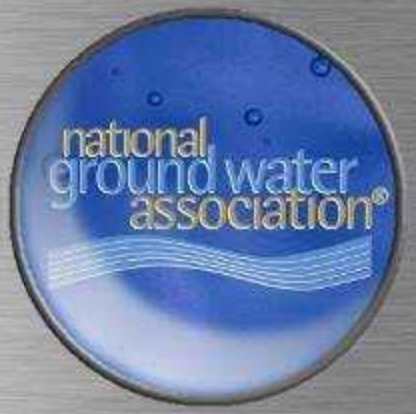
State Regulatory Oversight of Geothermal Heat Pump Installations: 2009 / 2010

Presentation by:
Kevin McCray, Executive Director



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- The 2009/2010 Geothermal Heating and Cooling Systems State Regulatory Oversight Survey was funded in a collaborative effort

Survey Compiled by:

Industry Insights, a research and consulting firm that specializes in conducting industry surveys and customized research services. Conducted, tabulated and analyzed the results of this report.

2009/2010 Geothermal Heating and Cooling Systems State Regulatory Oversight Survey

- Most complete, accurate, and up-to-date information for geothermal system regulation available anywhere at this time.
- The report is designed to allow readers to easily compare state-by-state regulations, as well as aggregate data on all responding states.

2009/2010 Geothermal Heating and Cooling Systems State Regulatory Oversight Survey

- 637 page full-report
- 34 responding states

- Available from NGWA
  - Free to regulatory personnel
  - Free to other NGWA members
  - $1,000 to non-members and non-regulators

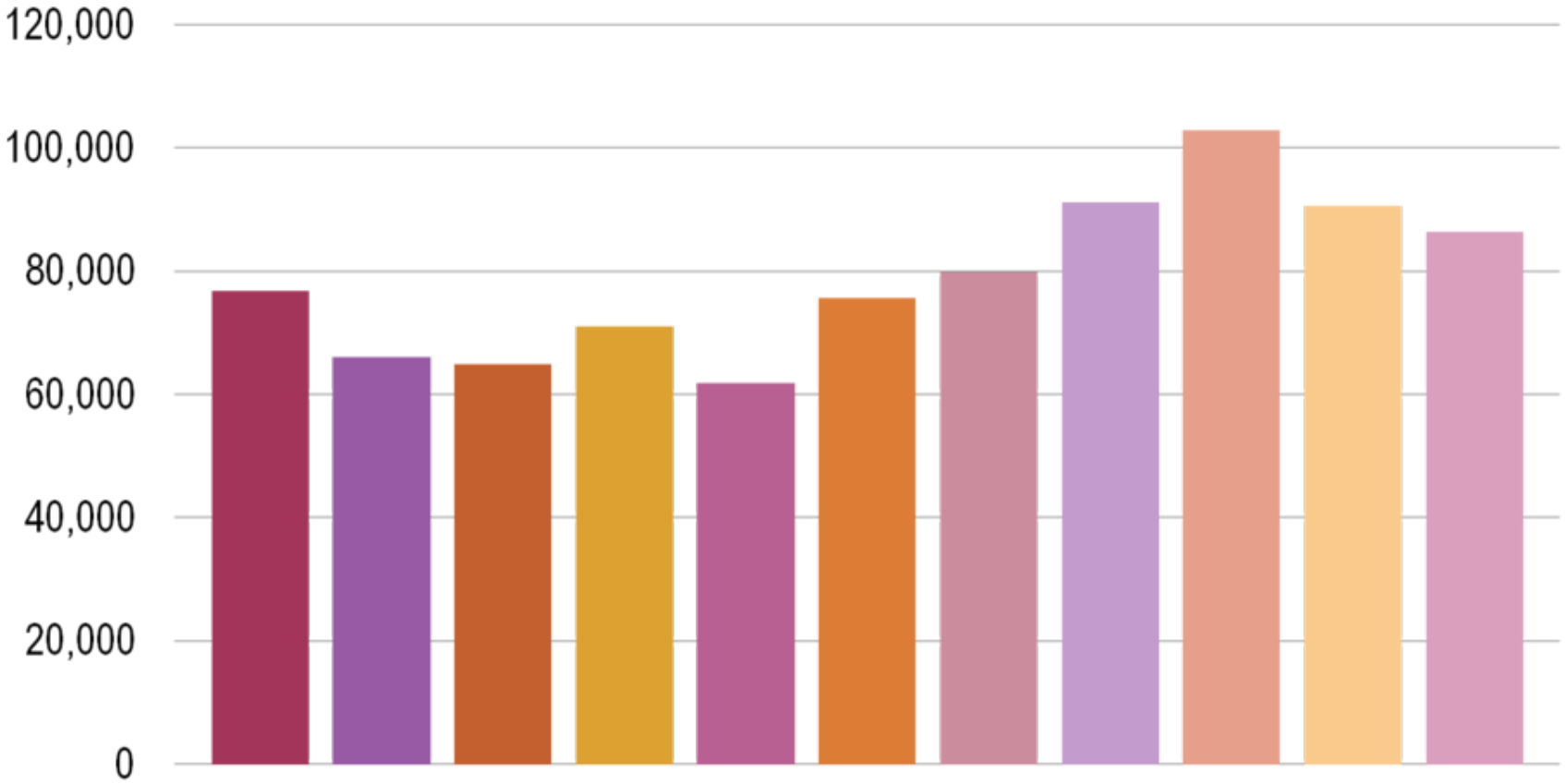
34 Responding States (as of May 1, 2010)

