

Princeton Energy Resources International, LLC

Technical Report 9846-019/03-3A

**Preserving the Geothermal R&D Legacy:
E-Archiving 25 Years of U.S. DOE Research**

Task: Geothermal Studies and Analyses
Subtask: 3a. Geothermal Data and Report Preservation
Report: 03-3A. Possible Modification of Existing Collections

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1.0 SUMMARY

1.1 The Project

In this project, PERI is helping the Geothermal Technologies Program of the U.S. Department of Energy (DOE, Washington, DC) figure how to improve the availability of a great deal of technical information about U.S. geothermal resources and technologies that has resulted from U.S. government-sponsored research on geothermal energy since 1974.

The project is figuring out how to archive -- in electronic form -- the most important paper reports that resulted from the research. The program budgets since 1974 (including ERDA outlays) have been on the order of \$1.5 billion. Many significant things have been learned and developed. The current generation of researchers needs to be able to find and retrieve many of the reports, to know what worked and what didn't in the past.

1.2 Identifying What to Preserve

PERI has begun interviewing principal staff of the geothermal research teams at the National Laboratories and other laboratories and researchers supported by the Geothermal Program. Because these are the folks that know this literature the best, their recommendations will be the most important concerning what to save.

PERI will also broadcast a request for further nominations and suggestions to the members of the Geothermal Resources Council (GRC) via a email in the near future.

1.3 Selecting What to Preserve

The step of selecting what to preserve could be complicated. We believe the universe of reports contains about 20,000 items. It could be greater, since GRC says it has at least 60,000 geothermal items, but most of those are not Federal reports. If a large number of reports are nominated, then PERI will work with the principal staff of the Geothermal Technologies Program at DOE Headquarters and the National Labs (Nix at NREL, Hoover at SNL, Renner at INEEL, and possibly someone from LBNL, BNL, LLNL, and LANL) to winnow down the pile.

For this to work, PERI will develop, soon, an ACCESS database to track the nominations.

Another important question is whether the DOE Geothermal component should try to assemble a database of citations to "all" known Government-sponsored geothermal research reports.

1.4 Selecting the Preservation Organization

We will call the organization the Geothermal Legacy Report Organization, or GLRO. This, of course, will be complicated, for a number of players are beginning to sense some funding and continued influence.

The leading contenders for the role of GLRO are:

1. OSTI. This the main technical information archiving organization for DOE as a whole. It has citations, and descriptions or abstracts, for about 15,000 geothermal reports. The dates of these start well before the founding of DOE proper in 1978. It has more than 1,770 full text .PDF files of relatively recent DOE-sponsored technical reports.
2. EREN/NREL. The "National Renewable Energy Laboratory" might be a good home for geothermal. EREN showed about 8,300 links to "geothermal" Web pages in early June, 2003. Most of the links are to high-level "review" reports. The interface is inconvenient, and the retrieved descriptions are brief, rather than abstracts.

NREL/EREN would have to build more experience in storing and retrieving technical reports. NREL is becoming more used to including "geothermal" more intimately in the "renewable energy" family. Working with this site must include consideration of the "DOE Geothermal Technical WebSite at INEEL."

3. GRC. This is where folks from the geothermal industry might look first. The funding for the library catalog is heavily dependent on DOE Geothermal Program direct funding. Locating a major resource here would give the GRC a shot in the arm. But the long term existence of this organization is not as certain as that of NREL and OSTI.
4. NTIS. This is the U.S. Government primary center for preserving old technical reports. As such, its function overlaps that of OSTI in the energy arena. NTIS is located in Springfield, VA, just outside of Washington, D.C.

Evaluation

We have developed initial working criteria for what would be a good archiving site. These are in Section 3.3 below.

OSTI fits most of our working criteria relatively better than other sites. The main reasons for this judgement are:

- (a) OSTI staff's extensive experience in this kind of work.
- (b) A relatively high degree of certainty that this function will be survive and be well supported for a long time at OSTI.
- (c) Anyone can retrieve most of the reports for free, from OSTI.

It is not clear that EREN (NREL) has run this kind of system with anything but a relative handful of technical reports. The current EREN Geothermal site provides access mainly to Web links to pages with broad general contents.

The GRC is just beginning to experiment with full text retrieval. NTIS charges hefty fees for every e.report.

Regardless of which site is chosen, we probably have the option of moving e.reports or copies of them from an initial site to others.

PERI notes that it is likely that any decision-making in this regard will be politically charged among one subset of the geothermal community or another. Some would support the GRC as a primary site to help the GRC remain a stronger institution. NREL will find favor from some parts of the geothermal community, and perhaps the DOE management at the Office of Energy Efficiency and Renewable Energy.

1.5 Specifying an "Ideal" System

A number of issues of usability should be addressed early. One way to get at that quickly is to posit a prototype system design, and let others take pot shots at that. So here is PERI's "Strawman" system. (See Section 4.5 for more details.)

- a. All of the reports should be in a highly readable form. We need to find out why PDFs from some places are better than others, and figure how to get the best formats.
- b. The reports must be searchable on words in the full text, not just keywords.
- c. Some of the geothermal reports, but not all of them, should be accessible from regular Internet search engines. Entingh believes that two forms of material should be findable on the main Internet by using Google or other search engines:
 1. Seminal review articles about key areas of geothermal technology, and
 2. New annotated background reports about the main areas of geothermal development and historical research have been.

These "front-line" reports should be posted at the NREL EREN site and/or the INEEL "Technical" Site. The remaining reports can be "hidden" behind a local search engine, Google-like, at OSTI, NREL, GRC, etc.

1.6 Initial and Later Postings

- a. We should try to post any reports that we have in e.form from the hydrothermal research groups. The initial batch could come from LLNL. See the Kasameyer interview.
- b. PERI has copies of about 400 HDR reports, in e.form, from the LANL experience at Fenton Hill. Only a few of these should be posted quickly, the others a year or two from now, after many hydrothermal reports have been posted. Otherwise, naive users will believe that a large fraction of DOE's research has been on HDR.

- c. SANDIA notes that it would be loathe to part with its copies of reports for scanning. We might have to make sure that much scanning and indexing can be done on a Lab-local basis, with support from HQ for that.
- d. In general, recent technical reports and those going forward from today are likely to be in e.retrievable form from the beginning. DOE HQ will need to encourage those in the National Labs to do the additional work necessary to find, catalog, and convert to e.form the legacy reports. It is likely that Laboratory technical staff will be best able to do this if they work in concert with the central document library of their respective institutions.
- e. We need to consider the possibility of getting at least abstracts posted into the main system for reports not originated at the National Labs. Those of interest include all of the GRC Transactions and Bulletin Articles, GeoHeat Center reports, the contents of the journal *Geothermics*, the contents of the proceedings of the Stanford University annual geothermal reservoir workshops, and the contents of the proceedings of the two World Geothermal Congresses (1995, 2000) and future versions of the same. Also, access to other research conducted in Europe in general, Iceland and Italy in particular, Japan, and New Zealand should ultimately be present at citations.

No system will be generally useful unless it lets the research user gain access to at least citations from all of these sources.

2.0 BACKGROUND

The project is being done by PERI, under DOE funding via the National Renewable Energy Laboratory. Dan Entingh, PERI, is leading the project. Ed Eugeni is the principal collaborator at PERI. Walter Short and Paul Stern of NREL are monitoring and collaborating. This is the first of three progress reports.

2.1 Purpose

The purpose of the project is to:

- a. Determine which geothermal technical products are significant and should be retrieved, archived, produced electronically (PDF), and posted on the Internet in one central location.
- b. Determine which information agency, or agencies, is best suited to assist the Geothermal Program with preserving and making these significant reports available to the geothermal community.
- c. Identify important storage and retrieval issues as the project proceeds.

