Geothermal Workforce Education Development and Retention

Great Basin Center for Geothermal Energy, University of Nevada, Reno

Dr. James Scott, Associate Director
Dr. ?, Director

Project Title: Geothermal Workforce Education Development and Retention
May 19, 2010

Principal Investigator: ?
Presenter Name: Jim Scott
Organization: Great Basin Center for Geothermal Energy, Univ. of Nevada, Reno

Track Name: Analysis, Data System and Education

This presentation does not contain any proprietary confidential, or otherwise restricted information.
• **Timeline**  
  Project start date: 1/15/10, project end date: 2014,

• **Budget**  
  Total project funding: $9M, FY10: $995,000

• **Barriers**  
  Courses’ importance to industry; sufficient enrollment.

• **Partners**  
  The University of Nevada, Reno (PI - ?) – Host organization  
  The University of Utah (PIs - Joe Moore and Pete Rose)  
  Stanford University (PI - Roland Horne)  
  Cornell University (PI - Jeff Tester)  
  Oregon Institute of Technology (PIs - John Lund and Toni Boyd)  
  Southern Methodist University (PI - David Blackwell)
National Geothermal Institute (NGI) Project Objectives and Location.

• Establish an NGI.
  • Institute will provide instructional programs to educate and train the next generation of U.S. scientists, engineers, plant operators, technicians and policy makers.
  • A consortium of institutions is required to provide necessary depth of expertise in geothermal energy.

• University of Nevada, Reno (UNR) is the host organization.
  • Reno is the home location for many geothermal energy companies.
  • UNR’s Redfield campus is located next to Ormat’s operating geothermal plants that are a resource for hands-on learning.
Redfield Campus, U. Nevada, Reno

Principal Investigator: ?
Presenter Name: Jim Scott
Organization: Great Basin Center for Geothermal Energy, Univ. of Nevada, Reno
Track Name: Analysis, Data System and Education
Seeking Industry Feedback

• Course development at NGI will be based on the needs of the geothermal energy industry.
  • The target client for our courses is either:
    • a university student,
    • employed, seeking knowledge of the most advanced techniques,
    • seeking employment in the geothermal industry,
    • considering investing in the industry.

• A list for curriculum review composed of 113 people directly involved in the industry was compiled, including email addresses.
  • The individuals selected are likely to have the best insights into educational needs.
A preliminary “straw man” curriculum was prepared to stimulate comment.

Eight proposed courses cover important aspects of geothermal energy:
1. Introduction to Geothermal Energy Utilization;
2. Geothermal Business Principles;
3. Public Policy, Permitting and Environmental Issues;
4. Exploration I;
5. Exploration II;
6. Reservoir Engineering and Management;
7. Power Plant Design and Construction;
8. Direct Use;
Also included: Field Trips and an Individual Project.
• Questionnaire was sent as a PDF with active “radio” buttons.

• Course and individual topics are scored 1-5
  • A “No” column for “No opinion”.
  • Scoring: 1 = little importance, 5 = most Important.

• A comment/suggestion field allows recipients to communicate their thoughts on each course.
Questionnaires were emailed to 113 individuals.

- 21 responses received and tabulated.
- Response rate 21/113 = 19%
## Statistical Values

<table>
<thead>
<tr>
<th>Course</th>
<th>Average Value</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Introduction to Geothermal Energy Utilization</td>
<td>4.32</td>
<td>1.11</td>
</tr>
<tr>
<td>2: Geothermal Business Principles</td>
<td>3.60</td>
<td>0.94</td>
</tr>
<tr>
<td>3: Public Policy, Permitting and Environmental Issues</td>
<td>3.80</td>
<td>0.89</td>
</tr>
<tr>
<td>4: Exploration I</td>
<td>4.30</td>
<td>0.98</td>
</tr>
<tr>
<td>5: Exploration II</td>
<td>4.26</td>
<td>0.93</td>
</tr>
<tr>
<td>6: Reservoir Engineering and Management</td>
<td>4.39</td>
<td>0.78</td>
</tr>
<tr>
<td>7: Power Plant Design and Construction</td>
<td>3.78</td>
<td>1.26</td>
</tr>
<tr>
<td>8: Direct Use</td>
<td>3.26</td>
<td>1.19</td>
</tr>
<tr>
<td>Field Trips and Individual Projects</td>
<td>4.55</td>
<td>0.60</td>
</tr>
<tr>
<td>Power Plant Operations - a technician course offered through Truckee Meadows Community College</td>
<td>3.84</td>
<td>1.38</td>
</tr>
</tbody>
</table>
Preliminary course topics were revised to reflect questionnaire comments.

• Example follows for Reservoir Engineering course.

• Original 7 topics expanded to 11.

• Lower emphasis on seismic methods.
Course 6: Geotherm 204- Reservoir Engineering and Management
This is an upper-division college course covering the basic principles of reservoir engineering and management. Reservoir characterization methods are presented as well as the elements of managing the resource.

