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Geothermal Heat Pump Manufacturing Activities 2009

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Contacts

This report was prepared by the staff of the Advanced Power Supply Team, Office of Electricity, Renewables, and Uranium Statistics. Questions about the preparation and content of this report may be directed to Michele Simmons, Team Leader, Advanced Power Supply Team at e-mail michele.simmons@eia.gov, (202) 586-9787 or Peter Wong at e-mail peter.wong@eia.gov, (202) 586-7574.

Preface

The U.S. Energy Information Administration (EIA) reports detailed historical data on geothermal heat pump manufacturing activities annually in its report, the *Renewable Energy Annual*. This report, *Geothermal Heat Pump Manufacturing Activities 2009*, provides an overview and tables with historical data spanning 2000-2009. These tables will correspond to identical tables presented in the *Renewable Energy Annual 2009* and are numbered accordingly.

Data in this report are based on manufacturing shipment information reported on Form EIA-902, “Annual Geothermal Heat Pump Manufacturers Survey.”

Prior editions of this report may be found on the EIA website at <http://tonto.eia.gov/reports/filterD.cfm?type=Renewable>.

Definitions for terms used in this report can be found in EIA’s Energy Glossary: <http://www.eia.doe.gov/glossary/index.html>.

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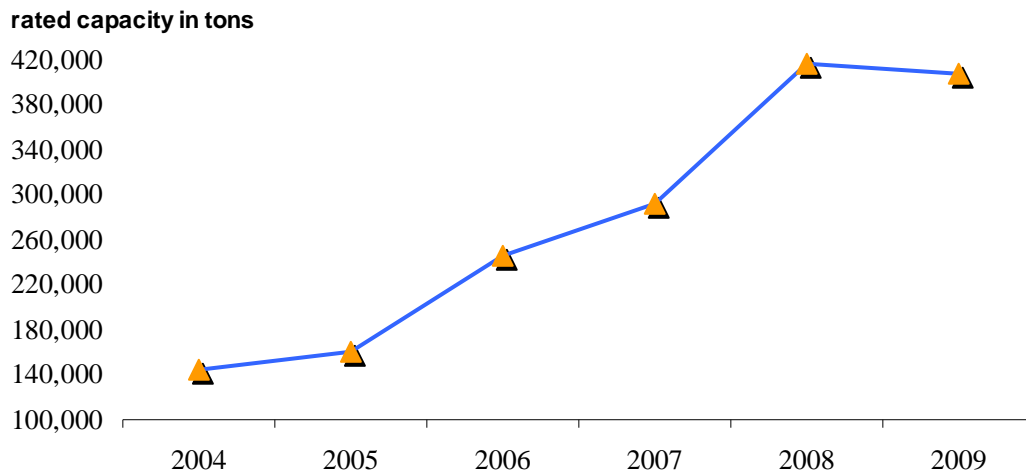
Geothermal Heat Pump Manufacturing Activities 2009

Overview

Shipments of geothermal heat pumps decreased nearly 5 percent in 2009 to 115,442 units from a year ago (Table 4.1), while capacity shipped decreased by only 2 percent to 407,093 tons¹ (Figure 4.1 and Table 4.2). This marked the first decrease in shipments experienced by the geothermal heat pump (GHP) industry since 2003.

On February 17, 2009, the American Recovery and Reinvestment Act of 2009 (ARRA) was signed into law. This legislation provides significant new Federal funding, loan guarantees, and tax credits to stimulate investments in energy efficiency and renewable energy.

Figure 4.1 Geothermal Heat Pump Shipments, 2004-2009



Source: U.S. Energy Information Administration (EIA)
Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Industry Status

In 2009, there were 27 known domestic manufacturers of geothermal heat pumps (Table 4.16), including brand name manufacturers² that shipped geothermal heat pumps manufactured by others under contract.

¹ Ton: A measure of the amount of Btu's (British thermal units) needed to melt one ton of ice in a 24-hour period. One ton equals 12,000 Btu's/hour available to heat and/or cool space.

² Brand name manufacturer is defined as a name used to identify a product in the consumer marketplace, which attributes the product to the owner of the name as the manufacturer.