2.2 Approach

The main approach is to discuss the goals and options with experts. More than one kind of expert is important here:

- a. Geothermal scientists and engineers who generated the information, use it now, and will continue to use it.
- b. Experts on storage and retrieval, particularly at OSTI, NTIS, GRC, and NREL/EREN.

Most of the work on this project is to clarify the typical interests and issues related to moving a significant collection of materials to electronic forms of storage and retrieval:

- What should be preserved?
- Where should the information be stored?
- How can we optimize awareness of the availability of the information?
- What options would allow future users to retrieve titles, abstracts, full text, etc. as easily as possible?
- How much will this cost? Initially? And then on a maintenance basis?

We believed at the beginning that no one could identify all the most important issues at the beginning of the project -- that many issues would emerge as we worked with others. Even the few initial interviews documented here are bearing this out.

3.0 REQUIREMENTS AND METHODS

3.1 Find the Nominators

PERI believes the following nominators are the most important in this process.

DOE Headquarters Staff

Washington, DC, staff have had much experience in helping congressional constituents find important information. Those interviewed should include at least: Dr. Roy Mink, Dr. Allan Jelacic, Dr. Marshall Reed, Ray Fortuna, Ray LaSala, and Susan Norwood. Staff of the Energy Information Administration should also be interviewed, particularly Thomas Petersik, who follows geothermal energy for that sub-agency of DOE.

National Laboratories

PERI is contacting the following national laboratories to determine who maintains and manages their websites, including report/information distribution sites that present geothermal findings to the geothermal community and the public:

- Sandia National Laboratory
- Los Alamos National Laboratory
- Lawrence Livermore National Laboratory
- Lawrence Berkeley National Laboratory
- National Renewable Energy Laboratory
- Idaho National Engineering and Environmental Laboratory
- Battelle Pacific Northwest Laboratory
- Oak Ridge National Laboratory
- Brookhaven National Laboratory

Companies and Universities

We intend to contact the following companies and universities to determine who maintains and manages their geothermal information including websites and information distribution sites that present findings to the geothermal community and the public:

- University of Utah Earth and Geoscience Institute
- University of California San Diego
- Stanford University
- University of Kansas
- Princeton Energy Resources International (Dan Entingh)

Other nominators will surface as we proceed. The interview script addresses this explicitly.

3.2 Identify Reports to Preserve

Identify, through interviews and other means, the reports that are important to the private and public geothermal community to preserve through improved archiving, referencing, and full-text report access via the Internet.

- The interviews will primarily focus on those individuals at the National Laboratories and DOE Headquarters who are currently involved in the geothermal community.
- In addition, we will solicit recommendations from individuals in the industry via Geothermal Resources Council broadcast announcements.

We have initially concentrated on interviewing thought leaders from the geothermal research groups at the National Laboratories. We believe they have better awareness than many workers in the industry of what R&D has been done in the past, and we assume they have a reasonable sense of values about what is important to preserve.

Our script for the interviews is in Appendix A, Item A-4. The script also addresses issues of the degree to which the National Lab geothermal groups have already been electronically archiving some of their work.

Our current working list of reports that seem important to preserve is contained in Appendix B.

3.3 Criteria for a Repository System

PERI believes there are a few strong requirements that will greatly affect the decision:

- a. The Geothermal Legacy Report Organization (GLRO) will have to have had significant experience in report collection, preservation, and electronic retrieval.
- b. Retrieval of full text is essential. This means that the GLRO will have to have quite capable servers, and be familiar with the use of local search engines. Other capabilities of value include web page designers, web technicians, database management.
- c. The U.S. world and geothermal communities should have easy access to the system. If they are not aware of the selected provider for the GLRO, its existence will have to be broadcast.
- d. The use of the system and retrieval of full text reports should be free or at very low cost. This means that some ongoing subsidy from DOE will be required. This could be most stable and easiest to manage via OSTI or EREN/NREL.
- e. Good working relationship with DOE HQ and/or lab staff.

3.4 Selecting Significant Reports

A number of issues are emerging as we starting getting nominations. For example:

- a. How will "we" decide that something is important enough to archive?
- b. Should we maintain the identity of nominators? Probably, unless they say they don't want their suggestions be attached to their ID.

3.5 Steps to Capture Reports

a. Reports at the National Labs

The most logical steps for this appear to be as follows.

1. With the aid of staff suggestions or recommendations from others in the geothermal community, the geothermal team at each Lab would identify the documents that should be preserved.
2. Through some process of voting or small committee work, "DOE" would finalize decisions about which reports to archive.
3. Next, someone at the Laboratory would determine if the OSTI already has an electronic copy of any of the reports that were deemed significant for preservation.

(This also could be done by a contractor. However done, someone will have to pay for this, unless we can figure a very clever way to avoid extra searching, cataloging, etc.)

4. If not, the lab would have to find a clean copy (hard copy) of the report and submit it to the OSTI for archiving, processing, and posting on the Internet.

We have already found that Labs might not want to participate in a process like this, for lack of time, fear of losing last copies of reports, etc. In some cases, a consultant might have to be sent to a Lab to help it harvest some of the more important legacy reports.

b. Reports Not at The National Labs

It is likely that a number of reports that are labeled as significant will not be found at the National Laboratories, but copies of these reports may exist at storage locations with significant geothermal technical collections. These are expected to include the Geothermal Resources Council library, OSTI, INEEL, NTIS, and PERI in some instances.

If that is the case, a copy of the report would have to be borrowed or purchased from the secondary source and submitted to OSTI for archiving, processing, and posting on the Internet.

The ideal scenario would be to work closely with the GRC and assist geothermal researchers in identifying significant reports as well as submitting the reports to a single location for storage in an online database with a search engine. The GRC will continue to maintain their Transactions, a collection of technical reports presented at the GRC fall annual meetings from 1979 to present. These reports are not (yet) available electronically, and the GRC charges a fee for a majority of the reports.

c. Harvesting Reports Already in Electronic Form

- OSTI

OSTI staff say they mine other sources for energy-related e.documents. We need to find out more about this. E.g., can OSTI staff mine Geothermal .PDFs at NTIS, at low per unit cost?

- HOT DRY ROCK Reports

PERI has all of the LANL Library's .PDFs on Fenton Hill project work on zip discs, and will convert them to CD-ROM soon. PERI's collection does not include review articles, technology development reports, and exploration work outside of Fenton Hill.

Warning: Placing these all at OSTI could make it look like HDR was the main emphasis of the DOE Geothermal program.

d. Harvesting Reports that are Only in Paper Form

OSTI can scan and convert to .PDFs. We have a price quote. Scanning -- and posting to the OSTI Information Bridge -- 500 reports of 200 pages each, 100,000 pages in all, would cost \$16,000. That's \$32 per 200 page report, 16 cents per page. This strikes PERI as relatively inexpensive. Note at the interview of Ted Clutter, GRC, that he's found a vendor that will do similar work for 86 cents/page.

Action: It appears that the OSTI Gray Literature reports are full-text searchable. We need to find out if all .PDFs are full-text searchable, or what scanning options must be used to make them so.

3.6 Find Ways to Minimize Users' Searching Efforts

We need to figure out how to minimize the search work required to find the reports.

- The essence of archiving is to enable retrieval, not just storage. Now, GRC and OSTI are the two best places to search for bibliographic info.
- At a minimum, the various DOE and Lab Geothermal Web sites should point to both OSTI and the GRC library as the primary sites for searching for bibliographic materials and full text.
- Could two sites have a catalog that contains the "geothermal" bibliographic materials at both sites, and indicates that you can get a cited report from one site or the other? In a sense this sounds silly, but it could be important if OSTI flags a *GRC Transactions* or *Geothermics*

report that is available only from the organization that owns the report, for a fee.

