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The Evolution of U.S. Policy Designed to Encourage Geothermal Development Provision of Access and Encouraging Project Development

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ABSTRACT

The past three decades have seen a multitude of incentive programs initiated as part of U.S. energy policy to encourage renewable energy development. Many such early geothermal programs were directed at risk reduction and the focus was primarily on the provision of grants, government cost sharing, loan guarantees, and insurance. These programs were all dependent upon large outlays of government monies and provided no guarantee of success. Over time most of these programs were severely scaled back or eliminated due to budget reductions.

Recent policy initiatives have focused increasingly on mandates, for example, renewable portfolio standards, tax incentives, or the use of system benefit changes. These programs are designed to create markets for renewable energy, provide rewards for production, or both.

These new programs focus upon rewarding renewable energy developers for success, rather than subsidizing companies involved in exploration and/or development – a practice that has increasingly come under attack as 'corporate welfare'.

1. INTRODUCTION

The past several years have seen the development of several new policy initiatives in the United States directed at expanding the development and use of renewable energy resources. Many but not all of these policy initiatives apply to geothermal electrical generation and/or direct use developments. Many that are specific to geothermal are a result of the GeoPowering the West Initiative that was launched in 2001 by the United States Department of Energy. The goals of the GeoPowering the West Initiative are to double the number of states generating electricity from geothermal energy by 2006 and the provision of geothermal energy to 7,000,000 homes by 2010.

However, to better understand U.S. geothermal policy it is necessary to go back to the mid 1970's. At that time the Federal Congress as well as a number of state legislatures enacted legislation to foster research and development and reduce the risks associated with geothermal development. The most comprehensive of these was the Federal Geothermal Research, Development and Demonstration Act of 1974, amended in 1980 by the Energy Security Act. Also critical to the development of the fledgling geothermal industry was passage of a number of tax incentive programs as provided for in the Energy Security Act of 1978 (Bloomquist, 1986) and the Public Utility Regulatory Policies Act (PURPA) in 1979.

In order to gain an understanding of U.S. geothermal policy, it is thus critically important to look at three broad areas. These include policies related to 1) incentives and risk reduction, 2) taxation, and utility law.

2. INCENTIVES AND RISK REDUCTION PROGRAMS

The risks associated with geothermal development have served to severely limit the availability of conventional financing to conduct exploration and development activities. Even after developers have successfully discovered geothermal fluids in usable quantities and of usable quality, financial institutions have been reluctant or unwilling to provide financing because of their lack of familiarity with geothermal projects and how the risks of project success can be adequately evaluated. Venture capitalists have also been reluctant to provide necessary financing because of the high risks and often marginal economics of nearly all except very high temperature electrical generation projects.

In order to promote the use of geothermal energy, the Federal government and many state governments have established programs aimed at minimizing or at least substantially reducing the financial risks of exploration and development, lowering the cost associated with drilling and facility operation and demonstrating the viability of a wide range of geothermal utilization projects for both electrical generation and direct applications.

These programs have been in the form of grants, loans, guaranteed loans, or industry cost sharing. Other programs served to ease financial risks of project development by providing tax incentives (see below) or reservoir insurance.

2.1 Loan Programs

The Geothermal Loan Guarantee Program (GLGP) was one of the first, the best known and most successful of all the state and Federal programs. The GLGP became effective in June of 1975 under Title II of the Geothermal Research, Development and Demonstration Act of 1974 (Nasr, 1978). The GLGP was designed to accomplish the following objectives:

a. To encourage and assist the private and public sectors to accelerate development of geothermal resources in an environmentally acceptable manner by minimizing a lenders financial risk,
b. To develop normal borrower-lender relationships in order that financing be made available without guarantees at some future date, and
c. To enhance competition and encourage new entrants into geothermal markets.

Under terms of the Act, loan guarantees could be granted for up to 75% of the project costs with the Federal government guaranteeing up to 100% of the amount borrowed.

The Act was subsequently amended in 1980 to allow for the granting of loans up to 90% of the total aggregate project cost providing that the applicant was an electric, housing or other cooperative or a municipality. However, loans were limited to $100 million per project and no qualified borrower was to receive more than $200 million in loans.

The GLGP was successful in furthering geothermal developments at a number of locations and in bringing both direct use and electrical generation projects on-line.

