Geomagnet Method					
14.45 – 15.00	Heat Loss	Micro earthquake Method					
15.00 – 15.15	Coffee Break			Coffee Break			
15.15 – 16.00	Introduction Hydrothermal Alteration and Alteration Mapping	Electrical Resistivity method		Reservoir Characterization and Reserve Assessment	Steam Field (Production Facilities)	Geothermal Business Risk	
16.00 – 16.45	Core and Cutting Logging (Introduction to Borehole Geology)	Magneto Telluric method					
16.45 – 17.15	Refreshing						

Appendix 3

Course Syllabus: Detailed Exploration Select a test site for Geothermal Resources

Time	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
	Mon 18/6	Tue 19/6	Wed 20/6	Thu 21/6	Fri 22/6	Sat 23/6	Sun 24/6	Mon 25/6	Tue 26/6	Wed 27/6
8.00 – 9.00	Review in hydrothermal system	Geological Field Mapping	Concept, Method and Target in Exploration Geochemistry	Gas geochemistry	Micro earthquake Method	Geology, geochemistry and geophysics survey	Field Trip to Wayang Windu Geothermal Field	Feasibility study	Case 1	Case 2
9.00 – 10.00										
10.00 – 10.15	Coffee break							Coffee break		
10.15 - 11.00	Exploration Concepts and Methods	Geological Field Mapping	Water geochemistry	Soil geochemistry	Electrical Resistivity method	Geology, geochemistry and geophysics survey		Feasibility study	Case 1	Case 2
11.00 – 11.45										
11.45 – 12.30	Lunch break							Lunch break		
12.30 – 13.15	Concept, Method and Target in Exploration Geology	Hydrothermal Alteration and Alteration Mapping	Water geochemistry	Concept, Method and Target in Exploration Geophysics	Magneto Telluric method	Exploration drilling		Feasibility study	Case 1	Case 2
13.15 – 14.00										
14.00 – 14.45	Remote Sensing Method	Subsurface geology	Stable isotope geochemistry	Gravity – Geomagnet Method						
14.45 – 15.00										
15.00 – 15.15	Coffee break						Coffee break			
15.15 – 16.00	Exercise	Exercise	Exercise	Exercise	Exercise	Exercise	Feasibility study	Case 1	Case 2	
16.00 – 16.45										
16.45 – 17.15	Refreshing						Refreshing			

Appendix 4

PTE 506 – Geothermal Reservoirs

Instructor: Dr. Fred Aminzadeh: Mork Family Department of Chemical Engineering and Materials Science, Petroleum Engineering Program

Course credit: 3 units

Class Hours: Wed 11am – 1:40pm

Class Location: TBD

Office Hours: TBD

Teaching Assistant: TBD

Catalogue Description:

Overview of geothermal reservoirs, exploration and production, heat and mass flow in fracture network, enhanced geothermal systems (EGS), geophysical geological methods for exploration and exploitation of hydrothermal and EGS fields, well stimulation, forecasting and power generation.

Extended Course Description

This is a graduate course designed to introduce the fundamentals of geothermal energy exploration, production and power generation. The objective of the course is to provide students with the necessary foundations of key elements of geothermal resources. Different requirements for viable conventional (hydrothermal) geothermal reservoirs (heat, fracture system and fluid) will be highlighted. The necessary tools for predicting existence of such conditions such as characterization of fracture network, heat and mass flow, as well as steam generation will be discussed. The enhanced geothermal systems where at least one of the three components that exist in the hydrothermal geothermal is artificially generated, will be introduced. Well simulation, power generation and transportation issues as well as different typical applications of geothermal energy will be covered.

Course Vision and Objectives

This course is intended to provide an opportunity for graduate students in Petroleum Engineers and other engineering disciplines to learn about the technology associated with exploration, drilling, well completion, reservoir engineering and power plant design for various types of geothermal systems. Additionally the course will focus on enhanced geothermal system including issues related to fracturing, pressure maintenance and geophysics-based (eg micro-earthquake / conventional seismic) fracture characterization.

Prerequisites

The material in this course would require familiarity with differential and integral calculus, and general reservoir engineering and seismic data. Familiarity with MATLAB is useful but not essential.