One key requirement that this issue points to is that we need to see if we can standardize large parts of the formats that the various organizations now use for indexing and retrieving reports. This would facilitate harvesting and indexing.

3.7 Working Tool: Make an index of all known reports?

At very least, we need to build up a database that indexes all the reports that we are working with to try to preserve. This will be a key management tool for this project. It is likely that PERI will build an ACCESS database to manage this in the short term. We probably need to talk to OSTI regarding how to structure such a database so that its contents can be compared to what OSTI (or NTIS also?) have in its system.

At some point we probably should have a working index to all of the DOE sponsored reports that we and the labs know about. This should be built up from lists that already exist, if possible. Someone must have experience in having done this, e.g., the legal community searching through lists of evidence and clues from different sources.

- Should this be best done at OSTI?
- Could a search done at OSTI search show that other libraries, e.g., GRC and INEEL Geothermal Library, hold significant items? Can and would GRC and INEEL Geothermal group be willing to export their bibliographic lists to OSTI, for merging?
- Can the software at OSTI generate a master list of geothermal reports that could be searched by ACCESS at DOE LAB and contractor sites, while we are getting this act together?

3.8 The Ideal

From the authors' work on extensive bibliographic research, the ideal result would be if every article that was preserved/archived under this result could be found from the Internet via a search engine like Google. Absent that, there should be have a Google-like engine at site in front of this collection, so that intense searching over full text, would be the next best thing.

We all know by know that searches based on pre-set keywords alone are much less useful than the full-text searches that have evolved over the internet. For example, as of June 4, 2003, Google Advanced Search came up with 398,000 hits for "geothermal". Searching for "geothermal" AND "wind" gave 121,000 hits, which is a reasonable assumption for the upper bound of information consolidated for "renewable energy". That leaves 270,000 hits at least for relatively more-specific geothermal information. You'd get nothing like this amount from a keyword-only searching system.

4.0 PROGRESS AND RESULTS

4.1 Interviews Conducted

Key information from the following is scattered about this report, and detailed in Appendix A.

- OSTI Staff
- NTIS Staff
- GRC, Ted Clutter
- Lawrence Livermore NL, Paul Kasameyer
- Sandia NL, [Contact]

4.2 Notes on National Laboratory Geothermal Web Sites

There are many inconsistencies among these websites with respect to appearance and depth of content available.

It would be useful if each of the national laboratory websites could be indexed and standardized a bit:

- a. Provide separate obvious ports to both the local geothermal group's recent technical reports and the main public search engine of the entire Laboratory.
- b. Provide links to the primary funding agency (e.g., DOE at EREN and INEEL) and the principal U.S. and world geothermal information retrieval systems. Get consensus so that these links will appear to be more or less the same everywhere, and include roughly the same annotations as the value of each link.

4.3 Candidate Repository Systems

Identify and select existing organizations and systems that would be useful repositories.

What we believe are the main "leading" candidates for this role are described here.

a. OSTI

OSTI is the Office of Scientific and Technical Information, U.S. Department of Energy. This the main technical information archiving organization for DOE as a whole. It has energy abstracts for many reports on energy done well before the founding of DOE proper in 1978. It has more than 1,200 full text .PDF files of relatively recent DOE-sponsored technical reports.

Scope of (OSTI) Services. OSTI has the ability to receive, capture, or harvest hard copy or electronic legacy files. Hard copy files are scanned and then turned into an electronic document for web posting.

OSTI has a harvesting program where they capture files that are posted on government agency or national laboratory websites, process them, then post them on the OSTI website as part of their searchable database. In addition, OSTI could develop a stand-alone and searchable geothermal database with a web interface located on the Internet. All of the files located in the OSTI database are

free to download by anyone. OSTI does charge a fee for the dissemination of hard copies.

Since OSTI already manages several thousand geothermal reports, as many as 16,759 returns were yielded during one particular search of the Energy Citations section of the OSTI site, they should host and manage the main collection of geothermal legacy reports that are compiled during the upcoming effort. In addition, OSTI can utilize their close working relationship with the National Technical Information Service (NTIS) to obtain geothermal technical reports that they may not currently possess.

OSTI is extremely interested in assisting the preservation of legacy reports for the Geothermal Program. They are doing similar work for a number of other DOE R&D programs, so can be expected to be skilled in help and advice.

OSTI estimates a cost of \$16,000 to scan 500 documents (of 200 pp. each) and post to the DOE Information Bridge.

OSTI Site navigation has markedly improved in the past two or three years.

But we believe that relatively few seem to use this site, since it was off limits to all but contractors until recently, and somewhat clunky to use until recently.

We have a quote from OSTI re cost of scanning technical reports, archiving them at OSTI, and making them accessible via OSTI's main search links.

b. EREN/NREL

EREN is the main web-site builder for the DOE Office of Energy Efficiency and Renewable Energy Office. We believe that EREN is a staff function of NREL, but we are not sure of that. NREL, the National Renewable Energy Laboratory, would be a good home for geothermal, once NREL gets more used to including "geothermal" more intimately in the "renewable energy" family.

The web-site home page for the DOE Geothermal Technologies Program is at EREN. The DOE Geothermal Program maintains a second home-page-like "Technical WebSite" the Idaho National Engineering and Environmental Laboratory. (Don't look for "INEEL" on the Internet, look for INEL, the prior name.)

These two sites are in addition to the geothermal collections/websites at each individual National Laboratory.

Geothermal Website

- Go to DOE homepage www.energy.gov
- Select Energy Sources & Production
- Select Geothermal <http://www.eere.energy.gov/geothermal/>

Idaho National Engineering and Environmental Laboratory

- DOE Geothermal Technical Site <http://geothermal.inel.gov/>
- A number of important reports are accessible here, particularly the Geothermal Program "Project Update" compendia of recent years. However, these are difficult to use if you don't already know what you are looking for.
- This is a good example of e.files that should be edited to improve accessibility. An index to major key words would be very useful. It would be even better if these reports were separated into separate technical items that could be found using a search engine.

ACTION: Here we need to find out if EREN/NREL or (the INEEL group) have substantial experience in managing a significant collection of technical reports. By the time this system matures, it is almost certain to contain 40,000 references items and 10,000 to 20,000 report files as full text.

c. GRC

GRC is the Geothermal Resources Council, Santa Rosa, CA. What is most important here is the **Geothermal Research Council On-Line Library**. This is a web-accessible card catalog of GRC report holdings. It does not have abstracts or full text. Nevertheless, it is extremely useful for finding citations to old reports, if you have a bit of an idea of what you are looking for.

The GRC makes available over 28,000 individual bibliographic citations from books, articles, papers and other publications. Via the Internet, the GRC offers listings for geothermal reference material, with new listings added on a continual basis. The geothermal publications listed on the GRC are only available via hard copy for a fee. The Council's On-Line System contains five databases:

- General Geothermal References
(This includes the GRC Transactions of the annual meetings, and references to many DOE-sponsored reports.)
- GRC Bulletin
- Geothermal Power Plants Worldwide
- Direct Use and Geothermal Heat Pumps
(This is mostly report, with full text of many, from the Oregon Institute of Technology GeoHeat Center.)
- International Vendors List of Geothermal Goods and Services.
(This is the GRC commercial services directory.)

Clutter has told PERI that the GRC will soon scan most of the GRC-originated materials, the Transactions and Bulletins, for abstract and full-text access via some system at GRC. Clutter does not want to have such reports "mined" over to another system, such as OSTI. He is not sure what the fee structure, if any, for using this would be. PERI is totally supportive of this effort.