The two most serious deficiencies in the program were that the very severe requirements of loan approval often served to limit the use of the program to those who should have been able to qualify for a conventional loan without the guarantee and the fact that utilities were unwilling to use the loan guarantee program because default, even on a loan guaranteed by the Federal government, would seriously affect their credit rating. Although successful, the program ended when the U.S. Congress failed to provide further appropriations for the program during the 1980's.

The User Coupled Confirmation Drilling Program was initiated by the US Department of Energy in 1980 to help meet the needs of developers of direct application geothermal projects by substantially reducing risk through cost-sharing with industry the confirmation of hydrothermal reservoirs. The program was designed to cost-share expenses for exploration and included siting drill holes, drilling, flow testing, reservoir engineering and the drilling of injection wells.

The primary objectives of the User Coupled Confirmation Drilling Program were to foster the economically viable use of direct application of resources through participation of the industrial and private sectors by:

1) Absorbing a portion of the risk associated with the confirmation of hydrothermal reservoir in the initial stages of direct heat utilization development while, at the same time,
2) Developing an experienced infrastructure of exploration, reservoir confirmation and utilization engineering consultants, contractors and equipment manufacturers who would reduce reservoir confirmation risks in the future.

Although the program was in the strictest sense a cost-share program between industry and the government, the program was structured to serve as a loan guarantee. If developers would finance the project out of in-house funds, or a loan could be obtained from a commercial institution using the USDOE contract as evidence that project risk had been substantially reduced, the Federal government would agree to pay between 20 and 90% of the total project cost based upon a formula which took into consideration the usability of the thermal fluids intersected by drilling for the planned application. On a completely successful project, the US Department of Energy's cost-share was 20%, whereas on a completely unsuccessful project, USDOE's cost share was 90%.

Several additional loan programs were authorized through provision of the Energy Security Act that passed Congress in 1980. These included Feasibility Study Loans, Reservoir Confirmation Loans and System Construction Loans.

Feasibility Study Loans had been authorized for direct applications of geothermal energy and were to be made available to "geothermal utility districts, geothermal industrial development districts and other persons". ["Person" was defined to include municipalities, cooperatives, industrial development agencies, non-profit organizations, Indian tribes and other entities including an individual, corporation, joint stock company, partnerships, associations, business trust, organized groups of persons (whether incorporated or not) or receivers or trustees of any of the foregoing]

Loans were to be available to defray up to 90% of the costs of:

a) Studies to determine the feasibility of any direct application geothermal development and
b) Preparing applications for any necessary licenses or other Federal, state, and local permits or approvals required by such development.

The Secretary of Energy was given the authority to cancel any unpaid balance and any accrued interest on any loan granted under provision of the Feasibility Study Loan Program if it was determined on the basis of the study that geothermal development was not technically or economically feasible.

The Loans for Geothermal Reservoir Confirmation Program authorized the Secretary of Energy to make loans to any person **"**to assist such persons in undertaking and carrying out a project which:

1) Was designed to explore or determine the economic viability of a geothermal reservoir and
2) Consists of surface exploration and the drilling of one or more exploratory wells."

Loans were made available to developers of both electrical and direct application geothermal projects, but were limited to a maximum of $3,000,000 and no loan for confirming a resource for electrical generation could exceed 50% of the cost of the project. For direct use projects, the loan could be in an amount up to 90% of such cost. As with the loans for feasibility studies, the Secretary of Energy was authorized to cancel the unpaid balance and any accrued interest on the loan if he determined that the geothermal reservoir, for which the loan was made, had characteristics which made that reservoir economically or technically unacceptable for commercial development. The loan term was a maximum of 20 years. If revenues were inadequate to fully repay the principal and accrued interest within 20 years after production began, the remaining unpaid amount was to be forgiven.

The Loans for the Geothermal Resource Confirmation Program was designed to replace the User Coupled Loan Program that was aimed strictly at promoting the confirmation of reservoirs for direct application and at the same time to serve as a supplement to the Geothermal Loan Guarantee Program by providing for geological assessments and reservoir confirmation activities related to electrical generation projects that were given very low priority under the GLGP.

System Construction Loans were also authorized by the US Congress under provision of the Energy Security Act. The Secretary of Energy was authorized to make a loan to any person to defray up to 75% of the costs directly related to the construction of a system for direct application geothermal development. No limit was placed upon the size of the loan and loans were repayable from revenue (at a rate not to exceed 20% of gross revenue) over 30 years. The loans were not forgivable.

