F I S C A L I M P A C T R E P O R T

SPONSOR Gonzales **ORIGINAL DATE** 02/11/09 **LAST UPDATED** **HB** 375

SHORT TITLE Certain Geothermal Heat Pump Tax Credits **SB**

ANALYST Francis

REVENUE (dollars in thousands)

Estimated Revenue			Recurring or Non-Rec	Fund Affected
FY09	**FY10**	**FY11**		
		($500.0)	Recurring	General Fund

(Parenthesis ( ) Indicate Revenue Decreases)

SOURCES OF INFORMATION

LFC Files
US Department of Energy

Responses Received From
Taxation and Revenue Department (TRD)
Energy Minerals and Natural Resources (EMNRD)
NM Environment Department (NMED)

SUMMARY

Synopsis of Bill

House Bill 375 creates the geothermal ground-coupled heat pump tax credit which is a credit against personal and corporate income tax liability. The credit is for 30 percent of the purchase and installation of an eligible system up to $9,000. The credit can be carried forward for ten years. The credits must be certified by EMNRD and only $2 million annually can be certified.

The credit is effective for tax years 2010 to 2020.

From US Department of Energy:

The geothermal heat pump, also known as the ground source heat pump, is a highly efficient renewable energy technology that is gaining wide acceptance for both residential and commercial buildings. Geothermal heat pumps are used for space heating and cooling, as well as water heating. Its great advantage is that it works by concentrating naturally existing heat, rather than by producing heat through combustion of fossil fuels.

The technology relies on the fact that the Earth (beneath the surface) remains at a relatively constant temperature throughout the year, warmer than the air above it during the winter and cooler in the summer, very much like a cave. The geothermal heat pump takes advantage of this by transferring heat stored in the Earth or in ground water into a building during the winter, and transferring it out of the building and back into the ground during the summer. The ground, in other words, acts as a heat source in winter and a heat sink in summer.

FISCAL IMPLICATIONS

According to TRD, using EMNRD estimates, 100-150 pumps will be installed annually. The relatively high cost of geothermal ground-coupled heat pumps (between $30 and $40 thousand), coupled with the slowing economy and tight credit markets, suggests that use of the credit will likely initially be slow. Due to the high cost of the pumps, all credits that are claimed are expected to be for the full $9,000 credit amount. 60% of claims are assumed to have sufficient tax liability to claim full credit in year of install; 40% of claims are assumed to claim the credit over a 5 year period.

The combination of the cap on individual credits and the overall cap means that the credit cannot cost more than $2 million annually.

SIGNIFICANT ISSUES

There is a similar federal credit that is for 30 percent of the cost of purchase and installation up to $2,000.

> **Qualified geothermal heat pump property costs.** Qualified geothermal heat pump property costs are costs for qualified geothermal heat pump property installed on or in connection with your home located in the United States. Qualified geothermal heat pump property is any equipment that uses the ground or ground water as a thermal energy source to heat your home or as a thermal energy sink to cool your home. To qualify for the credit, the geothermal heat pump property must meet the requirements of the Energy Star program that are in effect at the time of purchase. The home does not have to be your main home. (Form 5695)

If a typical system costs $30,000 to install, then the discount through the combined credits will be about 36 percent which should have a tremendous impact on demand for these systems. Going through a "savings calculator" at www.waterfurnace.com indicates annual savings for a medium size house in Albuquerque would be about $2,600.

NMED:

> The State's coal-fired power plants emit contaminants into the air including oxides of nitrogen, sulfur dioxide, particulates, mercury and carbon dioxide. Those pollutants adversely impact public health, visibility and the global climate. Because HB 375 provides incentives for geothermal heat pumps to provide energy to buildings, it could help to obviate the need to construct new conventional coal-fired power plants that emit more air pollution.

The Environment Department's Air Quality Bureau has a legislative performance measure to reduce annual statewide greenhouse gas emissions to a target level. Similarly, the Governor's Accountability and Performance Contract contains goals for reduction of greenhouse gas emissions. Finally, the Governor's Executive Order on Climate Change also contains goals for reduction of greenhouse gas emissions to 2000 levels by 2012, 10 percent below that by 2020 and 75 percent below 2000 levels by 2050. This Executive Order also requires the Energy, Minerals and Natural Resources Department to establish financial incentives for distributed and centralized renewable energy.

EMNRD:

This is an important clean energy technology that needs to be promoted in New Mexico. Governor Richardson issued Executive Order 2007-053 on Increasing Energy Efficiency to reduce statewide per capita energy consumption 20% by the year 2020, with an interim goal of 10% by 2012 (compared to 2005). The U.S. Department of Energy (DOE) has also established a requirement for states to achieve 25% in energy reductions by 2012, compared to 1990. An incentive program for ground-coupled heat pump systems will help achieve both state and federal goals.