Values: This is where industry staff most likely would go first for geothermal information. The funding for the library catalog is heavily dependent on DOE Geothermal Program direct funding. Locating a major resource here would give the GRC a shot in the arm. But the long term existence of this organization is not as sure as that for NREL and OSTI.

d. NTIS

NTIS is the National Technical Information System. This is the U.S. Government primary center for preserving old technical reports. As such, its function overlaps that of OSTI in the energy arena.

PERI's interview of NTIS staff is in Appendix A, Item A-2.

ACTIONS:

1. Someone in the Government should clarify why these overlapping efforts exist. Geothermal would be better off at OSTI than NTIS because DOE would pay more direct attention to it at OSTI.
2. We need to find out if NTIS will port all of its geothermal reports (e.file versions) over to OSTI for free. Or what the nominal costs would be.

e. The Old DOE Contractor Document Report Distribution System

Until 1992 or so, DOE ran a system that collected the gray literature from contractors, and then distributed it (for no charge) to other contractors that had some need to know some of what was in the reports. We thought this might be useful to examine, to see if something like it were still at work.

This process could be a valuable asset to the goal of harvesting, archiving, and preserving important geothermal information. But according to Mr. Ray Fortuna and Mr. Ralph Burr, the DOE Contractor Document Report Distribution System is no longer operational.

4.4 Overall Relative Values Among Sites

PERI's Criteria a, b, and d (Section 3.3) favor OSTI most significantly. It is not clear that EREN (NREL) has run this kind of system with anything but a relative handful of reports. The GRC is just beginning to experiment with full text retrieval. NTIS charges hefty fees for every e.report.

- OSTI is the prime candidate.
 - OSTI has about 1,700 "geothermal" full text PDF files in the Gray Lit Collection.
 - The OSTI Information Bridge search engine indexes about 15,000 "geothermal" reports, most of which are Federal products. The citations include abstracts in most instances.
- We should also work closely with the GRC.
 - GRC has a fairly good bibliographic search system. The citations do not include abstracts.

- In 2002, GRC had 20,000 items indexed. Clutter in April 2003 said GRC now has 40,000 items indexed.
- GRC is looking to scan in 3,000 articles from the GRC Transactions into .PDF form.
- Note that many of the articles in the GRC Transactions report the results of federally-funded R&D. That does not necessarily give the Government intellectual property use rights, but something might be negotiated with the GRC to allow some of those articles to be included in the federal geothermal legacy collection.
- At INEEL, Renner has been indexing reports using the same software that GRC uses.

4.5 A Strawman Legacy Preservation System

There are a number of considerations of usability that should be addressed early in this process. One way to get at that quickly is to posit one useful system, and let others take pot shots at that. So here is PERI's "Strawman" system.

- a. All of the reports should be in a highly readable form. The PDF files from some places are much less useful than from other places. We need to find out why, and how to get all of the e.reports built in a highly useful form.
- b. The reports should be searchable on words in the text, not just keywords. This has become the hallmark of being able to find a great deal of useful material through Internet search engines such as Google.
- c. Some of the geothermal reports, but not necessarily all of them, should be accessible from regular Internet search engines. Entingh believes that two forms of material should be findable from Google, etc.:
 1. Seminal review articles about key areas of geothermal technology, and
 2. Annotated background reports about the main areas of geothermal development and historical research have been. These articles will have to be prepared by groups such as the geothermal groups at the National Labs, university researchers, and consulting organizations like PERI. This approach can be a substitute for preparing detailed histories of the technical successes (and the rare failures) of the DOE geothermal program.

The Geothermal Program will probably have to fund maintenance of any server that allows access of these items directly from an Internet search.

The remaining reports can be "hidden" behind a local search engine, Google-like, at OSTI, NREL, GRC, etc.

- d. We should try to post any reports that we have in e.form from the hydrothermal research groups. The initial batch could come from LLNL. See the Kasameyer interview.
- e. PERI has copies of about 400 HDR reports, in e.form, from the LANL experience at Fenton Hill. We got those from the LANL library a few years ago. Some of these should be posted quickly. We think the bulk of them should be posted not immediately, but a year or two from now. Otherwise when one searches for "geothermal" at the primary Geothermal Technical Legacy site, they might believe that the program worked mainly on HDR.
- f. SANDIA notes that it would be loathe to part with its copies of reports for scanning. We might have to make sure that much scanning and indexing can be done on a Lab-local basis, with support from HQ for that.

We must not make this a highly "burdensome" process for anyone. For example, if Lab-local archiving work is required, a contractor might visit a Lab for a week or two to ensure that the work is done in manners consistent with what the Program is trying to do in general.

ACTION: PERI will check with OSTI and EREN staff to see if they have folks who do that.

APPENDIX A. INTERVIEWS

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A-1. OSTI Staff

(DOE) OFFICE OF SCIENCE AND TECHNICAL INFORMATION

File name: OSTI Report.doc
By: Ed Eugeni
File location: (Ed's CPU) C:\Desktop\Dan Entingh\OSTI Report.doc
Date: 4/29/03

Main Findings

OSTI, which leads the DOE e-government initiatives for disseminating research and development information, makes the results of DOE research available to scientists, researchers, and engineers in the DOE community and beyond. The OSTI website has five sources that may contain geothermal documents including:

The Information Bridge (<http://www.osti.gov/bridge/>)
Gray Literature site (<http://www.osti.gov/graylit/>)
Energy Citations site (<http://www.osti.gov/energycitations/>)
the PrePRINT Network (<http://www.osti.gov/preprint/>)
All Collections (<http://www.osti.gov/collections.html>).

OSTI has a harvesting program where they take files that are posted on websites, usually government agencies or national laboratories, process them, then post them on the OSTI website as part of their searchable database. In addition, OSTI could develop a stand-alone and searchable geothermal database with a web interface located on the Internet. All of the files located in the OSTI database are free to download by anyone. OSTI does charge a fee for the dissemination of hard copies.

OSTI is interested in assisting the preservation of legacy reports and file for the Geothermal Program. OSTI estimates a cost of \$16,000 to scan 500 documents consisting of 200 pages, and post the reports to the DOE Information Bridge.

The main OSTI contacts are Ms. Julia Daniel, Account Executive (865-576-2139) and Ms. Gloria Young, Project Manager (865-576-8411).

Background

The Office of Science and Technical Information (OSTI) mission is to collect, preserve, disseminate, and leverage the scientific and technical information resources of DOE to expand the knowledge base of science and technology and facilitate scientific discovery and application. Located within the Office of Advanced Scientific Computing Research in the DOE Office of Science, OSTI is responsible for leading the Department's Technical Information Management Program and for providing direction and coordination for the dissemination of scientific and technical information resulting from DOE research and development programs. To effectively disseminate scientific and technical information, OSTI hosts a number of products that provide a vast array of information and resources pertaining to energy

science and technology.

The DOE Office of Scientific and Technical Information provides access to a wealth of energy, science, and technology research and development information from the Manhattan Project to the present. OSTI makes the results of the Department's research available to scientists, researchers, and engineers in the DOE community and beyond; as well as academia, the international science community, and science attentive citizens through its numerous collections and services. In addition to DOE-funded research, OSTI provide research information of interest to the Department in a wide range of scientific disciplines through partnerships with other federal agencies and international organizations.

Capabilities

OSTI offers a range of information technology tools and services, such as development and maintenance of subject-specific databases and Web portals, management information systems, electronic publishing and creative services, and Web site development and maintenance. The various customized information tools that OSTI provides help DOE program offices, other federal agencies, and a multilateral international organization to better manage their information resources.

Website Design

The main collections on the OSTI website (<http://www.osti.gov>) include:

Information Bridge (<http://www.osti.gov/bridge/>)

- Full-text DOE research reports (primarily from 1995 to today).