Despite passage and authorization by Congress, none of the loan provisions of the Energy Security Act were actually implemented because successive administration failed to request the needed appropriations. The need for and desirability of such policy initiatives is as strong now as when the Energy Security Act was passed in 1980.

Unfortunately, some states, for example Washington, were often forbidden from establishing loan programs under provision of state Constitutions, or were able to only provide very limited programs for geothermal development. For example, the Alaska Department of Commerce established a revolving loan fund in the late 1970's under the Business Loan Division. Loans were only available up to $10,000 and interest rates were not especially attractive (Basecu et al, 1980). In Oregon, a small scale Local Energy Project Loan Program was established by the state legislature in 1979. This program included loans for "any system…of 25 MW or less, located in Oregon that used renewable resources, including but not limited to "…geothermal…to supply energy, including heat, electricity, mechanical action… to meet a local community or regional energy need in this state". Loans were financed through bond sales and bore the interest rate at which the bonds were sold (Bloomquist, 1986). Loans can be as small as $20,000 or as large as millions of dollars. Terms vary from five to 20 years. Loans terms are based on the type of project, the amount of energy saved and other financial considerations. Loans are usually structured so that repayment is made from energy savings of income produced by the project (Oregon Office of Energy 2001, Oregon Energy Loans, Brochure).

In other states such as Alabama, Alabama Power has established a utility loan program that will provide a maximum loan of up to $25,000 for geothermal heat pump installations. The loan term is seven years. In Montana, the state has established an Alternative Energy Revolving Loan Program that provides loans to individuals and small businesses for the purpose of building alternative energy systems. Geothermal heat pumps are one of the eligible technologies.

2.2. Financial Assistance Programs

One of the first, most successful and long-lived programs providing financial assistance to developers was the US Department of Energy's Technical Assistance Grant Program.

The program's intent was to provide assistance to potential developers of geothermal energy who had little or no expertise in the geothermal field in order to promote the rapid development of direct application resources. Assistance was provided to all public and private entities on a non-competitive, first-come first-served basis. Assistance was available in resource assessment and/or the preparation of technical and economic feasibility studies and was limited to 100 hours. Assistance was provided either by one of USDOE's technical centers or by a consultant selected by the center. A secondary aim of the program was to establish expertise in the private sector consulting industry.

Due to an increasing desire to involve more private sector consulting companies in the provision of technical assistance, the program was later scaled back with the technical centers being restricted to eight hours of direct assistance on any one project unless an exemption was provided. Technical assistance continues to be available through the Oregon Institute of Technology Geo Heat Center and the Washington State University Center for Distributed Generation and Thermal Distribution, with funds being made available through both the USDOE and the National Renewable Energy Laboratory. The program has been highly successful with numerous projects having been benefited by its ongoing availability.

The Program Research and Development Announcement (PRDA) program was initiated to provide funds for much more detailed feasibility studies than were possible under the Technical Assistance Grant Program. The program was directed at the completion of detailed engineering and economic feasibility studies of direct application of geothermal resources. In order to be considered for funding under the program, proposers were required to demonstrate their ability to carry the project through to completion and it was vital that the proposer was familiar with economic, energy utilization technology and institutional requirements of the direct application of geothermal resources.

PRDA announcements usually targeted particular applications which USDOE had a special interest in promoting. These included:

a) Industrial process steam and moderate to low temperature heat for industrial plants.
b) Agricultural, space, water and soil heating for greenhouses, grain drying, irrigation pumping and extraction of chemicals from agricultural products (starches, acetic acid, acetone/butanol and ethanol).
c) Space/water heating and cooling. Space heating and cooling, water heating (especially district heating and/or cooling systems) for commercial-sized building or business complexes and residential developments.
d) Mineral extraction. Process steam and moderate to low temperature heat for ore concentrating, leaching and flotation processes.

Solicitations for proposals were typically issued once or twice per year and grants were limited to between $100,000 and $125,000. Though generally considered to be successful the program could have been significantly more successful if more significance had been placed upon geologic, geophysical and other resource data as an integral part of the proposal evaluation process or if grants had provided monies for resource assessment as an integrated part of the program. The PRDA program was, however, closely tied to another US Department of Energy program, the "Program Opportunities Notice".