TECHNICAL ISSUES

The phrase "ultimately, the sun" is a vague term and could be confused with other tax credits for specifically solar heating systems.

TRD notes that it should be clear what documentation is required from EMNRD to receive the credit and there it should be explicitly stated that the credit is not refundable.

EMNRD has noted several technical issues. First, the agency's understanding of the intent of the law was to have a maximum $2 million but the language may be construed to allow $2 million for credits against personal income tax *and* $2 million against corporate income tax. Second, there are two definitions of "geothermal ground-coupled heat pump," one in the personal income tax section and tailored to residential systems and one in the corporate income tax section, tailored to business applications. There should be a single definition to avoid confusion and to recognize that some business taxpayers may file personal income tax returns rather than corporate.

EMNRD offers the following amendments to address these technical issues:

Page 3 lines 20-25 and Page 4 lines 1 and 2:

"G. As used in this section, "geothermal ground-coupled heat pump" means a system that ~~uses~~ [exchanges energy with] ~~energy from~~ the ground, water or, ~~ultimately, the sun~~ [a combination of ground and water] for distribution of [energy for] heating, cooling or domestic hot water; that has either a minimum coefficient of performance of three and four-tenths or an [energy] efficiency ratio of sixteen or greater; and that is installed by an accredited installer certified by the international ground source heat pump association."

Page 5, lines 19-25 and Page 6 line 1:

E. "~~As used in this section, "geothermal ground-coupled heat pump" means a reversible refrigerator device that provides space heating, space cooling, domestic hot water, processed hot water, processed chilled water or any other application where hot air, cool air, hot water or chilled water is required and that utilizes ground water or water circulating through pipes buried in the ground as a condenser in the cooling mode and an evaporator in the heating mode.~~

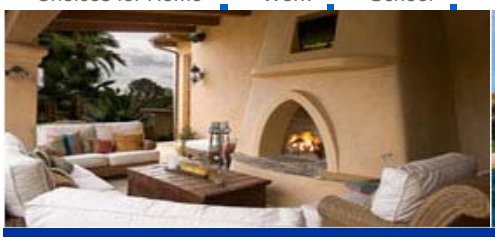
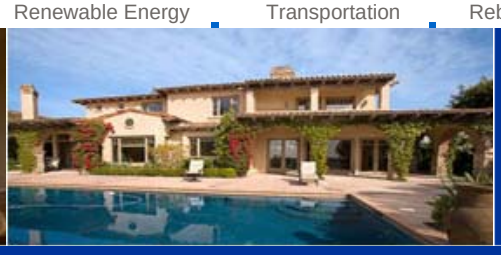
As used in this section, "geothermal ground-coupled heat pump" means a system that exchanges energy with–the ground, water or, a combination of ground and water for distribution of heating, cooling or domestic hot water; that has either a minimum coefficient of performance of three and four-tenths or an energy efficiency ratio of sixteen or greater; and that is installed by an accredited installer certified by the international ground source heat pump association."

NF/svb

The Legislative Finance Committee has adopted the following principles to guide responsible and effective tax policy decisions:

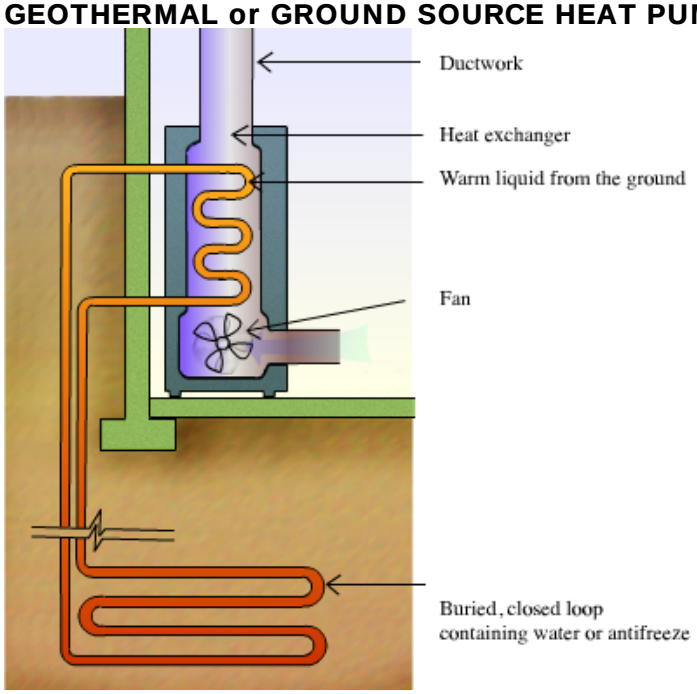
1. ***Adequacy:*** *revenue should be adequate to fund government services.*
2. ***Efficiency:*** *tax base should be as broad as possible to minimize rates and the structure should minimize economic distortion and avoid excessive reliance on any single tax.*
3. ***Equity****: taxes should be fairly applied across similarly situated taxpayers and across taxpayers with different income levels.*
4. ***Simplicity****: taxes should be as simple as possible to encourage compliance and minimize administrative and audit costs.*
5. ***Accountability/Transparency:*** *Deductions, credits and exemptions should be easy to monitor and evaluate and be subject to periodic review.*