Gray Literature (<http://www.osti.gov/graylit/>)

- Portal for technical report information generated through federally funded research and development projects.

Energy Citations (<http://www.osti.gov/energycitations/>)

- Bibliographic citations of DOE research from 1948 to today.

PrePRINT Network (<http://www.osti.gov/preprint/>)

- Documents that researchers circulate electronically in advance or in lieu of publication.

All Collections (<http://www.osti.gov/collections.html>)

- Includes other research-related technical information, such as DOE accomplishments and project summaries.

Information Bridge

The Information Bridge provides an open source to full-text and bibliographic records of DOE research and development reports in physics, chemistry, materials, biology, environmental sciences, energy technologies, engineering, computer and information science, renewable energy, and other topics. The Information Bridge consists of full-text documents produced and made available by the

Department of Energy National Laboratories and grantees from 1995 forward. Additional legacy documents are also included as they become available in electronic format. The Office of Scientific and Technical Information makes this Web site available to the public in partnership with the Government Printing Office (GPO), through GPO Access.

A search of the Information Bridge for geothermal by full-text and sorting by relevance yielded 1,965 returns. Searching the site for geothermal by title and sorting by relevance yielded 239 returns. There are several other search combinations that can be utilized via this site.

Gray Literature

Gray literature, which includes technical reports produced by Department of Energy National Laboratories and grantees, is presented via the DOE Information Bridge (<http://www.osti.gov/graylit/>). It has over 60,000 searchable reports comprising millions of pages. Gray literature is issued by noncommercial sources such as government agencies, research laboratories/facilities, and educational institutions; typically unavailable through commercial publishers; includes technical reports, conference papers, dissertations, and other materials published by the author's sponsor or employer.

The Department of Energy's Gray Literature web site is the Information Bridge www.osti.gov/bridge. A general search via the Information Bridge www.osti.gov/bridge for the word "geothermal", in the bibliographic record, retrieves 504 full-text documents. In addition, The Information Bridge will return all 504 hits in increments of 20 per list to view and/or download. There is also a unique feature at the top of the bibliographic record pages which enables searches within the full-text of these documents without having to download the entire document. This feature is especially nice for modem users or for searching very large documents.

Energy Citations

The Energy Citations section contains bibliographic records for energy and energy-related scientific and technical information from DOE and its predecessor agencies, the Energy Research & Development Administration and the Atomic Energy Commission. The database provides access to DOE publicly available citations from 1948 through the present, with continued growth through regular updates. Energy Citations includes bibliographic records of literature in disciplines of interest to DOE such as chemistry, physics, materials, environmental science, geology, engineering, mathematics, climatology, oceanography, computer science and related disciplines. It includes citations to report literature, conference papers, journal articles, books, dissertations, and patents.

Energy Citations is publicly available without charge to users. OSTI makes this Web site available to the public in partnership with the GPO, through GPO Access.

A search of the Energy Citation site for geothermal by title and sorting by relevance yielded 7,186 returns. Searching the site for geothermal by bibliographic info and sorting by relevance yielded 16,759 returns. There are several other search combinations that can be utilized via this site.

PrePRINT Network

The PrePRINT Network provides access to electronic preprints available from diverse sites. Developed by OSTI, the Network is a "one-stop shopping" site for preprints in science and technology. The PrePRINT Alerts feature allows users to create personal profiles, which will then notify the user as new information is added. Preprints in the areas of physics, materials, chemistry, mathematics, biology, environmental sciences and other areas related to DOE research interests are accessible through this Network.

The search on the PrePRINT Network site is limited to 250 returns at a time. Julia Daniels was contacted regarding finding the exact number of geothermal reports that are available via this resource. Once this information is obtained, it will be included in this summary.

All Collections

The Department of Energy Office of Scientific and Technical Information provides a fully searchable dynamic information resource and organized access to a comprehensive resource of scientific and technical information in physics and other disciplines of concern to the Department of Energy.

As stated earlier, OSTI provides three vast virtual resources covering each of the three main ways by which scientists communicate their findings:

- Gray Literature
- Preprint Literature
- Journal Literature

Many other information resources of interest are available via OSTI including:

- R&D Announcement Sites
- Specialized Information Resources and Software
- Customized Information Tools
- E-News Service

OSTI Response to PERI Questions

On several occasions, Ed Eugeni spoke to Ms. Barbara Leighton, Ms. Julia Daniel, and Ms. Gloria Young of the Office of Scientific and Technical Information. Ms. Daniel has become the main contact at OSTI. Her phone number is 865-576-2139.

OSTI has the ability to receive, capture, or harvest hard copy or electronic legacy files. Hard copy files are scanned and then turned into an electronic document for web posting. OSTI has a harvesting program where they take files that are posted on websites, usually government agencies or national laboratories, process them, then post them on their website as part of their searchable database. All of the files located in the OSTI database are free to download by anyone. OSTI does charge a fee for the dissemination of hard copies.

OSTI has conducted project cost sharing, mainly working with other departments and agencies. OSTI is very interested in supporting the Geothermal Program in preserving any technical reports and legacy

files. The costs to the Geothermal Program would depend on the number of reports that must be processed by OSTI. Ms. Daniel and Ms. Young will provide PERI with a projected cost estimate based on processing on a PERI estimate of 500 reports that are approximately 200 pages in length. PERI chose these numbers in order to receive an estimate for a large job.

OSTI has a long and excellent relationship with the National Technical Information Service (NTIS). OSTI refers a lot of people to NTIS and vice versa.

Conclusions

OSTI leads the DOE e-government initiatives for disseminating research and development information. OSTI makes the results of DOE research available to scientists, researchers, and engineers in the DOE community and beyond.

OSTI offers a range of information technology tools and services, such as development and maintenance of subject-specific databases and Web portals, management information systems, electronic publishing and creative services, and Web site development and maintenance. OSTI could develop a stand-alone and searchable geothermal database with a web interface located on the Internet.

OSTI is interested in assisting the preservation of legacy reports and file for the Geothermal Program. The following requirements were submitted to OSTI in order to obtain a cost estimate for their services:

- Assume there are ~500 full-text documents (~ 200 pages per documents) to be included in the final product
- Documents are to be scanned and posted to the DOE Information Bridge.

OSTI estimates a cost of \$16,000 to scan 500 documents and post to the DOE Information Bridge.

OSTI Quote for Archiving Costs

Office of Scientific and Technical Information
Statement of Work/Cost Estimate

For: DOE Geothermal Research Program

This statement of work estimates the cost to provide scanning and posting of technical reports to the DOE Information Bridge.

External POC:

Ed Eugeni, Princeton Energy Resources International (PERI)
Consultant to DOE Geothermal Research Program
eeugeni@perihq.com 301-468-8469

Scope:

PERI is assisting the Department of Energy Geothermal Research Program with the task of preserving U. S. geothermal information (new reports, legacy reports, etc.), mainly full-text documents. The goal is to scan these documents (legacy and new reports) and post on a website for easy retrieval.

Requirements:

- I. There are ~500 full-text documents (~ 200 pages per documents) to be included in the product
- II. Documents are to be scanned and posted to the DOE Information Bridge.

The Cost:

OSTI estimates a cost of \$16,000 to scan 500 documents and post to the DOE Information Bridge.