Almost all manufacturers have their geothermal heat pumps tested and certified by the Air Conditioning, Heating, and Refrigeration Institute (AHRI) for their cooling capacities and operating efficiencies. In general, geothermal heat pumps are rated based on one of the four standards by the AHRI. The four classifications for geothermal heat pumps are as follows:

- ARI-320, Water-Source Heat Pumps (WSHP). These systems are installed in commercial buildings, where a central chiller or boiler supplies chilled or heated water, respectively, to heat pumps installed in series. The heat pumps reject building heat to chilled water during the cooling season and, during the heating season, take heat from boiler water
- ARI-325, Ground Water-Source Heat Pumps (GWHP). The GWHP is an open-loop system directly utilizes water from a well or water body, pumps it through a pipe for use as a heat exchanger, and returns it back to the environment
- ARI-330, Ground Source Closed-Loop Heat Pumps (GSHP). A water or water/glycol (antifreeze) solution flows continuously through a closed loop of pipe buried underground. Ground heat is absorbed into or rejected from the solution flowing in the closed loop. At the heat pump, heat is drawn from or dumped to the closed loop solution via heat transfer through a heat exchanger, which passes heat to, or removes heat from, the refrigerant in the heat pump
- ARI-870, Direct Geexchange Heat Pumps (DXHP). A geothermal heat pump system that uses refrigerant in a buried pipe loop as a heat exchanger. The refrigerant in the loop never leaves the system. A direct expansion system is a ground source system with a closed-loop which uses refrigerant throughout the system rather than a water/glycol solution to exchange heat

Out of 115,442 geothermal heat pump units shipped in 2009, a total of 22,009 were WSHP units (ARI-320 rated), 87,717 were GWHP or GSHP units (ARI-325 or ARI-330 rated), and 759 were DXHP units (ARI-870 rated). ARI-rated shipments decreased to 110,485 units in 2009, while the number of other non-ARI rated units shipped decreased to 4,957 in 2009 (Table 4.1).

Of the 27 manufacturers reporting GHP shipments in 2009, many manufacturers also reported being involved in one or more of the following geothermal heat pump-related activities (Table 4.15):

- 17 designed geothermal heat pumps or systems
- 13 developed prototype geothermal heat pumps only
- 7 developed prototype systems, which include geothermal heat pumps and other components

- 18 were involved in wholesale distribution
- 3 were involved in retail distribution
- 3 installed GHP products
- 4 manufactured system components

In addition, several manufacturers are planning to introduce new geothermal heat pump-related products in the next calendar year (Table 4.13):

- 10 plan to introduce new ARI-320 rated water-source heat pumps
- 13 plan to introduce new ARI-325 rated ground water-source heat pumps
- 11 plan to introduce new ARI-330 rated ground source closed-loop heat pumps
- 2 plan to introduce new ARI-870 rated direct geoechange heat pumps
- 4 plan to introduce new Non-ARI rated heat pumps in 2010 (Table 4.13)

In 2009, direct employment in the geothermal heat pump manufacturer industry accounted for 1,832 person-years³ (Table 4.14). Of the 27 manufacturers, 12 had 90 percent or more of their total company-wide revenues from geothermal heat pump-related activities, 3 had 50 to 89 percent, 4 had 10 to 49 percent, and 8 manufacturers had less than 10 percent (Table 4.16).

Geothermal Heat Pump Shipments

The total rated capacity of geothermal heat pumps shipped in 2009 was 407,093 tons, approximately 2 percent less than the 2008 shipments of 416,105 tons (Table 4.2). The average unit size shipped in 2009 was 3.53 tons, compared to an average unit size of 3.43 tons in 2008 (Table 4.1 and Table 4.2).

In 2009, water-source heat pump (ARI-320 rated) shipments decreased to 56,181 tons (Figure 4.2 and Table 4.2). This category has fluctuated in the past few years, largely due to one manufacturer classifying its equipment differently each year.

Shipments of ground water-source heat pumps and ground source closed-loop heat pumps (ARI-325/330 rated) continued to dominate the GHP industry in 2009, accounting for more than 73 percent of the total shipments (Figure 4.2 and Table 4.2). The shipments of ARI-325 and ARI-330 were 298,209 tons of capacity, a nearly 2.8 percent decrease from the corresponding 2008 shipments.

³ Person-year: One whole year, or fraction thereof, worked by an employee, including contracted manpower.

Shipments of direct geothermal heat pumps (ARI-870 Rated) totaled 3,103 tons in 2009 (Figure 4.2 and Table 4.2).

