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# The U.S. Department of Energy Geothermal Legacy Reports Collection

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## Keywords

*DOE, geothermal, research, history, legacy, archive, OSTI*

## ABSTRACT

The Geothermal Technologies Program (GTP), U.S. Department of Energy (DOE), began a study in 2002 of the accessibility of geothermal technical reports from the view of a user of the Internet. In 2005, the GTP decided to go ahead with converting into electronic form the reports from DOE-sponsored research that had been archived at DOE's Office of Scientific and Technical Information (OSTI) since the inception of the DOE Geothermal research effort. About 1,200 reports had been submitted to OSTI in electronic format by the National Laboratory Geothermal teams since 1999. 3,200 additional paper reports received before 1999 were converted in 2005. The project is now looking for more reports to scan. This article explains how you can access the full-text-searchable reports in the Geothermal Legacy Collection at OSTI via the Internet.

## Introduction

The Department of Energy (DOE) Geothermal research program, under various names, has sponsored about \$1.5 billion of research and demonstration programs since its inception in 1978. While all of that research was well documented with respect to both programmatic rationale and technical findings, much of the history and results of the work have become cloudy to many who work on geothermal today.

DOE's geothermal program managers at the National Laboratories, e.g., Idaho National Laboratory, and the National Renewable Energy Laboratory, began to notice that researchers appeared to be proposing work that they believed might have already been done ten or twenty years ago. PERI proposed to the Geothermal Technologies Program (GTP) that it survey what could be learned about earlier research by using search engines on the Internet.

## Two Surveys

An initial survey was done in 2002. That led to a few very interesting findings:

1. There were two very important geothermal bibliographic databases available on the Web. These were the Library Database of the Geothermal Resources Council (GRC) and geothermal reports referenced in two main bibliographic databases at the DOE's Office of Scientific and Technical Information (OSTI), Oak Ridge, Tennessee.
2. Additional useful information was available from the Web site of the International Geothermal Association, where Dr. Roland Horne, Stanford University, with others, was beginning a site and a process to e-archive international geothermal symposia, such as the World Geothermal Congresses of 1995, 2000, and 2005.
3. The GRC Library Database included citations for all of the articles in the GRC Transactions, many reports from the DOE grey literature and most of the articles in the journal *Geothermics*. The citations included most of what you need to decide if an article is of interest, but did not include abstracts. At this time, the GRC was beginning a process of e-archiving the contents of the GRC Bulletin and the Transactions of the GRC annual meetings. Bill Cummings, a geothermal geophysicist, had helped to begin that effort.
4. At OSTI there were two significant collections of geothermal reports. The first of these comprised about 1,100 geothermal technical reports included in OSTI's "Information Bridge." These were reports of research findings that the DOE National Laboratories were required to submit to OSTI in Adobe Acrobat (PDF-normal) form directly, since about 1998. These reports are available on the Internet. This process will continue.
5. The second collection at OSTI consisted of about 7,000 geothermal technical reports in paper form. These are stored in OSTI's Non-classified Vault, and electronically indexed in the OSTI Energy Citations Database (ECD). The ECD

citations were and are available on the Internet. About 3,200 of those reports responded to a set of search terms that are significant in the DOE geothermal research work. Many of the rest of the 7,000 reports are articles from technical journals, including the Transactions of the GRC, which cannot be archived electronically because of copyrights. The ECD includes an abstract for almost all of its reports, and includes citations for the reports in the Information Bridge.

The second survey was conducted by PERI in 2003 - 2004. That work concentrated on a few main issues.