Account Executive: Julia Daniel
865-576-2139 danielj@osti.gov

Project Manager: Gloria R. S. Young
865-576-8411 youngg@osti.gov

A-2. NTIS Staff

National Technical Information Service (NTIS) (Springfield, Virginia)

Site Visit Report, April 15, 2003, Ed Eugeni

Background Information

On April 15, 2003 Eugeni met with Jeanette Young-Reese, Agency Liaison Specialist, Wayne Strickland, Product Management and Marketing Specialist, and Gloria Durham, Product Management of NTIS to discuss the options for retrieving legacy files and reports, scanning the files and reports, and producing an end product available to the public, preferably as an electronic document available for download via the World Wide Web. NTIS, as part of the U.S. Department of Commerce Technology Administration, supports the nation's economic growth and job creation by providing access to information that stimulates innovation and discovery. NTIS accomplishes this mission through two major programs: information collection and dissemination to the public, and production and other services for federal agencies.

The primary purpose of NTIS is to assist U.S. industries to accelerate the development of new products and processes as well as helping the U.S. maintain a leading worldwide economic competitive position. NTIS facilitates public access to Federal information, develops guidelines for federal agencies to transfer their government information to NTIS, and develops implementation methods and procedures to facilitate federal agencies in the smooth transfer of information to NTIS. They also maintain a permanent repository of unclassified scientific, technical, engineering, and business information, collect and disseminate this information worldwide, and develop new and enhanced methods for expeditious dissemination of information.

NTIS headquarters are located in Springfield, VA. This site hosts all the necessary departments for retrieving or harvesting legacy reports, scanning the documents, generating electronic files for Internet download, CD ROM production, micro fiche production, hard copy production, as well as product distribution. The Customer Service Division at the Springfield location processes all orders.

Meeting Notes

NTIS presented several options for the Geothermal program regarding harvesting, producing, and disseminating legacy reports. The production department can receive old hard copy legacy reports, scan the document, and then clean up the document before creating the end product. NTIS offers several end product options including web-posted files (PDFs), hard copies, CD ROMs, or microfiche.

If the legacy report is already in electronic form, NTIS can harvest or capture the file from a user or site, then generate a PDF and post the file on the Internet.

NTIS can design, host, maintain, and manage any or all of the following services for the Geothermal Program: World Wide Web sites, FTP sites, Telnet sites, and Bulletin Board Systems (BBS). These sites, of course, would incur additional fees for design and maintenance. These services can be as

simple as web page design and web hosting, or as involved as the complete "start to finish" mounting of a site. They can also add "back-end" functionality to a site with search engines, sales modules, and databases. NTIS also has complete off-site backup systems in case something should happen to their main server. The maximum down-time (worst case scenario) to replace the server with a backup system is 10 days. In addition, NTIS has plenty of storage space available for developing online, searchable database that contain full-text reports.

The potential benefits to having NTIS develop a fully integrated geothermal database with a World Wide Web interface are:

- An off-site Internet access point which provides physical separation of Internet customers from an agency's own computer network
- An Internet site which remains on government property subject to government protection
- Access for your customers to our FedWorld-staffed Help Desk
- Use of FedWorld's large telecommunications bandwidth
- In depth statistical reporting
- The ability to combine online delivery with paper, fax, microfiche, video, CD-ROM, and other delivery media under one interagency agreement
- The commitment of a dedicated professional staff experienced with federal agency needs and security concerns.

All current entries in the NTIS bibliographic database system, from 1990 forward, are available for download from the NTIS website www.ntis.gov. However, this does not mean that only reports published from 1990 to present are listed in the database system. If a report was originally published in 1978 was submitted to NTIS at any time between 1990 to present, it can be found in the online bibliographic database system. When the database was searched for geothermal, it returned 1,272 records.

In addition to the bibliographic database system, NTIS can develop an online, searchable geothermal library that has its own URL (web location) and contains full-text reports if the Program so desires.

NTIS began optically scanning all of the technical reports that it receives in 1997. This process has allowed NTIS to provide full text of reports as downloadable PDF files. However, there is a fee of \$8.95 for each download over 20 pages. The DOE would have to incur these charges in order for the files to be available as free downloads to the public. In addition, large files can present download problems for an NTIS-hosted database with a web interface. NTIS has a 200-page size limit on downloadable files. For additional fees, NTIS may be able to post files larger than 200 pages on the web for downloading.

If those additional costs are too high, files larger than 200 pages can be made available via hard copy, CD ROM, or microfiche In addition, color dependent files can incur additional costs. Customized CD-ROMs can be developed for a nominal fee of \$18.95 for one title, or \$15.95 for each title if you order more than one on the same order.

Payment to NTIS

NTIS facilitates a royalties payment program where they receive quarterly payment for their services to cover the cost of producing the files and disseminating the information. Since users must pay to download some reports from the NTIS site, the Geothermal Program would have to cover these costs in order to make the reports available as free download for users.

Conclusion

NTIS is the largest central resource for government-funded scientific, technical, engineering, and business related information available today, and they already host numerous geothermal documents and reports. NTIS showed great interest in working with the Geothermal Program to develop an online geothermal publications depot.

The most beneficial, and perhaps logical NTIS option is to develop a geothermal online publications library that has a stand-alone URL or web address (www.ntis.geothermal.com for example) for downloading full-text reports and documents. However, this option could also be the most costly and most time-consuming.

The Geothermal Program would have to pay the up-front costs associated with downloading files via the Internet. The other option would be to have the user pay the \$8.95 fee charged by NTIS for downloading files exceeding 20 pages. In addition, NTIS has a 200-page size limit on downloadable files. However, for additional costs NTIS may be able to post files larger than 200 pages on the web for downloading.

A-3. Geothermal Resources Council, Ted Clutter

By: Dan Entingh

Date: June 2, 2003

1. Background

Entingh and Clutter reviewed their conversation of about a month ago. In the meantime, Entingh sent and Clutter read the PERI 2002 report on preserving DOE technical reports, and review of major Geothermal Program-funded U.S. Web sites.

2. GRC Plans to E-Archive its Main Reports Soon

GRC is in process of figuring out how to, and finding funding for posting all of the historical GRC-originated reports to a electronic library and/or web site. Separate items would be all articles in the GRC Transactions (about 3,000 articles), each GRC monthly Bulletin, and GRC Special Reports. He has a quote from a Sacramento, CA, firm of \$22,000 to scan and convert to PDF files about 25,500 pages of such material. That's about 86 cents per page. Whether this goes forward soon will be determined roughly by the end of July. Clutter hopes to have the project completed by the end of 2003.

3. Fees and Other Publications

Clutter is not sure what kind of fee structure GRC would use, if any. A main requirement is that posting the material electronically does not decrease the GRC's sales of paper products, e.g., the Transactions.

Clutter and Entingh agreed that paper publication of some of these compilation materials is extremely important to allow the generalists in the U.S. and world geothermal community to browse technical findings across disciplines. They agreed that the DOE's recent switch from paper to CD-ROMs for distribution of the DOE Geothermal Project Updates has made the Program more or less invisible to the ordinary user.

4. GRC Will Broadcast PERI Request for Nominations

Entingh asked if GRC would help PERI/DOE broadcast a request to the U.S. community for nominations for legacy reports that should be e-archived. Clutter said he thought a broadcast email from PERI/DOE via the GRC member list would be the most effective approach. Entingh hoped for an article in the Bulletin also, which probably won't happen.

ACTION: PERI will draft a nomination request for broadcast emailing by the GRC. DOE and GRC will review it before transmission to the membership. The email will include information about what both DOE and GRC are doing to "preserve legacy information."