Textbook:

Geothermal Reservoir Engineering, Malcolm Alister Grant & Paul F Bixley Elsevier, 2011

Grading:

Homework	20%
Midterm	20%
Term Project	30%
Final	30%

Expectations for Assignments, Exams, and Projects:

Homework assignments will be given on a weekly basis [3-4 hrs/week].

The Midterm and Final will consist of a written exam. Questions will include both qualitative issues to gauge general understanding of the subject matters by the students as well as problems requiring actual calculation based on equations discussed during the class.

The Term project will be a collaborative analysis among team members of an integrated case study, requiring the application of a variety of methods commonly used in geothermal resource exploration and development. The students will be assigned to work on different geothermal field, each having a specific challenges including expansion of the capacity, characterization of the field and design of power plants for optimum utilization of the generated steam from the fields as well development of new “Enhanced Geothermal Systems”. The project grade will be based on a report to be submitted by each team member on their individual contributions and a team report submitted at the end of the course. It will also be based on an oral presentation by each team member summarizing the results.

Course Schedule

Week #	Topic
1	Overview of Geothermal Reservoirs Reading Chapter 1-2 Textbook Class Exercise in Energy Modeling Equivalency of a geothermal power plant with other power generating fuels.
2	Vapor and Liquid Dominated Systems- Chemistry of Geothermal Fluids Homework 1: Thermodynamic aspects of geothermal systems (due) week 4 Reading: Chapter 3 and Appendix 3 Class Exercise: Liquid dominated Systems with and without influx Supplemental Reading: Corrosion of Piping Under Insulation in Geothermal Energy Extraction Processes Darrell L. Gallup, NACE paper 03025
3	Exploring for geothermal fields-Electromagnetic-Chemical and geophysical methods Reading: Louise Pellerinet al GEOPHYSICS, VOL. 61, NO. 1 (JANUARY-FEBRUARY 1996); P. 121–130
4	Hydrothermal geothermal systems: heat, fluid and fracture Reading: Chapter 10
5	DRILLING AND PRODUCTION TECHNIQUES IN GEOTHERMAL RESERVOIRS. Homework 2: Wellbore Design – Casing and Cement (Due Week 6)
6	Down-hole measurement in geothermal wells and their interpretation Reading: Chapter 4-6 Homework 3: Interpretation of geothermal Logs (Due Week 7)
7	Completion and testing of geothermal wells, special tubular, heat losses

	Homework 4: Well Design for a vapor dominated system (Due Week 8)
8	Midterm Exam
9	Enhanced geothermal systems (EGS) Reading Chapter 14 Class Discussion: A Coupled Flow-Geomechanics Model For Fluid And Heat Flow For Enhanced Geothermal Reservoirs ARMA 11=213 Case studies.
10	Stimulation of hydrothermal and EGS reservoirs Class Discussion: Problems and opportunities Simulating Complex Fracture Systems In Geothermal Reservoirs Using an Explicitly Coupled Hydro-Geomechanical Model AMA 11-244
11	Characterizing geothermal reservoirs with geological, geophysical (MEQ/EM and conventional seismic) and log data Homework 5: Interpret data from a liquid dominated system (Due Week 11) Assignment of Team Term Projects: Design the development plan including drilling, completion and pressure maintenance and power plant for a newly discovered vapor dominated system. Due week 15.
12	Reservoir Engineering aspects of geothermal reservoirs: Field examples from the Geysers,(N. California) and Java (Indonesia) Reading: Chapter 12-13 Supplemental Reading: Modeling of Geothermal System SPE 13613 (Bodvarson et al) Class Review: Analysis of Internal Steam Drive in Geothermal Reservoirs J C Martin SPE 5382
13	Power production from geothermal fields Homework 6: Design of flash and a binary cycle. (Due week 14) Class discussion: Implementation of Efficient Plant Designs in a Time Constrained Market. SPE 121360
14	Management of geothermal reservoirs-Pressure Maintenance-Forecasting Reading Chapter 11. Case studies
15	Team Term Project Presentations:
	Final Exam