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(FORM UPDATED: 08/11/2010)

WISCONSIN STATE LEGISLATURE ... PUBLIC HEARING - COMMITTEE RECORDS

2011-12

(session year)

Assembly

(Assembly, Senate or Joint)

Committee on Natural Resources...

COMMITTEE NOTICES ...

- Committee Reports ... **CR**
- Executive Sessions ... **ES**
- Public Hearings ... **PH**

INFORMATION COLLECTED BY COMMITTEE FOR AND AGAINST PROPOSAL

- Appointments ... **Appt** (w/Record of Comm. Proceedings)
- Clearinghouse Rules ... **CRule** (w/Record of Comm. Proceedings)
- Hearing Records ... bills and resolutions (w/Record of Comm. Proceedings)
(**ab** = Assembly Bill) (**ar** = Assembly Resolution) (**ajr** = Assembly Joint Resolution)
(**sb** = Senate Bill) (**sr** = Senate Resolution) (**sjr** = Senate Joint Resolution)
- Miscellaneous ... **Misc**

* Contents organized for archiving by: Stefanie Rose (LRB) (August 2013)

APPENDIX E: Advisory Board Minutes

Meeting Minutes

In general, Advisory Board discussions covered the following topics:

- Overall impressions
- Literature Review
- Task 2.3 Certification and Regulations
- Task 2.5 Stakeholder Interviews
- Task 2.9 Financial Model Research
- Task 3.3 Survey Analysis
- Task 5.1 Financial Overview

Not all Advisory Board members spoke to every topic listed above. The one exception is the Advisory Board meeting with Patrina Mack, which dealt primarily with the GSHP consumer experience. The meeting minutes from each discussion are below.

Dan Bernstein and Paul Boney

Meeting Date: March 18, 2010; 2pm

The discussion began with Dan Bernstein and Paul Boney giving their overall impressions of Project Negatherm. Dan Bernstein noted concern over the "Bad Apple" cowboy contactors who reflect badly on industry.

Comments on the Literature Review: Paul called the documents assembled, "impressive," and suggested adding recent USDA and Texas Foundation articles.

Comments on Task 2.3 Certification and Regulations: Dan Bernstein emphasized that water wells do not equal boreholes. There is the perception that California environmental regulations are much higher than other states.

Comments on Task 2.5 Stakeholder Interviews: The Geo Exchange Organization has branded the industry "geo." Paul Boney commented that there has been a slowdown in shipments this year, natural gas prices and consumer demand (cause/effect?) both down. There are also carbon issues out there - tradable EE credits.

Comments on Drilling: Drill technology improving, smaller rigs, more machine innovation, new loop technologies, third party performance data needed (DB).

Comments on Task 2.9 Financial Model Research: Paul Boney noted that ARRA and PACE influencing the financing. Sonoma has a \$50M EE/RE plan and CaliforniaFIRST is an exciting proposition. Dave Bernstein pointed to the estimate that 100,000 GSHPs is equivalent to a

500MW Power Plant. The USDA Rural Electric Service (RUS) also has micro loans, where the utility puts the loop into a tariff and uses micro loans for equipment inside house.

Comments on Consumer Survey: Paul Boney noted that this is a rare look at consumers. There has been very little industry study and nothing publicly available. Dave Bernstein added that the GSHP industry needs to improve its public relations abilities.

Comments on Driller Survey: "Interesting", but no comments of note.

Liz Battocletti

Meeting Date: March 22, 2010; 10am

Liz Battocletti was impressed with the breadth of Project Negatherm. She discussed how Project Negatherm's study dovetails well with the upcoming DOE funded study she will be conducting.

Comments on the Literature Review: Liz did not have anything to add to the Literature Review. She noted that there is a market report put out by a private firm but it is not publicly available.

Comments on Task 2.3 Certification and Regulations: It is important to distinguish between water wells and closed loop boreholes. Liz noted how the GSHP industry is an industry marked by regional differences. In California, Sonoma has been a thought leader, they've included GSHPs in their PACE program.