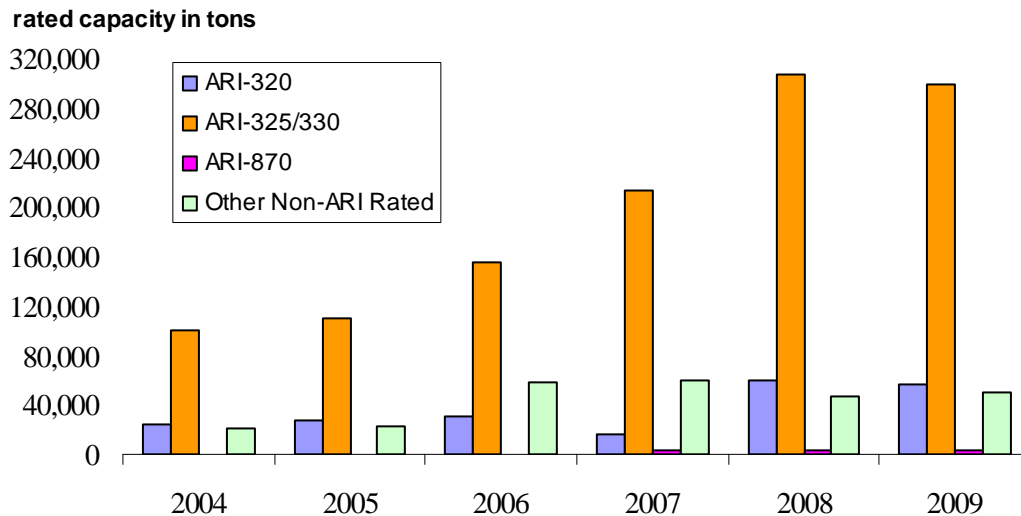
Despite the decline in total shipments, capacity of non-ARI rated heat pump shipments in 2009 increased more than 5.6 percent (49,600 tons) from 2008 shipments (Figure 4.2 and Table 4.2).

Total Revenue and Average Price

The total revenue for shipments of geothermal thermal heat pumps was approximately \$319.5 million in 2009, almost the same as 2008 (Table 4.5). Revenue includes charges for cooperative advertising and warranties, but does not include excise taxes and the cost of freight or transportation.

The average price (dollars per ton) for water-source heat pumps (ARI-320 rated) was \$590.38 in 2009, ground water-source heat pumps and ground source closed-loop heat pumps (ARI-325/330 rated) was \$835.21, direct geothermal heat pumps (ARI-870 rated) was \$957.10, and non-ARI rated heat pumps was \$691.54 (Table 4.5).

Figure 4.2 Geothermal Heat Pump Shipments by Capacity and Model Type, 2004-2009



Source: U.S. Energy Information Administration (EIA)
Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Domestic Shipments

During 2009, domestic shipments declined slightly, with rated capacity totaling 338,689 tons, a 2 percent decrease from 346,622 tons in 2008 (Table 4.6).

During 2009, GHP shipments to domestic wholesale distributors, the largest customer category, totaled 173,065 tons of capacity or 51 percent of the domestic market share. Shipments to the second-largest customer category, installers, amounted to 154,321 tons, or nearly 46 percent of the domestic market-share (Table 4.10).

In 2009, domestic shipments to the residential sector accounted for 172,559 tons of capacity or almost 51 percent of the domestic market. Of the domestic shipments to the residential sector, 4.8 percent were ARI-320 rated, 88 percent were ARI-325/330 rated, 1.5 percent were ARI-870 rated, and 5.6 percent were non-ARI rated (Table 4.11). The commercial sector was the second largest domestic market in the United States in 2009, accounting for 156,533 tons of capacity or 46 percent of the domestic market share. Almost 27 percent of the purchases for this sector were ARI-320 rated GHP, 61 percent ARI-325/330 rated GHP, just over 0.01 percent ARI-870 rated GHP, and 12.5 percent non-ARI rated GHP. The industrial sector, with slightly less than 3 percent of domestic shipments, was the smallest domestic sector.

Complete Systems

In general, geothermal heating/cooling systems provide space heating and cooling, as well as water heating. A complete geothermal heating/cooling system is defined as a unit with all the necessary functional components, except for installation materials. The system includes three principal components (listed below) and a device called a “desuperheater” which can be added to produce hot water when the system is providing heat or air conditioning.