The Program Opportunity Notice or PON program was initiated to provide an opportunity for interested parties to propose direct utilization or combined electrical/direct application projects and that would demonstrate single or multiple uses of geothermal energy through field experiments in space/water heating and/or cooling for residential and commercial buildings, agriculture and aquacultural uses and industrial processing. All grants were made on a competitive basis and required a cost share.

Under the PON program, much more emphasis was placed upon the need to provide strong evidence of suitable geothermal resources than was the case with the PRDA program and that made a significant difference in the overall success of the program. Another significant difference was the requirement for cost sharing. The greater financial commitment required of the proposer helped ensure that the project would be carried through to completion.

The PON program resulted in a number of successful demonstrations, the most well known being the Boise, Idaho and Klamath Falls, Oregon district heating systems.

Although the program was generally directed at direct use applications, in at least one instance a PON was issued to solicit offers from private industry to participate in a geothermal demonstration power plant project. Under terms of the solicitation, DOE's share of project costs could not exceed 49% of the total project cost and DOE was entitled to recover up to 50% of its share of aggregate project cost from revenue generated. Unfortunately the project selected was never successfully completed.

Unlike the PON program that was directed primarily at direct application of geothermal energy, the Industry Coupled Program was designed to be a cooperative effort between the US Department of Energy and industrial organizations engaged in geothermal exploration for electrical power generation. The program was initiated to foster development by providing for:

1) Cost sharing with industry for exploration, reservoir assessment and reservoir confirmation, and
2) The release to the public of geoscientific data that would increase the understanding of geothermal resources.

Under guidelines of the program a contract between the US Department of Energy and an industrial partner was to specify:

1) An exploration and/or reservoir confirmation program that the industrial partners would undertake and manage
2) A data package which industry would agree to make public, and
3) A certain percentage of the total project cost (generally 20-50%) which USDOE would contribute to the work.

The program was never well publicized and when employed not particularly successful in meeting its intended objectives because release of geoscientific data had little impact on broader industry participation in geothermal development since most land positions were already well established.

A potentially better approach to cost sharing that would have potentially brought greater return to the government or to the tax paying public would have been either to require future revenue sharing with the government as was specified under the PON program, thus establishing a revolving fund, or to require the participating industrial partner to provide energy at a reduced rate to the public.

Although all of the above financial assistance programs with the exception of the technical assistance program were terminated due to lack of congressional support, USDOE sometimes directly but more commonly through one of the National Laboratories has continued to provide financial support. This support is generally directed at specific technologies, critical component development, resource exploration or demonstrations. Recent solicitations have been directed at for example small power plant demonstrations, critical power plant and well field components e.g. downhole pumps and enhanced evaporative cooling, direct use applications and enhanced geothermal systems. All of these programs have required an industry cost share. Many of the initiatives, however, remain under-funded, and many projects have suffered from burdensome regulatory and administrative requirements.

Some states have also provided significant financial assistance: of these, California is by far the best example. Funding has come from geothermal royalties on state lands and the states' share of Federal royalties. Projects supported included, for example, resource assessment, drilling, technical assistance, regulatory compliance, technology development and demonstration and enhanced injection.

In a number of states, investor-owned and/or public utilities have also established incentives programs directed at promoting geothermal heat pumps. In New Hampshire, the New Hampshire Cooperative provides up to $1,250 for members who choose geothermal heat pumps for their primary heating system. In Nebraska, Lincoln Electric Systems will provide up to $250 for new geothermal heat pumps installed in single or multi-family houses and commercial buildings.

3. TAXATION

Tax policy has long been a favorite tool of law makers looking to increase capital investments in, for example, industrial production, exploration for and development of petroleum resources and now development of renewable energy resources.

Geothermal tax incentives have been enacted at both the Federal and state levels to provide tax savings for both developers and users of geothermal energy. Such savings reduce the risk of the investment, make geothermal much more economically attractive and thus much easier to finance. Tax incentives may apply to direct use projects, electrical generation projects or both.

The first significant Federal tax act was the Energy Security Act of 1978, which provided for deduction of intangible drilling costs and allowed for percentage reservoir depletion allowances (Nimmons, 1978).

Intangible drilling cost deduction allows a taxpayer investing in the drilling of a well for geothermal deposits to elect to expense the intangible drilling costs involved in the construction of the well in the same manner as an investment in oil and gas wells (see Miller's Oil and Gas Federal Income Taxation, 1977). Eligible intangible costs include such things as wages, fuel, repairs, hauling and incidental supplies and can represent a significant portion of field development expense. Unfortunately, slim hole temperature gradient and geochemical test wells as well as injection well costs are ineligible and must instead be capitalized with costs being recoverable only after production is established through depreciation (Bloomquist, 1986).