- Connecticut
- Delaware
- Florida
- Idaho
- Illinois
- Kansas
- Kentucky
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Washington
- West Virginia
- Wyoming

Survey Methodology

- Data was collected on nine geothermal system configurations. They were:
  1. Open loop – single well for water withdrawal, water returned to a surface source
  2. Open loop – single well for water withdrawal, water returned to a second well
  3. Standing column – single well for water withdrawal and water return
  4. Closed loop – vertical boreholes
  5. Closed loop – subsurface trenched, or other configuration, but not vertical boreholes
  6. Closed loop – surface water body emplacement
  7. Direct exchange (DX) – vertical boreholes
  8. Direct exchange (DX) – subsurface trenched, or other configuration, but not vertical boreholes
  9. Concentric pipe systems (heat exchange fluid flows to the bottom of the hole through a small diameter inner pipe)

Ground and Groundwater-sourced Heat Pump Unit Shipments: 1999 - 2009



Source: U.S. Bureau of the Census, Current Industrial Report MA333M

No. of Systems over 5 Years (median)

Open 1	Open 2	Stand Col.	CL 1	CL 2	CL 3	DX 1	DX 2	Con.
5	45	58	552	nr	nr	10	nr	nr
0.75%	6.7%	8.7%	82%	nr	nr	1.5%	nr	nr

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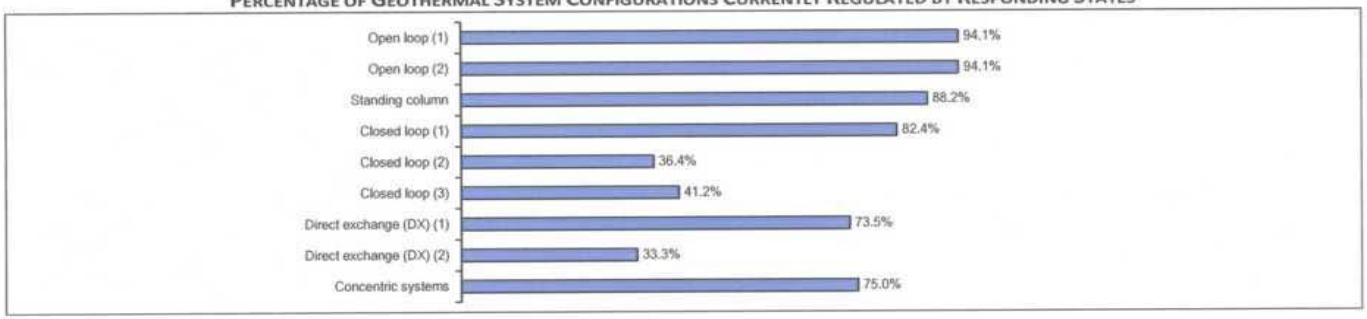
Respondent Profile

PERCENTAGE OF GEOTHERMAL SYSTEM CONFIGURATIONS CURRENTLY REGULATED BY RESPONDING STATES



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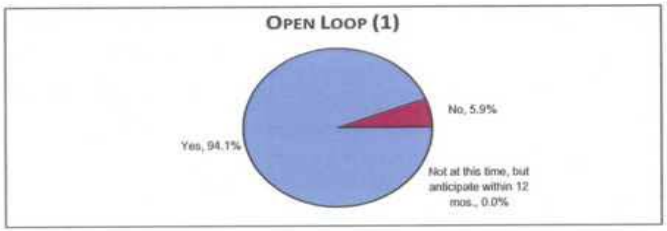