Comments on Task 2.5 Stakeholder Interviews: In terms of branding, "Geoexchange" is a trade name; "Ground Source Heat Pumps" may be a more accurate term. Liz refers to them as Geothermal Heat Pumps - because her grant money came from the geothermal dU.S. EPartment @ DOE and that is their terminology. WaterFurnace refers to them both as GSHP and geothermal heat pumps. Branding also falls under the scope of regional differences and this will be further investigated in Liz's upcoming report.

Liz has noticed that many contractors are becoming interested in GSHPs due to increasing consumer demand. At an IGHSPA training/test in Maryland, HVAC guys and drillers were there because customers have been asking about it. The 30% tax credit has played a big role in pulling demand.

Liz also spoke about the role Renewable Portfolio Standards (RPS) could play in accelerating demand for GSHPs. Since GSHPs are in the Energy Efficiency (EE) space and not the Renewable Energy (RE) space, they are not currently eligible to play a part in RPS standards. There is a need to change this and add GSHPs to renewable portfolio standards (RPS).

Comments on Drilling: Liz disagreed with the costs of drilling being the largest cost component of a GSHP system, in her experience it is closer to half the cost. The shortage of drillers, again, is a very regional thing.

Comments on Consumer Survey: Liz suggested that we need something like the California Solar Initiative for GSHPs. Liz is going to further investigate where geographically GSHPs make the most sense. Liz noted that the consumer survey is key to understanding who is going to purchase this technology.

John Geyer

Meeting Date: March 22, 2010; 12pm

Overall impressions:

Comments on Literature Review: John suggested merging the Project Negatherm library with the consortium library that spans GSHP literature from 1996 to 2001. The library is maintained in storage in Pennsylvania. John suggested that a collection of manufacturers' historical and current technical publications would make for an interesting library.

Comments on Task 2.3 Certification and Regulations: The consortium put effort into educating the Department of Water Resources (DWR) about GSHPs. Eventually, the DWR came out with a publication, Bulletin 74-99. However, in California, they failed to identify anything that needed regulation. There's nothing different or unknown in California that hasn't been addressed in the other states. John commented that the fees issue is a decade-old red herring, suggesting that there is a problem with the fees and permitting but it doesn't have to do with the work.

John suggested a way to standardize the regulations could be to create a categorical exclusion review for horizontal and vertical GSHP work. John stressed the importance of regulating the industry, saying wherever work is done, there should be a permit and there should be a nominal fee. However, he believes the regulations should be protective of existing sanitation and groundwater standards, not proscriptive of geothermal practices.

Furthermore, John highlighted how utility involvement in the GSHP industry could change the playing field. If PG&E and So Cal Edison had an active role in GSHP system construction, they would not be dealing with 69 different jurisdictions. Rather, they would have a standard fee and permitting process because no small players could stand up to them. Absent their (utilities) unique coverage of these different jurisdictions, there is no one with sufficient clout to push for unified regulations/fees. An example of a state that has been proactive in streamlining regulations is Idaho.

As to California regulations, no one has come forward with a positive suggestion since '98 as to how to better accomplish state leadership. The issue is that boreholes are not water wells - they are not open to the atmosphere and they are not a threat to groundwater.

Comments on Task 2.5 Stakeholder Interviews: As to the issue of industry branding, in the beginning the Environmental Protection Agency (U.S. EPA) report in 1992 referred to them as geothermal heat pumps. When the consortium formed, they developed geoexchange as a unique and identifiable name but it was not embraced by manufactures. IGSHPA seems to have the longest thread in terms of naming. John stated that his own approach to naming is to go along with whatever the customer wants to call it, so long as he is helping them get what they want. However, when John is training he sticks with IGHSPA's "ground source heat pump" terminology. John commented that he's not so concerned about branding as he is about endorsements, confidence and credibility.

Through his earlier work, John established early on the 5 main reasons to buy GSHPs (we identified in 1997) in no particular order:

- Economy
- Environment
- Safety: no onsite fuel storage, indoor air quality, leaky pipes.
- Comfort
- Novelty

However, they found that at the end of the education and selection process – it always comes down to what the customer can afford.