The major components are:

- Geothermal earth connection subsystem: Using the earth as the heat source and heat sink, this subsystem consists of a series of pipes which are commonly called a “loop.” They carry a fluid used to connect the geothermal system's heat pump to the earth near the building to be conditioned
- Geothermal heat pump subsystem: An electric heat pump that exchanges heat between the fluid and the air that conditions the building
- Geothermal heat distribution subsystem: An air-delivery system that delivers the conditioned air to the building

Of the manufacturers reporting 2009 shipments, the majority of these manufacturers sell only geothermal heat pump subsystems (geothermal heat pump units), and three manufacturers reported selling complete systems. The complete systems accounted for 19,598 tons, or 5 percent of total (including exports) GHP shipped in 2009 (Table 4.6 and Table 4.12).

Origin of Shipments

Of the 407,093 tons of total GHP capacity shipped in 2009, 250 tons were imported from China. The remaining 406,843 tons of GHP capacity shipped were manufactured in the United States. The top five manufacturing states were: Florida, Indiana, Oklahoma, South Dakota, and Texas, with almost 57 percent (231,471 tons) of the total capacity shipped from Indiana and Oklahoma (Table 4.8).

Destination of Shipments

GHP export shipments totaled 68,404 tons of capacity in 2009. The export market accounted for nearly 17 percent of total capacity shipments and was dominated by sales to Canada, with more than 83 percent (56,845 tons) of total exports (Table 4.7).

In 2009, domestic GHP shipments totaling 338,689 tons of capacity went to all 50 States, and the District of Columbia (Table 4.6). About 52 percent of domestic GHP shipments (176,162 tons of capacity) went to ten States: Florida, Illinois, Indiana, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, and Texas, with more than 13 percent (44,705 tons of capacity) of the total sent to Ohio and Pennsylvania.

Geothermal Direct Use of Energy and Heat Pumps

EIA does not collect data on non-electric applications of geothermal energy such as crop drying and groundwater heat pumps. Analysis conducted by the Oregon Institute of Technology, Geo-Heat Center, indicated that non-electric uses of geothermal energy amounted to nearly 53.7 trillion Btu in 2009, increased more than 16 percent from a year ago (Table 4.17)⁴. Almost 84 percent of this energy was provided by geothermal heat pumps.

⁴ Data provided by Dr. John W. Lund, Oregon Institute of Technology, Geo-Heat Center.

Table 4.1 Geothermal Heat Pump Shipments by Model Type, 2000 - 2009**(Number of Units)**

Year	Model Type				Total
	ARI-320	ARI-325/330	ARI-870	Other Non-ARI Rated	
2000	7,808	26,219	-	1,554	35,581
2001	NA	NA	NA	NA	NA
2002	6,445	26,802	-	3,892	37,139
2003	10,306	25,211	-	922	36,439
2004	9,130	31,855	-	2,821	43,806
2005	9,411	34,861	-	3,558	47,830
2006	10,968	47,440	-	5,274	63,682
2007	8,112	66,863	809	10,612	86,396
2008	23,204	91,402	783	5,854	121,243
2009	22,009	87,717	759	4,957	115,442

ARI-320 = Water-Source Heat Pumps.

ARI-325 = Ground Water-Source Heat Pumps.

ARI-330 = Ground Source Closed-Loop Heat Pumps.

ARI-870 = Direct Geoexchange Heat Pumps.

NA = Not available. No survey was conducted for 2001.

- = No data reported.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.2 Rated Capacity of Geothermal Heat Pump Shipments by Model Type, 2000 - 2009

(Tons)

Year	Model Type				Total
	ARI-320	ARI-325/330	ARI-870	Other Non-ARI Rated	
2000	26,469	130,132	-	7,590	164,191
2001	NA	NA	NA	NA	NA
2002	16,756	96,541	-	12,000	125,297
2003	29,238	89,731	-	5,469	124,438
2004	23,764	100,317	-	20,220	144,301
2005	28,064	110,291	-	22,047	160,402
2006	31,198	155,736	-	58,669	245,603
2007	15,667	212,739	3,412	59,482	291,300
2008	59,360	306,650	3,114	46,981	416,105
2009	56,181	298,209	3,103	49,600	407,093

ARI-320 = Water-Source Heat Pumps.