1. What reports did the geothermal research teams at the National Laboratories recommend should be e-archived? Detailed recommendations were received from Sandia National Laboratories, Idaho National Laboratory, and Los Alamos National Laboratory. Staff at a number of other labs recommended that the project go forward, but didn't have time to make detailed recommendations.
2. Where should the repository be? The two good candidates were the GRC and OSTI. OSTI was selected for three main reasons: (a) OSTI already had a sophisticated searchable bibliographic system (the ECD) connected to the Internet to which 1,200 or so PDFs were already attached via the Information Bridge collection. (b) OSTI was an official organization of the Department of Energy, starting from the days of the Atomic Energy Commission, and therefore could be expected to have substantial longevity. (c) OSTI has significant experience in scanning in reports, based on special projects it conducted in the past.
3. What form should the electronic documents take? Here Roland Horne and Bill Cummings were especially helpful. They had both worked through the understanding that the most useful form of Adobe Acrobat reports are in "PDF-normal" form. This means that a bitmap image of each page is also processed through optical character recognition (OCR) software. That enables a search engine to find reports based on words in the text of the report, and enables the user to find important passages of the text based on the words. OSTI's information technology contractors already knew this, but it helped immensely to have this point reiterated by *geothermal* experts.

## Progress in 2005

Using the search criteria developed by PERI in 2003-2004, OSTI scanned in about 3,400 DOE-funded reports from its unclassified vault.

PERI identified a significant number of DOE geothermal "programmatic" reports that had not been deposited at OSTI, wrote abstracts for them, and shipped them to OSTI for scanning. These included many *Proceedings of the Geothermal Program Review*, and all issues of the *Geothermal Progress Monitor* reports. The programmatic reports will allow future analysts to understand how the Geothermal Program was structured, and the main areas and questions it tried to address.

All of these reports are now marked by the words "Geothermal Legacy" in one of the fields of the OSTI Energy Citations Database.

## Work During 2006

The Geothermal Technologies Program decided early in federal fiscal year 2006 to support a major effort to try to find many more reports covering DOE sponsored research that never arrived at OSTI. One example of these is the numerous orange covered reports from the University of Utah Research Institute (UURI). This center of expertise was not a DOE National Laboratory so the requirement that UURI send all of its DOE-funded output to OSTI seems to have been enforced only sporadically.

DOE, OSTI, and PERI are selecting contributions directly from three categories of potential suppliers of reports:

### 1. *National Laboratories*

Here we hoped that the librarians of the Laboratories will help us directly to find and loan to OSTI historical documents that fit the criteria of being part of the GTP/OSTI Geothermal Legacy collection. OSTI staff are working this part of the project, since each Laboratory already has a staff member who serves as a main contact point to OSTI.

### 2. *Scientists and Engineers with Small Collections*

About 30 such "Geothermal Specialists" have been identified. They are being asked to nominate reports that should be in the Legacy collection, either from their own work or that of others. PERI is helping these folks search an OSTI "Master Reports" list (an EXCEL file) to figure out if the report has already been scanned.

### 3. *Organizations or Individuals with Potentially Large Collections*

Here, what has to be done is a little more complicated, because there are a variety of special conditions and needs related to comparing a long list of reports to the OSTI Master Reports List.

In these cases, the lead interactions have usually been done by PERI. What we have looked for, for the most part, are existing lists of reports in the collections. PERI has translated those into EXCEL files that were then compared by computer search against the "Master List" of Geothermal Legacy reports already scanned at OSTI. Various modes of search and selection were then applied to offer DOE Headquarters GTP staff lists of reports that: (a) were not already at OSTI; and (b) appeared to be of technical merit for preservation.

Beyond those three sources, OSTI continued to search its Energy Citations Database for additional geothermal technical reports that were missed by the initial screens (search terms and phrases) used in 2005. About 800 more reports were found through this path.

## Finding Geothermal Reports at OSTI

Reports or information about them can be found in three ways. These are the Energy Citations Database (ECD), the Geothermal Energy Portal, and OSTI's Master List Excel file for the Geothermal Legacy Project.

## Finding Reports via the Energy Citations Database

Using your browser, go to: [www.osti.gov/energycitations/](http://www.osti.gov/energycitations/).

Alternatively use Google Advanced Search with OSTI and ECD as search terms in the top line.