As to barriers to adoption, John suggested that utility endorsement and creating a list of utility-qualified contractors could accelerate customer confidence and access to GSHP technology. There are two examples of utilities in California that got involved with GSHPs and created programs: Truckee Donner Public Utility District and Plumas-Sierra Rural Electric Cooperative. Truckee Donner experimented successfully with bulk purchasing and Plumas-Sierra did a loop lease program. John noted that mass drilling of subdivisions by a utility who would do it at cost w/bulk buying could be an absolute natural if the utility can rate-base the GSHP system and get RPS credits.

However, the overall lack of utility endorsement means there's no one telling customers that this is a good thing. There's only one way they (utility) make money – selling power! If they can rate base the infrastructure and get a return on that and lease the loops, it sweetens the deal. They can sell less power and look good doing it. Barriers to rate-basing include the lack of an internal champion to carry it through to the PUC or the legislature.

John believes that investor owned utilities (IOUs) will take GSHPs to mainstream when:

- IOUs can rate-base some portion of the (investment) geothermal system most likely the ground loops.
- IOUs can get credit for environmental benefits towards RPS targets.

John concluded this train of thought by saying that IOUs need to aggregate greenhouse gas savings and be authorized to trade them on the secondary market; once this happens, utilities will be on board and they will create a list of qualified contractors who can do the work.

Comments on Drilling: As to the cost of drilling, John pointed out that drilling is risky and if the driller has to absorb all the risk, he's going to charge more. IF the risk is distributed amongst customer/driller, cost will come down. John suggested distributing the risk between customer and driller by doing the following: a bid comes in for \$X, if the drilling goes better than expected (average drilling of more than 60 ft per hour), the cost goes down by up to 10%. If there are problems, the cost of drilling can go up by 20%. This way the driller is communicating with the owner and his books are open. John stated that he's done this successfully with a number of commercial jobs.

As to the availability of drillers, John suggested that the number of drillers in California who can convert to geothermal may be the greatest in the nation. As groundwater regulations tighten, traditional water well drillers are being squeezed, one might find that there are more potential drillers ready to convert to geothermal in CA than anywhere else in the country.

John pointed out an area of opportunity for the GSHP industry: anywhere in the central valley, as soil conditions are very similar to the great plains (which we all recognize as heat pump heaven).

John pointed out that there are great opportunities in California. California has thousands of school buildings and every one of them has the land for a ground loop so why not go with geothermal? Schools are the low hanging fruit but we've only done 100 of them - there are guaranteed savings on operating and maintenance.

Comments on Task 2.9 Financial Model Research: John asserted that the utilities need to get savings to customer, loop lease, rate-base authorization. The economic incentive for customers is low monthly bills, and the customer should get 75% of savings. Utilities can easily rate make or rate base but no one has pushed them to. Until they get real enforcement of RPS and until they are authorized to trade emissions offsets and gain yet another revenue stream they will not do so. I have heard of rate-basing/geothermal rates for the Midwest; John Kelly should have a list of geothermal rates in the country.

Comments on Consumer Survey: Again, Comfort, Economy, Safety, Novelty, Environment but at the end of the day the decision always revolves around can they afford it.

Comments on Driller Survey: There are a lot of Father and Son businesses. The HVAC is a big issue for the GSHP industry; 98% of HVAC is served by traditional manufactures and they have no interest in GSHPs going forward. All of their dealers on the ground are a traditional sales force. The idea of diverting a finite labor force into a different segment is not attractive.

John expanded this point by pointing out that the mechanical industry has no real interest in GSHPs because they make their living off of service contracts. He sees this as an intrinsic problem. If the ultimate goal of GHSP is 5% of the market - that'd be good, but we'd be seeing some push back from the traditional mechanical industry. Furthermore, there's also a bait-and-switch that goes on - contractors offer GSHP systems and then dissuade customers from GSHPs.