ARI-325 = Ground Water-Source Heat Pumps.

ARI-330 = Ground Source Closed-Loop Heat Pumps.

ARI-870 = Direct Geoexchange Heat Pumps.

NA = Not available. No survey was conducted for 2001.

- = No data reported.

Note: One ton of capacity is equal to 12,000 Btus per hour.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.3 Average Cooling Efficiency for Geothermal Heat Pump Shipments, 2008 and 2009

(Average EER)

Year	Model Type			
	ARI-320	ARI-325/330	ARI-870	Other Non-ARI Rated
2008	13.1	19.5	17.5	13.5
2009	14.6	20.4	18.2	14.3

EER = Energy Efficiency Ratio.

ARI-320 = Water-Source Heat Pumps.

ARI-325 = Ground Water-Source Heat Pumps.

ARI-330 = Ground Source Closed-Loop Heat Pumps.

ARI-870 = Direct Geexchange Heat Pumps.

Notes: One ton of capacity is equal to 12,000 Btus per hour.

Efficiency is expressed as btus of output per watthours of input. The greater the EER the more efficient the unit.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.4 Average Heating Efficiency for Geothermal Heat Pump Shipments, 2008 and 2009

(Average COP)

Year	Model Type			
	ARI-320	ARI-325/330	ARI-870	Other Non-ARI Rated
2008	4.4	4.0	4.2	3.6
2009	3.9	4.1	4.3	3.8

COP = Coefficient of Performance.

ARI-320 = Water-Source Heat Pumps.

ARI-325 = Ground Water-Source Heat Pumps.

ARI-330 = Ground Source Closed-Loop Heat Pumps.

ARI-870 = Direct Geexchange Heat Pumps.

Notes: One ton of capacity is equal to 12,000 Btus per hour.

Efficiency is expressed as btus of output per watthours of input. The greater the COP the more efficient the unit.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.5 Geothermal Heat Pump Shipments by Model Type, Quantity, Revenue, and Average Price, 2008 and 2009

Model Type	2008			2009		
	Quantity (Rated Capacity in Tons)	Revenue (Thousand Dollars)	Average Price (Dollars per Ton)	Quantity (Rated Capacity in Tons)	Revenue (Thousand Dollars)	Average Price (Dollars per Ton)
ARI-320	59,360	44,125	743.34	56,181	33,168	590.38
ARI-325/330	306,650	241,556	787.73	298,209	249,067	835.21
ARI-870	3,114	W	W	3,103	2,970	957.10
Other Non-ARI Rated	46,981	W	W	49,600	34,300	691.54
U.S. Total	416,105	319,520	767.88	407,093	319,506	784.85

ARI-320 = Water-Source Heat Pumps.

ARI-325 = Ground Water-Source Heat Pumps.

ARI-330 = Ground Source Closed-Loop Heat Pumps.

ARI-870 = Direct Geoexchange Heat Pumps.

W = Data withheld to avoid disclosure of proprietary company data.

Notes: Totals may not equal sum of components due to independent rounding.

One ton of capacity is equal to 12,000 Btus per hour.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.6 Geothermal Heat Pump Shipments by Destination, 2008 and 2009**(Rated Capacity in Tons)**

Destination	2008	2009
Alabama	1,963	1,782
Alaska	107	190
Arizona	6,608	4,036
Arkansas	4,057	3,558
California	9,522	6,998
Colorado	4,233	3,134
Connecticut	3,577	2,684
Delaware	1,835	2,605
District of Columbia	1,792	1,345
Florida	12,439	18,558
Georgia	8,013	5,305
Hawaii	174	52
Idaho	1,180	1,433
Illinois	26,599	18,795
Indiana	18,119	17,764
Iowa	12,801	12,907
Kansas	2,720	4,447
Kentucky	10,931	12,366
Louisiana	603	1,299
Maine	719	556
Maryland	12,048	11,062
Massachusetts	7,719	3,054
Michigan	13,075	13,191
Minnesota	17,124	16,823
Mississippi	1,711	1,583
Missouri	8,585	13,724
Montana	1,755	1,766
Nebraska	12,618	9,154
Nevada	4,286	1,815
New Hampshire	3,324	2,812
New Jersey	2,785	5,131
New Mexico	1,806	1,027
New York	19,589	18,142
North Carolina	2,645	3,629
North Dakota	3,483	5,789
Ohio	20,332	23,348
Oklahoma	9,036	7,451
Oregon	2,343	1,875
Pennsylvania	22,494	21,357
Puerto Rico	21	-
Rhode Island	339	470
South Carolina	2,455	3,405
South Dakota	4,215	2,729
Tennessee	10,144	7,625
Texas	10,207	14,460
Utah	2,689	3,065
Vermont	543	535
Virginia	8,610	8,338
Washington	3,936	5,446
West Virginia	771	976
Wisconsin	7,522	8,370
Wyoming	420	723
Shipments to United States/Territories	346,622	338,689
Exported	69,483	68,404
Total Shipments	416,105	407,093