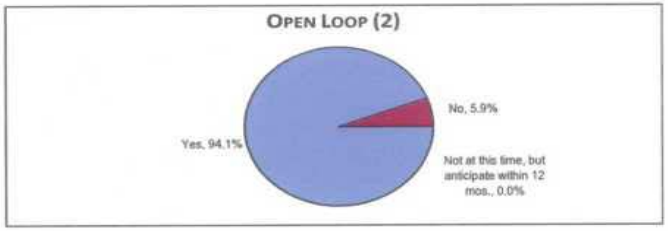

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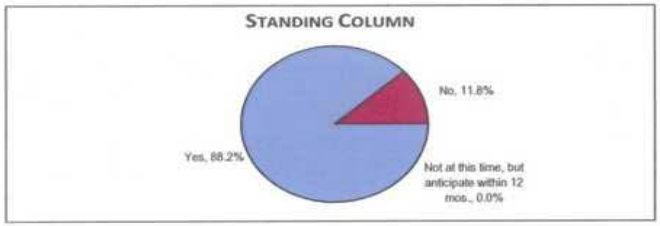
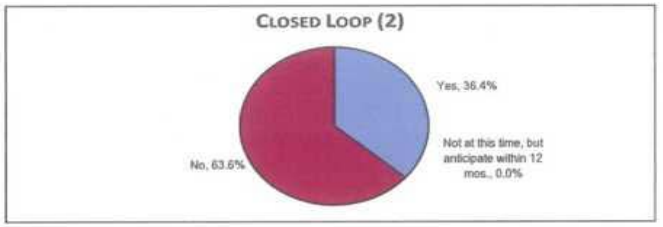
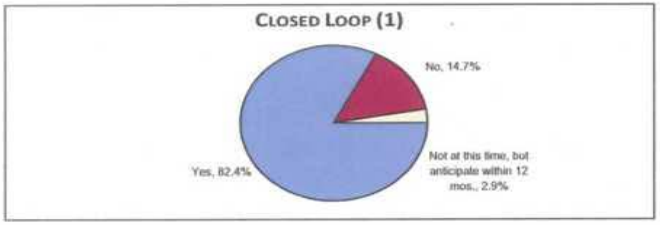
Direct exchange (DX) (1)–(vertical boreholes)
Direct exchange (DX) (2)–(subsurface trenched, or other configuration, but not vertical boreholes)
Concentric systems–(heat exchange fluid flows to the bottom of the hole through a small diameter inner pipe and then up the annular space between the inner and outer pipes)

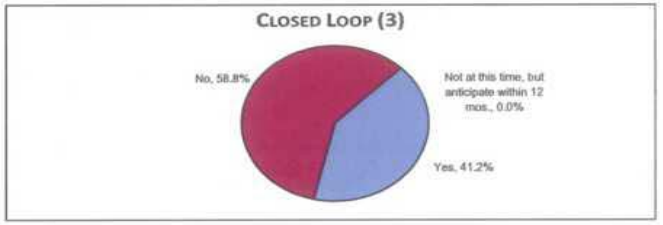
Respondent Profile

PERCENTAGE OF GEOTHERMAL SYSTEM CONFIGURATIONS CURRENTLY REGULATED BY RESPONDING STATES (CONTINUED)









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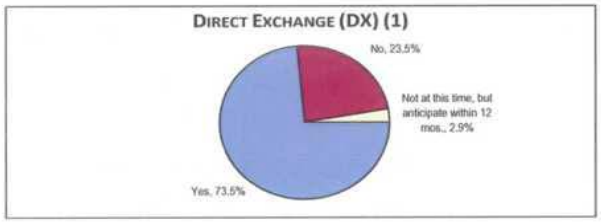
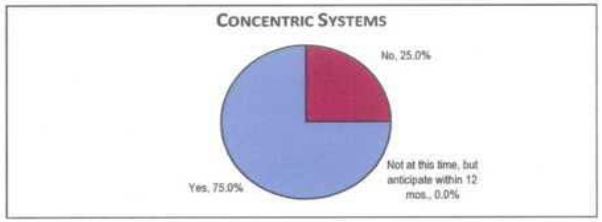
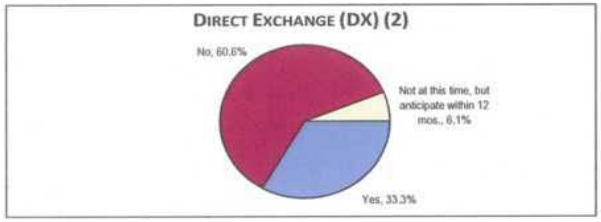
Respondent Profile

Percentage of Geothermal System Configurations Currently Regulated by Responding States (continued)







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Which state boards have oversight?

Board	Open 1	Open 2	Stand Col.	CL 1	CL 2	CL 3	DX 1	DX 2	Con.
Building	0	0	0	6	11	11	0	0	0
Plumbing	0	0	0	6	0	0	0	0	0
Electrical	0	0	0	0	0	0	0	0	0
Water Well	67	70	69	79	44	30	67	56	70
HVAC	5	5	5	12	10	10	6	11	7

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License required?