More information about the LFC tax policy principles will soon be available on the LFC website at www.nmlegis.gov/lcs/lfc

Choices for the Home

GEOTHERMAL or GROUND SOURCE HEAT PUMPS



Heat pumps move heat from one place to another - from outside to inside a home, for example. That's why they're called "heat pumps."

We explained the way that they work in the section "Central HVAC." Here's a simplified version of how a heat pump works:

All heat pumps have an outdoor unit (called a condenser) and an indoor unit (an evaporator coil).

A substance called a *refrigerant* carries the heat from one area to another. When compressed, it is a high temperature, high-pressure liquid. If it is allowed to expand, it turns into a low temperature, low pressure gas. The gas then absorbs heat.

In the winter the normal heat pump system extracts heat from outdoor air and transfers it inside where it is circulated through your home's ductwork by a fan.

Even cold air contains a great deal of heat; the temperature at which air no

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Wholehouse Fans

Window AC

Consumer Tips

longer carries any heat is well below -200 degrees Fahrenheit. But the coldest temperature ever recorded in the lower 48 states was -70 degrees, recorded at Roger Pass, Montana on January 20, 1954. Obviously in such weather, a heat pump would have to work pretty hard to produce 68-degree temperatures inside your home.

That's why geothermal heat pumps are so efficient.

Geothermal heat pumps are similar to ordinary heat pumps, but instead of using heat found in outside air, they rely on the stable, even heat of the earth to provide heating, air conditioning and, in most cases, hot water.

From Montana's minus 70 degree temperature, to the highest temperature ever recorded in the U.S. - 134 degrees in Death Valley, California, in 1913 - many parts of the country experience seasonal temperature extremes. A few feet below the earth's surface, however, the ground remains at a relatively constant temperature. Although the temperatures vary according to latitude, at six feet underground, temperatures range from 45 degrees to 75 degrees Fahrenheit.

Ever been inside a cave in the summer? The air underground is a constant, cooler temperature than the air outside. During the winter, that same constant cave temperature is warmer than the air outside.

That's the principle behind geothermal heat pumps. In the winter, they move the heat from the earth into your house. In the summer, they pull the heat from your home and discharge it into the ground.

Studies show that approximately 70 percent of the energy used in a geothermal heat pump system is renewable energy from the ground. The earth's constant temperature is what makes geothermal heat pumps one of the most efficient, comfortable, and quiet heating and cooling technologies available today. While they may be more costly to install initially than regular heat pumps, they can produce markedly lower energy bills - 30 percent to 40 percent lower, according to estimates from the U.S. Environmental Protection Agency, who now includes geothermal heat pumps in the types of products rated in the EnergyStar® program. Because they are mechanically simple and outside parts of the system are below ground and protected from the weather, maintenance costs are often lower as well.

As an added benefit, systems can be equipped with a device called a "desuperheater" can heat household water, which circulates into the regular water heater tank. In the summer, heat that is taken from the house and would be expelled into the loop is used to heat the water for free. In the winter, the desuperheater can reduce water-heating costs by about half, while a conventional water heater meets the rest of the household's needs. In the spring and fall when temperatures are mild and the heat pump may not be operating at all, the regular water heater provides hot water.

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How Do They Compare?

Surveys taken by utilities have found that homeowners using geothermal heat pumps rate them highly when compared to conventional systems. Figures indicate that more than 95 percent of all geothermal heat pump owners would recommend a similar system to their friends and family.

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Other Places to Visit...

International Ground Source Heat Pump Association
Note: This organization has listings of designers and certified installers

ENERGY STAR®

U.S. Department of Energy
Information for Consumers on Geothermal Heat Pumps.

Cost

As a rule of thumb, a geothermal heat pump system costs about $2,500 per ton of capacity. The typically sized home would use a three-ton unit costing roughly $7,500. That initial cost is nearly twice the price of a regular heat pump system that would probably cost about $4,000, with air conditioning.