- = No data reported.

Note: "Export" in Table 4.6 and "Exporter" in Table 4.10 are different. "Export" refers to shipments outside of the country, while "Exporter" is the type of customer.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.7 Distribution of U.S. Geothermal Heat Pump Exports by Country of Destination, 2008 and 2009

(Rated Capacity in Tons)

Region/Country	2008	2009	Percent of U.S. Exports 2009
Africa			
South Africa	-	74	0.11
Total	-	74	0.11
Asia			
China	6	549	0.80
India	5	162	0.24
Japan	-	13	0.02
Jordan	19	10	0.01
Korea, South	3,905	2,890	4.22
Palestinian Authority	183	-	-
Thailand	366	-	-
Total	4,484	3,624	5.30
Australia and Oceania			
Australia	345	811	1.19
New Zealand	101	6	*
Total	446	817	1.19
Central America			
Barbados	91	69	0.10
Bermuda	-	36	0.05
Cayman Islands	5	-	-
Costa Rica	-	21	0.03
Mexico	16	-	-
Netherlands Antilles	-	33	0.05
Total	112	159	0.23
Europe			
Czech Republic	-	4	*
Hungary	12	30	0.04
Ireland	50	-	-
Italy	30	-	-
Kazakhstan	-	762	1.11
Latvia	5	3	*
Lithuania	45	-	-
Netherlands	8	2	*
Poland	303	2,705	3.95
Portugal	7	35	0.05
Romania	432	407	0.59
Russian Federation	47	17	0.02
Slovakia	273	10	0.01
Spain	39	301	0.44
Turkey	2,816	557	0.81
United Kingdom	4,162	2,047	2.99
Total	8,229	6,880	10.06
North America			
Canada	56,212	56,845	83.10
Total	56,212	56,845	83.10
South America			
Argentina	-	5	*
Total	-	5	*
U.S. Total	69,483	68,404	100.00

* = Less than 0.01 percent.

- = No data reported.

Note: Totals may not equal sum of components due to independent rounding.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.8 Geothermal Heat Pump Shipments by Origin, 2008 and 2009**(Rated Capacity in Tons)**

Origin	2008	2009
Arkansas	3,618	3,823
Florida	61,388	76,293
Indiana	115,428	103,916
Michigan	31,561	17,155
Minnesota	13,010	10,618
New York	13,961	11,100
Ohio	3,459	4,950
Oklahoma	117,460	127,555
Oregon	-	29
Pennsylvania	4,849	5,393
South Dakota	18,709	20,227
Tennessee	129	333
Texas	32,447	18,291
Wisconsin	-	7,160
Shipments from United States/Territories	416,019	406,843
Imported	86	250
Total Shipments	416,105	407,093

- = No data reported.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.9 Distribution of U.S. Geothermal Heat Pump Imports by Country of Origin, 2008 and 2009

(Rated Capacity in Tons)

Region/Country	2008	2009	Percent of U.S. Imports 2009
Asia			
China	86	250	100.00
Total	86	250	100.00
U.S. Total	86	250	100.00

Note: Totals may not equal sum of components due to independent rounding.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.10 Geothermal Heat Pump Domestic Shipments by Customer Type, 2008 and 2009

(Rated Capacity in Tons)

Customer	2008	2009
Exporter	-	-
Wholesale Distributor	184,869	173,065
Retail Distributor	1,256	10,463
Installer	160,084	154,321
End-User	413	840
U.S. Total	346,622	338,689

- = No data reported.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.11 Geothermal Heat Pump Domestic Shipments by Sector and Model Type, 2009

(Rated Capacity in Tons)

Destination	Model Type				Total
	ARI-320	ARI-325/330	ARI-870	Other Non-ARI Rated	
Residential	8,348	152,107	2,524	9,580	172,559
Commercial ¹	42,051	94,917	18	19,547	156,533
Industrial	3,274	1,448	-	4,875	9,597
Electric Power	-	-	-	-	-
Transportation	-	-	-	-	-
U.S. Total	53,673	248,472	2,542	34,002	338,689

¹Including government.