Once you get to the OSTI ECD home page, select “Advanced Search” from the left button at the top toolbar.

At the top row of Advanced Search terms, select “Bibliographic Record” at the left, and then “Geothermal Legacy” (with the quotation marks) in the box at the right. (On June 13, 2006, that found 5,112 reports.) Entries for the first 25 reports found are listed.

To see any complete bibliographic entry (including the abstract) for each item on the list, from the Search Results page, click on the Identifier (the field at the very left of each row) for the resource/document of your choice. (*Note that this important instruction is buried in the Help file for the Search pages.*)

Now you can go back to the Advanced Search page, and enter combinations of terms in the three remaining rows to find specific reports you want to see.

For example, selecting “Title” at left and “direct use” at the right finds 19 entries, among them the OIT GeoHeatCenter’s *Geothermal direct use engineering and design guidebook, 1991*.

## Finding Reports via OSTI’s Geothermal Portal

OSTI’s Geothermal Portal is a special information search page maintained by OSTI for the DOE Geothermal Technologies Program. Its Internet address is: [www.osti.gov/geothermal](http://www.osti.gov/geothermal). The Portal is updated biweekly. Tabs at the left side of the Portal Home Page get you to the following:

- [Publications](#)
- [Distributed Search](#)
- [Related Links](#)
- [Site Help](#)
- [Comments](#)
- [Other Subject Portals](#)

From the Portal you can also get easily to the following DOE sites:

[DOE Office of Energy Efficiency and Renewable Energy \(EERE\)](#),

[Office of Geothermal Technologies Program](#),

[Geothermal Topics](#). This tab provides introductory information about aspects of geothermal systems. Recommend it to beginners.

[Database Description](#). This tab explains the value of each of the geothermal information sites described below.

One very useful aspect of the OSTI Geothermal Portal is that it will search through a number of important document collections at the same time. Click on the “Distributed Search” button at the left of Portal home page to use this feature.

You may choose any or all of the following sites in your search.

- [DOE Information Bridge](#)

- [Energy Citations](#)
- [Energy Information Administration \(EIA\)](#)
- [Environmental Protection Agency \(EPA\)](#)
- [E-print Network](#)
- [National Technical Information Service \(NTIS\)](#)
- [U.S. Patent and Trademark Office \(USPTO\)](#)
- [Scientific and Technical Information Network \(STINET\)](#)

## The Geothermal Legacy Project Master List

The Master List is an Excel spreadsheet file that contains the bibliographic information for all of the reports that have been scanned into PDF format in the Geothermal Legacy project. You can download a copy of the file at: [https://ostiweb.osti.gov/geothermal/Master\\_Geothermal\\_Legacy.xls](https://ostiweb.osti.gov/geothermal/Master_Geothermal_Legacy.xls)

Report title, authors, DOE report number, year of publication and complete abstract are all included in the file. You can search on this file using the search capabilities of Excel. There are no links back to the OSTI collection itself. To get copies of the reports, go through the OSTI ECD, as described above.

The purpose of the Master File has been to allow contributors to the Geothermal Legacy Collection determine whether reports that they feel are important have already been scanned and placed in the collection. It is not clear how long the Geothermal Legacy Master File will remain available at OSTI.

## How You Can Contribute to the Geothermal Legacy Collection

Contact: Ms. Lynn Davis, DOE Office of Scientific & Technical Information, 1 Science.gov Way, Oak Ridge, TN 37830, phone: 865.241.6435, fax: 865.576.3589, email: [davisl@osti.gov](mailto:davisl@osti.gov)

If you have reports that might be considered for scanning, she will remind you how to access the OSTI Geothermal Legacy Collection Master List, and help you with further steps in the process.

Address questions to any of the following:

Allan Jelacic, DOE, Washington, DC - [Allan.Jelacic@EE.DOE.GOV](mailto:Allan.Jelacic@EE.DOE.GOV)

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