A-4. Script for National Lab Interviews

File name: script4.doc Ed Eugeni

SCRIPT FOR CALLS TO NATIONAL LABORATORIES

1. BACKGROUND

- a. PERI has a small contract with DOE Geothermal through NREL to figure out what old reports and datasets DOE should try to archive on a central web server.
- b. The general idea is to try to make the most important work sponsored by DOE since 1978 or so available (as whole text reports, not just references to paper reports that no one can find any more) to Geothermal workers for many years.
- c. We would like your input to questions such as what to archive and how, including your opinion on what retrieval approaches you believe might be most useful.
- d. Some of the questions and issues are a bit complex, so we might not try to get all of your opinions in just this call. We might call you later, or get you to email us some written notes, comments, or lists.
- e. (If asked:) The idea for doing this started with my PERI colleague, Dan Entingh. He did some initial survey work in 2002, and DOE and NREL have become convinced that is important to try to electronically archive some of the results of the \$1,500 million plus the U.S. has spent on Geothermal R&D.
- f. (If asked:) The types of reports nominated so far include: DOE Geothermal Programmatic reports like Proceedings of the old Geothermal Program Reviews; Technical reviews and primary textbooks, Details on interactions of materials and geothermal brine chemicals; Analyses of the costs and benefits of geothermal power and geothermal R&D work; Results of exploration studies.

2. MAIN AREAS OF INTEREST

What we are mainly looking for from you is support in determining:

- a. What reports/files are worth saving?
- b. Who is best suited from your laboratory to nominate reports for archiving?
- c. If we can retrieve and archive nominated reports that have been converted to electronic files (PDFs)?
- d. If we can access copies of legacy reports as well as new reports?

3. WHAT SHOULD BE SAVED?

- a. What **types** of files and reports would YOU nominate for archiving?
- b. What **specific** files or reports would you nominate? They don't necessarily have to be from your Lab's work.
- c. How many reports (estimate) do you believe should be archived, and what would you estimate the average page count is for these files?
- d. Would you, or some other likely candidate in your group, be willing to help us compile a list of reports from your Lab (or other sources, too) that DOE should archive?
- e. Email the lists to eeugeni@perihq.com.

4. WHO ELSE SHOULD NOMINATE REPORTS for ARCHIVING?

- a. Are there any other people in your Geothermal Group or Lab that would be the best nominators for what should be archived?
- b. Do you think they would be interested in nominating reports?

5. HOW CAN WE ACCESS COPIES OF REPORTS AND E.FILES?

5.1 Are E.files Available from your Geothermal Group?

- a. Do you, others in your Geothermal Group, or the Group as a whole have e.files that we could archive easily?
- b. Who controls or maintains your Geothermal Group website? Would it be worthwhile to talk to her/him about what we are trying to do here?

5.2 Does Your Lab's Current Central Library or Web Site operate E.File Holdings?

- a. Does your Lab's Central Library maintain electronic files that would be of value to harvest and archive at a central Geothermal-related archive system?
- b. Does the (Lab name) main website have a specific geothermal section?
- c. Who controls or maintains the (lab name) main website? Or who else would be a good contact about the holdings of your Lab's central library collection?
- d. Can geothermal reports/publications be accessed from the geothermal site?
- e. Do you know if your Lab has any plans to save/store important, current information once then

become outdated and replace by new reports? Will (lab name) keep hard copies as well as electronic copies of the report?

5.3 Paper Reports and Legacy Reports:

- a. Do you have access to any legacy geothermal reports that were produced by (lab name)?
- b. Are any of the individuals still around that produced these legacy reports?
- c. At (lab name), who maintains hard copies of the legacy files?

6. DOES YOUR LAB PARTICIPATE IN A FORMAL HARVESTING SYSTEM?

There used to be a system, run by DOE, that collected technical and planning reports from Labs and other Contractors, and distributed them to various Contractors. We re trying to figure out if something like this still exists, and if your Lab participates in something like that.

- a. Does (lab name) actively submit reports to a collection and information agency?
- b. What kind of relationship does (lab name) have with collection agencies such as OSTI and NTIS?

A-5. List of Initial Contacts at Labs

By: Ed Eugeni and D. Entingh
File name: nlabs03. ext
File location: (Ed's Computer)
C:\Desktop\Dan Entingh\Working List.doc 5/13/03

LIST OF NATIONAL LABORATORIES GEOTHERMAL GROUPS

LABORATORIES

Sandia National Laboratory

- Homepage: www.sandia.gov
- Geothermal site: <http://www.sandia.gov/geothermal/>
- Contact info: Nominator: Ed Hoover,
Director of Geothermal R&D Group
Phone: 505-844-7315
Email: erhoove@sandia.gov

Los Alamos National Laboratory

- Homepage: <http://www.lanl.gov/worldview/>
- Geothermal site: N/A
- Contact info: SUE GOFF for lead on whom best to call.
Phone:
Email:

Lawrence Livermore National Laboratory

- Homepage: <http://www.llnl.gov/>, <http://en-env.llnl.gov/>
- Geothermal site: <http://geosciences.llnl.gov/esd/geothermal/>
- Contact info: Paul Kasameyer, Geothermal Group Manager
Phone: 925-422-6487
Email: kasameyer@llnl.gov

Lawrence Berkeley National Laboratory

- Homepage: <http://www-esd.lbl.gov>
- Geothermal site: <http://www-esd.lbl.gov/ER/geothermal.html>
- Contact info: Marcello Lippmann, and ask him whom to talk to.
Phone: 510-486-5035
Email: mjlippmann@lbl.gov

Idaho National Engineering and Environmental Laboratory

- Homepage: <http://www.inel.gov/>
- Geothermal site: <http://geothermal.inel.gov/>
- Contact info: Joel Renner, Geothermal R&D Program Manager
Phone: 208-526-9824

Email: rennerjl@inel.gov

Battelle Pacific Northwest National Laboratory

- Homepage: <http://www.pnl.gov/>
- Geothermal site: N/A
- Contact info:
- CALL: Ask RENNER (INEEL) whom to talk to. Or ask NIX (NREL). Here there may be no one working on GTh now, but maybe someone who used to work on it is still there.

Oak Ridge National Laboratory

- Homepage: <http://www.ornl.gov/>
- Geothermal site: N/A
- Contact info: Dr. Mike Simonson
Phone: 865-574-4962

National Renewable Energy Laboratory

- Homepage: <http://www.nrel.gov>
- Geothermal site: <http://www.nrel.gov/geothermal/>
- Contact info: Gerry Nix, Manager of Geothermal Group
Phone: 303-384-7566
Email: Gerald_nix@nrel.gov

Gerry Nix, who is the head of the GTh R&D Group at NREL, and the working first lieutenant of the three: Nix (NREL), Hoover (Sandia), and Renner (INEEL). Nix will likely refer you to others on his staff, including Kutscher, Hasini, Gawlik, and Barathan. While Walter Short and Paul Stern do not work directly under Nix, they work FOR him with respect to geothermal analysis matters. W.Short should also be contacted, through Paul.Stern re nominations for documents and studies to archive.

Brookhaven National Laboratory

- Homepage: <http://www.bnl.gov/world/>
- Geothermal site: <http://www.bnl.gov/est/MEA.htm>
- Contact info: Dr. Marita Berndt
Phone: 631-344-3060

A-6. LLNL, Paul Kasamayer

File name: LLNL.doc Ed Eugeni
File location: S:\GEO\03g.info\[LLNL.doc]
Date: 6/04/03

PHONE CALL TO NATIONAL LAB

- 1. ORGANIZATION**
Lawrence Livermore National Laboratory (LLNL)
- 2. CONTACT**
Dr. Paul Kasameyer, Geothermal Group Manager
925-422-6487
- 3. CONVERSATION DETAILS**

Overview

Dr. Kasameyer believes that all of the reports at Lawrence Livermore National Laboratory, legacy as well as new, are worth saving. Kasameyer stated that he and Ms. Carol Bruton are the most qualified individuals at LLNL to nominate geothermal reports for archiving. The Geothermal Program can retrieve and archive nominated LLNL reports that have been converted into electronic files (PDFs). In addition, the Program will have access to hard copies of both LLNL legacy reports and new reports.