ARI-320 = Water-Source Heat Pumps.

ARI-325 = Ground Water-Source Heat Pumps.

ARI-330 = Ground Source Closed-Loop Heat Pumps.

ARI-870 = Direct Geoexchange Heat Pumps.

- = No data reported.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.12 Shipments of Complete Geothermal Heating/Cooling Systems, 2008 and 2009

Shipments Information	2008	2009
Complete Systems		
Shipped	3,891	5,924
Rated Capacity (Tons)	19,043	19,598
Percent of Total Shipments	5	5
Number of Companies	5	3
Revenue of Systems (Thousand Dollars)	W	W

W = Data withheld to avoid disclosure of proprietary company data.

Note: Complete geothermal heating/cooling system is defined as geothermal heat pump unit with all the necessary functional components, except for installation materials. These include geothermal heat pump, air handler, heat exchanger, and system kits.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.13 Number of Companies Expecting to Introduce New Geothermal Heat Pump Products in 2010

New Product Type	Number of Companies
ARI-320 Water-Source Heat Pumps	10
ARI-325 Ground Water-Source Heat Pumps	13
ARI-330 Ground Source Closed-Loop Heat Pumps	11
ARI-870 Direct Georexchange Heat Pumps	2
Other Non-ARI Rated	4
Non-Geothermal Heat Pump System Components	-

ARI-320 = Water-Source Heat Pumps.

ARI-325 = Ground Water-Source Heat Pumps.

ARI-330 = Ground Source Closed-Loop Heat Pumps.

ARI-870 = Direct Georexchange Heat Pumps.

- = No data reported.

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.14 Employment in the Geothermal Heat Pump Industry, 2007 - 2009

Year	Person Years
2007	1,219
2008	1,537
2009	1,832

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.15 Companies Involved in Geothermal Heat Pump Activities by Type, 2008 and 2009

Type of Activity	2008	2009
Geothermal Heat Pump or System Design	17	17
Prototype Geothermal Heat Pump Development	12	13
Prototype Systems Geothermal Development	5	7
Wholesale Distribution	15	18
Retail Distribution	3	3
Installation	4	3
Manufacture of System Components	3	4

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.16 Geothermal Heat Pump-Related Sales as a Percentage of Total Company Sales Revenue, 2008 and 2009

Percent of Total Sales Revenue	Number of Companies	
	2008	2009
90-100	11	12
50-89	1	3
10-49	4	4
Less than 10	7	8
U.S. Total	23	27

Source: U.S. Energy Information Administration (EIA), Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey."

Table 4.17 Geothermal Energy Consumption by Direct Use of Energy and from Heat Pumps, 1990 - 2009**(Quadrillion Btu)**

Year	Direct Use	Heat Pumps	Total
1990	0.0048	0.0054	0.0102
1991	0.0050	0.0060	0.0110
1992	0.0051	0.0067	0.0118
1993	0.0053	0.0072	0.0125
1994	0.0056	0.0076	0.0132
1995	0.0058	0.0083	0.0141
1996	0.0059	0.0093	0.0152
1997	0.0061	0.0101	0.0162
1998	0.0063	0.0115	0.0178
1999	0.0079	0.0114	0.0193
2000	0.0084	0.0122	0.0206
2001	0.0090	0.0135	0.0225
2002	0.0090	0.0147	0.0237
2003	0.0086	0.0188	0.0274
2004	0.0086	0.0212	0.0298
2005	0.0088	0.0240	0.0328
2006	0.0091	0.0276	0.0367
2007	0.0094	0.0317	0.0411
2008	0.0097	0.0365	0.0462
2009	0.0087	0.0450	0.0537

Note: Direct use includes applications such as: district heating, aquaculture pond and raceway heating, greenhouse heating and agricultural drying.

Source: John Lund, Oregon Institute of Technology, Geo-Heat Center (Klamath Falls, Oregon, March 2010).