Profession	Open 1	Open 2	Stand Col.	CL 1	CL 2	CL 3	DX 1	DX 2	Con.
Design	27	27	29	37	37	12	36	20	31
Drilling	92	96	92	91	37	22	90	43	89
GW HP	59	55	59	44	43	25	47	33	40
Construction	41	50	50	66	67	50	59	62	59
System Operator	25	25	25	20	29	29	23	33	21

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Permits and Fees?

Permit or Fee	Open 1	Open 2	Stand Col.	CL 1	CL 2	CL 3	DX 1	DX 2	Con.
Construction Permit & Fee	50	52	52	42	38	29	44	43	44
Geothermal Permit & Fee	37	36	35	33	29	25	27	17	20
Geothermal Design OK'd & Fee	22	19	21	13	25	14	15	29	14
Operate Permit & Fee	33	29	30	17	22	22	27	25	19
Geologic Record	0	0	0	4	27	67	5	30	5

Environmental Permits or Registrations?

Permit or Fee	Open 1	Open 2	Stand Col.	CL 1	CL 2	CL 3	DX 1	DX 2	Con.
Volumetric flow rates	50	48	47	0	0	0	0	0	7
Well depths	15	14	5	6	0	13	7	0	0
Number of wells	6	5	6	12	0	0	8	0	0
Heat load	32	15	11	6	0	25	8	0	7
Water quality	68	53	33						

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Geothermal Installer Training?

Profession	Open 1	Open 2	Stand Col.	CL 1	CL 2	CL 3	DX 1	DX 2	Con.
Design	0	0	0	0	0	0	0	0	0
Drill	27	35	29	32	0	9	30	13	26
GHP	10	18	14	17	14	11	13	17	13
Construction	9	9	10	11	11	10	13	13	13
Operator	5	5	5	6	13	0	7	17	7

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Standards & Regulations?

Regulation	Open 1	Open 2	Stand Col.	CL 1	CL 2	CL 3	DX 1	DX 2	Con.
Construction	89	93	92	100	89	64	95	88	100
Operation	48	50	44	37	38	22	44	57	44
Abandonment	89	93	92	100	88	40	100	86	100
Heat transfer to earth calculation	4	4	5	5	13	9	6	14	6
Limits to earth temp ranges over lifecycle	9	8	9	10	0	10	12	14	13
R-22	36	39	43	50	75	50	65	71	50
R-401A	36	39	43	50	67	50	59	75	50

Specific Criteria?

Criteria	Open 1	Open 2	Stand Col.	CL 1	CL 2	CL 3	DX 1	DX 2	Con.
Location on property	50	62	60	57	50	40	53	57	53
Setback	73	80	88	68	71	33	68	67	67
Depth	8	16	9	5	14	0	6	0	7
Formations penetrated	25	32	30	42	43	33	35	33	32
Heat transfer fluids	33	35	41	70	71	50	71	67	63
Water additives	64	67	70	57	43	33	61	50	56
Spacing of loops	16	20	23	20	14	11	13	0	6
Materials	56	64	68	80	63	67	78	71	71

Survey Methodology

- The survey instrument used for this study was an online questionnaire that primarily requested geothermal heating and cooling regulatory data.
- An email containing a link to the online survey was sent to state contacts in mid-January. If multiple contacts existed for a state, all contacts were copied on one email to encourage collaboration and discussion.
- The email also instructed the recipient to forward the survey link on to others whom may be were more qualified to answer the questions.
- To encourage participation, reminder emails were sent by both Industry Insights and the associations funding the study.

Survey Methodology

- Survey submissions were collected through early April with 34 states responding to at least a portion of the survey. Before the results were finalized, each respondent's data was sent back to them in report-format for verification.
- All data were checked both manually and by a specially designed computer editing procedure.
- Final results were tabulated and the report was completed in early May 2010.
- Respondents to the survey were sent the final report, which was offered as an incentive to participate.

Interpreting the Results

- Throughout the individual state data an “X” denotes the response the state gave for all frequency questions.
- Most of the numeric measures and statistics included in the “All States” section of this study are reported on the basis of medians rather than arithmetical averages or means. Unlike the mean, the median is not distorted by a few unusually high or low values that may exist in the sample due to special circumstances. The "median" figure represents the mid-point of the figures for a particular measure, with one-half of the respondents reporting figures above it and one-half below. Each median has been independently selected from its own array of figures.
- Smallest Largest
- Number Number
- Reported Typical Reported
- Lower 25% of Reported Figures
- Middle 50% of Reported Figures (or Middle Range)
- Upper 25% of Reported Figures
- Median
- All open-ended/text-based questions were removed from the “All States” section of the report. The

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