You will have to, however, add the cost of **drilling** to this total amount. The final cost will depend on whether your system will drill vertically deep underground or will put the loops in a horizontal fashion a shorter distance below ground. The cost of drilling can run anywhere from $10,000 to $30,000, or more depending on the terrain and other local factors.

Added to an already built home an replacing an existing HVAC unit, an efficient geothermal system saves enough on utility bills that the investment can be recouped in five to ten years.

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Durability

Geothermal heat pumps are durable and require little maintenance. They have fewer mechanical components than other systems, and most of those components are underground, sheltered from the weather. The underground piping used in the system is often guaranteed to last 25 to 50 years and is virtually worry-free. The components inside the house are small and easily accessible for maintenance. Warm and cool air are distributed through ductwork, just as in a regular forced-air system.

Since geothermal systems have no outside condensing units like air conditioners, they are quieter to operate.

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How Do They Work?

Remember, a geothermal heat pump doesn't create heat by burning fuel, like a furnace does. Instead, in winter it collects the Earth's natural heat through a series of pipes, called a loop, installed below the surface of the ground or submersed in a pond or lake. Fluid circulates through the loop and carries the heat to the house. There, an electrically driven compressor and a heat exchanger concentrate the Earth's energy and release it inside the home at a higher temperature. Ductwork distributes the heat to different rooms.

In summer, the process is reversed. The underground loop draws excess heat from the house and allows it to be absorbed by the Earth. The system cools your home in the same way that a refrigerator keeps your food cool - by drawing heat from the interior, not by blowing in cold air.

The geothermal loop that is buried underground is typically made of high-density polyethylene, a tough plastic that is extraordinarily durable but which allows heat to pass through efficiently. When installers connect sections of pipe, they heat fuse the joints, making the connections stronger than the pipe itself. The fluid in the loop is water or an environmentally safe antifreeze solution that circulates through the pipes in a closed system.

Another type of geothermal system uses a loop of copper piping placed underground. When refrigerant is pumped through the loop, heat is transferred directly through the copper to the earth.

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Types of Loops

Geothermal heat pump systems are usually not do-it-yourself projects. To ensure good results, the piping should be installed by professionals who follow procedures established by the International Ground Source Heat Pump Association (IGSHPA). Designing the system also calls for professional expertise: the length of the loop depends upon a number of factors, including the type of loop configuration used; your home's heating and air conditioning load; local soil conditions and landscaping; and the severity of your climate. Larger homes requiring more heating or air conditioning generally need larger loops than smaller homes. Homes in climates where temperatures are extreme also generally require larger loops.

Here are the typical loop configurations:

Horizontal Ground Closed Loops

This type is usually the most cost effective when trenches are easy to dig and the size of the yard is adequate. Workers use trenchers or backhoes to dig the trenches three to six feet below the ground in which they lay a series of parallel plastic pipes. They backfill the trench, taking care not to allow sharp rocks or debris to damage the pipes. Fluid runs through the pipe in a closed system. A typical horizontal loop will be 400 to 600 feet long for each ton of heating and cooling.

Vertical Ground Closed Loops

This type of loop is used where there is little yard space, when surface rocks make digging impractical, or when you want to disrupt the landscape as little as possible. Vertical holes 150 to 450 feet deep - much like wells - are bored in the ground, and a single loop of pipe with a U-bend at the bottom is inserted before the hole is backfilled. Each vertical pipe is then connected to a horizontal underground pipe that carries fluid in a closed system to and from the indoor exchange unit. Vertical loops are generally more expensive to install, but require less piping than horizontal loops because the Earth's temperature is more stable farther below the surface.

Pond Closed Loops

This type of loop design may be the most economical when a home is near a body of water such as a shallow pond or lake. Fluid circulates underwater through polyethylene piping in a closed system, just as it does through ground loops. The pipes may be coiled in a slinky shape to fit more of it into a given amount of space. Since it is a closed system, it results in no adverse impacts on the aquatic system.

Although they are less applicable to California, there are other loop systems described at the Geothermal Heat Pump Consortium's Web Site. These include an Open Loop System in which ground water is pumped into and out of a building, transferring its heat in the process; and Standing Column Well Systems, which can be up to 1,500 feet deep and can also furnish potable water.

In a few places, developers have installed large community loops, which are shared by all of the homes in a housing project.

To date, geothermal heat pumps are an under-used technology, merely because few people are aware of it's potential. The Department of Energy's

Office of Geothermal Technologies, however, wants to increase installations of geothermal systems to about 400,000 a year by 2005. If the goal is reached, that would mean that 2 million systems would be in service, saving consumers over $400 million per year in energy bills and reducing U.S. greenhouse gas emissions by over 1 million metric tons of carbon each year.

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