Specifics

Dr. Kasameyer stated that LLNL has added all of their geothermal reports to the Livermore Library page. He stated that this includes copies of the old legacy files, with reports dating back to the early to mid 1970s. The Livermore Library contains 169 geothermal documents.

However, 42 of those documents are not available to the public due to security issues. Mr. Kasameyer said that he would look into the security issues of those files. He strongly believes that all of those 169 reports should be archived by the Geothermal Program, even if 2% of those reports were not generated via Geothermal Program funds. Mr. Kasameyer expressed that he, as well as Ms. Bruton, are interested in assisting the Geothermal Program in archiving reports.

Since all of the reports have already been converted into electronic format, Mr. Kasameyer has easy access to all of those files. In addition, some of the LLNL personnel responsible for creating those reports are still employed there.

As previously mention, the main website for LLNL hosts the Livermore Library. The library can be reached by: 1) going to www.llnl.gov, 2) clicking on the Publications link, 3) clicking on the Library link, 4) clicking on the Documents Online link, 5) typing geothermal into the search bar. Geothermal reports in the Livermore Library date back to 1972. The Technical Information

Department manages the website.

The geothermal group at LLNL does not currently have a specific section on the LLNL main website. However, the group is in the process of developing a geothermal website. Mr. Kasameyer stated that Mr. Ray Allen requested the development of the website.

Mr. Kasameyer does not know if LLNL any plans to save/store important, current reports or information once they become outdated and replace by new reports. However, Mr. Kasameyer did state that he is holding on to as many hard copies of reports as possible.

Mr. Kasameyer stated that the Office of Science and Technical Information harvests LLNL electronic reports on a daily basis. Mr. Kasameyer provided an additional contact for the Livermore Library reference desk: Xiaorong Zhang; email: zhang8@llnl.gov; phone: 925-422 4922 or 925-422-8491.

A-7. SNL (Senior Staff Member)

File name: SNL.doc
By: Ed Eugeni
File location: S:\GEO\03g.info\[SNL.doc]
Date: 6/04/03

PHONE CALL TO NATIONAL LAB

1. ORGANIZATION

Sandia National Laboratory (SNL)

2. CONTACT

(Anonymous until he or she reviews these comments.)

3. CONVERSATION DETAILS

Overview

[Contact] was very busy and was only available for a brief discussion. He provided an additional contact, Mr. T. J. Cook, for more information on archiving Sandia geothermal reports. However, Mr. Cook is out of the office until July. [Contact] believes that workshop reports, technical reports, and contractor reports are worth archiving.

Specifics

[Contact] did not have the time to discuss the majority of the issues regarding archiving geothermal reports. He was worried about the amount of time the archiving task would take, as well as funding for the task. In addition, he was disinterested in shipping hard copies of reports to a government agency for archiving. [Contact] is worried that the files would be lost and not returned to Sandia. He also stated that he has shelves full of reports (too many to give an estimate), and a lengthy amount of time would be spent searching through the reports as well as copying them in order to send a copy to a government agency for archiving.

[Contact] maintained that there is a lot of work involved in archiving the geothermal reports, particular for him and his staff due to the large volume of reports at Sandia. [Contact] requested that the Geothermal Program present the national laboratories with a list of potential files for archiving. He believes the list would greatly reduce the amount of time spent searching through the large volume of Sandia reports in order to nominate one for archiving.

APPENDIX B. REPORTS NOMINATED SO FAR

Updated: June 5, 2003

B-1. Generally Good Ideas

These are nominated by Dan Entingh, one of the authors of this report.

- DOE Geothermal Research Program Programmatic Reports:
 - DOE Geothermal Program Review Proceedings, 1982 forward. PERI has copies of most of these. These, along with certain Progress or Status reports, form the best basis we have for tracking the history of the program.
 - DOE GTh Program Status Reports. Various years. PERI has some.
 - Geothermal Progress Monitor, all issues (18 or 19). Each is about 60 pp. A primary source of history of status and development of the industry.
- Brochures and Review Articles from Federal Agencies:
 - There are seminal reports from the USGS, EIA, and DOE itself that reflect physical and business realities of the geothermal enterprise in the U.S. These are the reports that are closest to useful review articles done in the past 10 years. Some of these are already posted at OSTI (Gray Literature).

B-2. Specific Suggestions from Individuals

ENTINGH, Dan, PERI:

- Economic analyses conducted for the program at various times. These include studies done by:
 - Battelle Pacific NW Labs. Bloomster, Fassbender, et al. 1977
 - MITRE. Goldstein, Leigh, Gupta, Dhillon, Entingh, et al. 1977-92
 - Site Characteristics Analyses
 - Early results from GELCOM model
 - Benefit/Cost analysis of R&D Projects and Thrusts
 - TECHNECON, with UURI and EER
 - Electric systems
 - Direct heat systems
 - MERIDIAN
 - Resource estimates
 - Economics analyses
 - IMGEO Model

- PETTY et al.
 - Resources and economics analyses.
 - For EIA, 1992
 - For NREL, 1993. PERI has the e.files
- PERI
 - Royalty and Tax Analysis
 - PURPA Cliff Analysis
 - GPRA Benefits Analysis, Detailed for FY ~2000
 - Historical Costs Analysis
 - Domestic, Foreign, Overall
 - Resources Update Analysis
- Main Technical Articles from Non-DOE Sources
- GRC
 - Ted Clutter reported to Entingh that Clutter is seeking funding, about \$80,000 to put the entire contents of the GRC Transactions on line at the GRC Library site. That's about 3,000 articles.
 - We should look into whether they could be accessible from OSTI search engine also. Clutter said he did not like that idea, since GRC "owns" the reports. But he also said that GRC primarily is in the information dissemination business, and he gets most of his revenue from preparing information for dissemination.
 - We should also look into helping GRC archive the news articles in the GRC Bulletins, since these are a primary source of historical information.
- GeoHeat Center, OIT, Klamath Falls, OR
 - GHC has already scanned many of their reports, and you can get them from the Web.
 - GHC is the absolute leader in this regard.
 - GHC should be given more funding for identifying earlier important articles, to be scanned at GHC or sent to OSTI
 - GHC's reports should be at least "harvested" to the OSTI site, and GHC
- Stanford Geothermal Reservoir Workshop Proceedings
 - This is a very important source of technical data, with a strong historical slant because of its longevity, and because it mixes articles from industry and DOE-sponsored projects.
 - Recent ones are available on CD ROM.
 - We need to see if the Stanford Team would offer up all of its past Transactions for scanning and archiving at OSTI.
- Geothermics (Journal)
 - Elsevier. Probably would want a lot of bucks. But might be willing to go along with scanning in some of older materials. It is likely that for a small fee, say \$5,000, DOE would give Elsevier more than it would ever expect to gain from selling geothermal articles directly to the public.
 - Note that the GRC Library Database has already indexed most if not all of the contents of

Geothermics.

[Contact], Sandia NL:

- There are so many Sandia relevant reports that DOE HQ is going to have to preselect what it wants.

KASAMEYER, Paul, Lawrence Livermore NL:

- The entire corpus of LLNL Geothermal research reports has been converted to e.form, and is ready for use in any appropriate way. There are 169 reports in all. But 42 are now not available to the public due to security issues. Paul will look into resolving security locks on some or all of those reports.

JELACIC, Allan, DOE HQ:

- A number of analyses that Entingh has done over time on benefits and other matters important to the federal GTh Program. See Entingh's lists above for some of them.

MINES, Greg; INEEL:

- The DOE Blue Handbook on Production of Electricity. Much of the material there remains very useful.

PETTY, Susan; Consulting Reservoir Engineer:

- The two Materials Selection Guidelines Reports from Radian Corp.