The percentage reservoir depletion allowance traditionally available to oil and gas was also extended to geothermal by the Energy Security Act of 1978. The Act provided for the percentage of gross income deductible for depletion, declining from 22% in 1978 to 15% for 1984 and years thereafter.

Two other tax credits were also provided by Congress in 1978, including the Residential Energy Credit and the Business Investment Credit. Both were later modified in 1980 under provisions of the 1980 Windfall Profit Tax Act.

The Residential Energy Credit allowed an individual taxpayer a credit for qualified renewable energy source expenditures made in conjunction with a principal residence. The amount allowed was 40% of the first $10,000 or a maximum of $4,000. The residential investment credit was unfortunately eliminated.

The Business Investment Credit provided a 15% tax credit for business investing in certain kinds of alternative energy property including geothermal. The percentage allowed was reduced to 10% and made permanent in 1992 (Wiser et al 2003).

In addition, investments in geothermal are eligible for five years accelerated depreciation.

Legislation now pending before Congress would extend the Federal Production Tax Credit (PTC) now available to wind and closed-loop biomass projects to geothermal generation. The 1.8¢/kWh tax credit as proposed would be available for five years and could be taken in addition to the business investment tax credit. (Wiser et al, 2003, Gawell, Personal Communication 2004). Many in the geothermal industry feel that the PTC would be the single most important policy change allowed the geothermal industry since the passage of the Energy Policy Act of 1992.

A number of states also enacted tax incentives programs. These programs took the form of business tax credits, residential tax credits, property tax exemptions, sales tax exemptions and exemptions on public utility taxes. Some, but not all, of these programs also apply to eligible geothermal heat pumps. For example, in Oregon homeowners and renters who pay Oregon income taxes are eligible for a Residential Energy Tax Credit if they purchase, among other technologies, a closed-loop geothermal space or water heating system. Oregon also provides a business Energy Tax Credit in the amount of 35% of eligible project costs. The tax credit may be taken over five years: 10% in the first and second year and 5% each year thereafter. The maximum amount of tax credits a resident may recover per year is $1,500. A 2003 Amendment now allows for owners of projects with eligible costs of $20,000 or less to take the entire tax credit in one year. North Dakota provides an exemption from local property taxes on any geothermal energy device, including geothermal heat pumps. Nevada also exempts value added by a qualified renewable energy system from the assessed value of any residential, commercial or industrial building for property tax purposes. The exemption applies to both geothermal electric as well as geothermal heat.

Some states, including Massachusetts, provide an exemption from the state's sales tax for geothermal heat pump systems and related equipment.

4. UTILITY POLICY

It is in the generation and transmission area that changes in utility policy have had the greatest impact on geothermal development.

In 1979 the U.S. Congress enacted the Public Utilities Regulatory Policy Act or PURPA. PURPA for the first time ever allowed for the generation of electricity by non-utility companies, thus creating the private power industry. PURPA not only allowed for the generation of electricity by non-utility companies but also required regulated utilities to purchase the output from these facilities at their avoided cost, i.e. the cost the utility would incur if it were to generate power itself or purchase power from some other outside source.

The impact of PURPA on the geothermal industry was tremendous and several hundred megawatts of new geothermal generation came online during the 1980s as a result of its enactment. Much of that was in California.

Following the enactment of PURPA at the Federal level during the 1980s, many state utility commissions began to require that regulated utilities develop integrated resource plans (IRP) as a means of incorporating demand side resource into resource planning, as well as incorporating other factors such as uncertainty and environmental quality into the planning process. IRP allowed for a portfolio approach to minimizing costs subject to reliability requirements, and as a means to incorporate environmental and diversity factors as well. IRP was designed to be a way to consider in a balanced fashion all of the characteristics, costs and benefits of renewable energy, conventional generation and demand side resources. Although IRP technically opened the door to significant amounts of new renewable generation, geothermal had difficulty competing successfully unless considerable weight was given to environmental and diversity externalities, and monetizing such externalities proved to be not only contentious but often impossible (Wiser et al, 2003).