**Topics covered:**
1. Reservoir/Resource Characterization.
2. Seismic attributes of geothermal reservoirs.
4. Tracing flowpaths with MEQs.
5. Reservoir management.
6. Injection well strategies.
7. Scaling prediction and control.
Course 6: **Geotherm 204- Reservoir Engineering and Management**

This is an upper-division college course covering the basic principles of reservoir engineering and management. Reservoir characterization methods are presented as well as the elements of managing the resource.

**Topics covered:**
1. Reservoir / resource characterization overview.
2. Reservoir modeling, thermodynamics.
3. Reservoir decline analysis, calculating reserves.
4. Well testing, tracer testing and interpretation.
5. Production logging (long-term temperature and pressure monitoring and interpretation; data storage and retrieval).
6. Injection management.
7. Natural recharge / cooling.
8. Corrosive fluids, scaling prediction and control.
10. EGS.
11. Seismic analysis of geothermal reservoirs.
Curriculum Development Workshop

• A one- or two-day workshop will be convened in Reno;
• Agenda:
  • Questionnaire results and “straw man” curriculum discussion,
  • Consortium partners will make presentations in their areas of expertise,
  • Input from industry representatives will be integrated,
  • Curriculum development assignments will be made,
  • A report summarizing results and conclusions will be prepared.
Workshop Participants - Co-PIs

The University of Nevada, Reno (PI - ?; Workshop Organizer – Jim Scott ) – Host organization
The University of Utah (PI - Joe Moore)
Stanford University (PI - Roland Horne)
Cornell University (PI - Jeff Tester)
Oregon Institute of Technology (PIs - John Lund and Toni Boyd)
Southern Methodist University (PI - David Blackwell)
Workshop Participants - DOE representative and Industry Collaborators

DOE - Nicole Reed
Ram Power - Christy Morris
Ormat - Charlene Wardlow
Enel - Andrew Rael
Nevada Geothermal Power - Kim Niggemann
Vulcan Power Co. - Jim Combs
SAIC - Sabodh Garg
Magma Energy, Reno - Walter (Dick) Benoit (not available in June)
Significant Meetings

Meetings were held to:
1. Explore possible NGI cooperation with U.S. Dept. of Labor training/placement programs;
2. Determine requirements for obtaining UNR credits and certificates for NGI courses;
3. Logistical and administrative services available for NGI at the Redfield campus;
4. Discuss a proposed Geothermal Plant Operator Course from TMCC;
5. Teleconference with our consortium members on a proposed curriculum;
6. Discuss the relationship of NGI to UNR’s Alternative Energy Minor;
7. Discuss collaboration with the University of Auckland in New Zealand.
Meetings – NevadaWorks – 2/2/10

• NevadaWorks is an organization funded by the U.S. Dept. of Labor to train and place clients in the local workforce.
  • JOINT = Job Opportunities in Nevada.
• We (NGI) presented our plan to provide courses and certification.
• NevadaWorks represents a possible NGI cooperative effort.
• Expecting a U.S. Dept. of Labor model RFP in April.
Scott and Shevenell met with 5 representatives of UNR Continuing Education to:

1. Determine requirements for obtaining UNR credits and certificates for NGI courses:
   - Certificates can be awarded with minimal difficulty; UNR credits somewhat more.
2. Discover the logistical and administrative services available for NGI at the Redfield campus:
   - Services such as transport, lodging, certification, tuition collection & disbursement are available at negotiable cost.
Meetings – TMCC Geothermal Plant Operator Course Advisory Committee 02/04/10

• Community college training for geothermal plant operators.
• Committee members from industry (4) and academia (7) guide curriculum development.
  • Shevenell and Scott are committee members.
• Course complements NGI curriculum.
  • Redfield campus serves both TMCC and NGI.
Consortium Teleconference 2/12/10

• Call used teleconference application allowing on-line viewing and editing of documents.

• Summary of recent meetings was presented:
  1. NevadaWorks 02/02/10
  2. UNR Continuing Education 02/03/10
  3. TMCC Geothermal Plant Operator Course Advisory Committee 02/04/10

• Proposed list of geothermal course topics and possible instructors:
  • Proposed curriculum edited during meeting.

• List of industry contacts with email addresses/websites: List approved
Meetings – Advisory Committee for UNR Alternative Energy Minor 1/29/10

• An Alternative Energy Certificate is being prepared for the UNR curriculum.
• Minor requires 15 upper-division credits.
• NGI curriculum to provide credits.
Meetings – University of Auckland, New Zealand

• Meeting during GRC - October, 2009.
• Met with representatives from New Zealand’s Institute of Earth Science and Engineering (IESE), Univ. of Auckland; and Auckland UniServices Ltd.
• Draft Letter of Agreement received offering to share expertise in geothermal education and geothermal research and development.
GBCGE Educational Mission

- Graduate Student Education
- Interdisciplinary Renewable Energy Minor
- Graduate Certificate in Renewable Energy
- Technician Training – Truckee Meadows Community College (TMCC)
- National Geothermal Training Institute – Redfield Campus