IRP was also best suited for a regulated monopolistic system. However, during the 1990s many states began to deregulate the utility industry and many utilities were required to divest of their generation assets and were in reality turned into "wire" companies. Because of divesture there were no longer stable generation portfolios and the development of new generation is now often driven solely by market forces.

The latest utility-related policy initiative directed at encouraging the development of renewable generation is the passage of renewable portfolio standards (RPS) in a number of states (13 as of May 2004). The RPS ensures that a minimum amount of renewable energy (in some states this can include high efficiency co-generated or combined heat and power) is included in the portfolio of electricity resources. It does so by requiring retail electricity suppliers to ensure that a minimum amount of their electricity supply comes from eligible renewable resources. Minimums range from less than 1% to a high of 30%. The requirement is usually designed to be phased in and to be met by an established future date. Eligible resources are established by definition, unfortunately some states have failed to include geothermal as an eligible resource. To add flexibility and reduce cost of meeting the requirement, tradable renewable certificates (TRC) can be used to track and verify compliance. Some states have chosen to specify maximum percentages of given resources, provided set aside percentages for specific resources such as solar photovoltaic or placed various values on different renewables to encourage a diverse mix of renewable resources (Wiser, et al 2003). The U.S. Congress is also considering a national RPS. A national RPS is not, however, unilaterally supported by the renewable industry or the environmental community. Many feel that the RPS is best handled at the state level and since a Federal mandate (probably less than 10%) would be lower than established mandates in several states there is a worry that states would opt for lower numbers. There does seem to be greater support for some forms of national trading system of renewable certificates. This could definitely benefit western states with significant potential to develop large amounts of geothermal energy.

In practice RPS and IRP (when still feasible) can be complementary policies. While an RPS can minimize the cost of meeting specific renewable energy targets, IRP can directly address a fuller range of impacts in a multi-attributable analytical approach (reliability, cost, environmental impacts and generation diversity). In addition, IRP decisions may have long-term regulatory support, so that risks can be well understood by those financing renewable energy generation facilities. In contrast, RPS requirements in the absence of long-term contracting standards are concerned only with meeting annual and long range targets, leaving greater risk for investors in renewable generation (Wiser, et al, 2003).

Some state utility commissions have also provided for the use of renewable energy credits (REC), often referred to as green tags or green certificates. REC could have a market value in the range of 1-2¢/kWh and could significantly improve the economic viability of a number of renewable generation technologies, including geothermal.

Finally, several states have provided for the imposition of a non-bypassable system benefit charge (SBC) on electricity rates. Funds so collected are used directly to support renewable generation development through monetary support via production incentives, grants or rebates as well as provide indirect support as, for example, through customer education.

5. CONCLUSION

U.S. renewable energy policy has continued to change over time in an attempt to best meet the needs of these emerging technologies. Geothermal has been the focus of numerous policy initiatives directed at expanding the industry and bringing both electrical and direct application projects on-line. Much of the early emphasis was placed on direct financial support in the form of loans, guaranteed loans, grants, government cost sharing or insurance. However, as Federal funding became less and less available the emphasis turned more toward creating markets for geothermal power and/or rewarding companies for success through production tax credits or direct monetary support. No matter what form policy takes, it is critically important that it provide a level playing field for all renewables.

REFERENCES

V Basecu, N. et al., 1980. Alaska: A Guide to Geothermal Energy Development. Oregon Institute of Technology, Geo Heat Utilization Center.

Bloomquist, Dr. R. Gordon, 1986. A Review and Analysis of the Adequacy of the U.S. Legal, Institutional and Financial Framework for Geothermal Development. Geothermics, Vol. 15, No. 1, pp. 87-132.

Gawell, Karl, 2004. Personal Communication. Geothermal Energy Association.

Nasr, L.H., 1978. Geothermal Loan Guaranty Program and its Impact on Exploration and Development. Colorado School of Mines.

Nimmons, J. T., 1978. Memorandum: 1978 National Energy applications to geothermal development. Earl Warren Legal Institute, Geothermal Commercialization Project, University of California, Berkeley.

Oregon Office of Energy, 2001. Oregon Energy Loans Brochure.

United States House of Representatives, H.R. 2772, Introduced July 17, 2003.

Wiser, Ryan, Kevin Porter, Robert Grace and Chase Kappel, 2003. Creating Geothermal Markets: Evaluating Experience with State Renewables and Portfolio Standards. Prepared for the National Geothermal Collaborative, pp. 72.