As to the typical gestation of a job: 3 -6 months (residential) - meeting with project manager, coordination, logistics; 6-18 months for (school and commercial) - because they have to get through their budget cycle. Furthermore, if a geothermal job has to be done when other people (contractors) are on the job can be troublesome. There can also be endless meetings with project teams.

John has not encountered problems getting permits, he noted that a good driller knows where to get the permits.

John pointed out that billing innovations could also impact the GSHP industry. In California this year they are going to implement conversion of the billing format thanks to smart meters. We will see peak pricing in the upper 30s to low 40s per kW hour. The smart grid and interactive meter shift 100% of the market risk off of the utility and onto the customer.

In order to increase widespread adoption of GSHP technology John suggested we need more schools instructing about this technology and we need to streamline existing processes. If we could recreate the western training center or get a legit training program out of PG&E. In state sponsors for a regional training center and a geothermal designation on the testing, would help on the drilling aspect.

Augie Guardino

Meeting Date: March 23, 2010; 11am

Overall impressions: Augie started off the conversation by giving some of his background in the GSHP industry. He stated that his company has known about geothermal for the past 15 years. Augie and his brother went out to Oklahoma and got fired up about the technology. He noted that there's a lot of positive energy back there in Stillwater for GSHPs.

In his experience, IGSHPA is telling you that people out there want drillers but they don't tell you how to go about it. For Augie, the process of finding customers has been a little unique. He's never solicited work or customers, rather when they got credentialed they just went through the IGSHPA registry. Augie sent out letters to everyone who was IGSHPA certified in California and this is how he drummed up business.

Most of Augie's jobs are for the green clientele or for people looking to add more windows to their home and still comply with Title 24 Building Standards.

Augie mentioned that in California it's about trying to get the word out; there are ill-informed naysayers out there. There are not enough people that know about it and getting to the market is the hard part. It also gets peddled by people who don't have the best interests at heart.

Comments on Task 2.3 Certification & Regulations: In Augie's experience the Santa Clara Valley Water District is a very GSHP friendly jurisdiction. They have the water district and they have a well commission with 6-8 people on staff. They have people assigned to doing permits, they have geologists on staff. As a result, they can give it the time it needs and be realistic about it.

Augie noted that a lot of the counties don't know what they're up against and they are charging fees for water wells. The permitting schedule affects us and project design - the fees are per well. Furthermore, a lot of these counties justify the permitting expense because they have to have an inspector out there when the holes are sealed.

As to the DWR Draft Standards, Augie did a lot of work with Carl Hauge at DWR on that. The Southern California region of DWR put it up on their website and as a result, Southern California kind of adopted it even though it's just a draft. In Northern California, it's a different story, each county has been kind of been making it up as they go along. It is hard to educate counties on GSHP systems while you're trying to get a project through and thus counties can be

a big hurdle for us. The basic understanding that boreholes for closed loop systems are not water wells needs to be there.

Comments on Stakeholder Interviews: Augie stated that they always refer to the technology as "geothermal," however this requires explanation so it does not get confused with deep geothermal resources. Augie also pointed out that consumer awareness is going to be a little grass roots unless the industry finds some money for proper radio/internet/TV time.

Augie discussed how the biggest and most difficult chunk of the market to serve is that of retrofits. He explained that on a retrofit it's very difficult because you have to have a perfect storm. You need an ac/heater unit to go out and you have to have the room to do it. Augie says they haven't aggressively gone after the residential retrofit market but commercial retrofits are different and may have fewer constraints.

Augie shared his insight into the drilling: no matter what you're doing, you have to be able to make your footage. The more you can drill in a day, the lower your costs. Even if you're not lowering your costs, the more production in a day the more profitable you can be. This is why a lot of guys don't want to do residential because it's not as economically feasible if you're only drilling 4 holes.

Augie further explained the issue of economies of scale by saying it would take a lot of work and coordination. But there are many opportunities for GSHP technologies in planned communities, for example, new housing communities often have to put in a community park, so why not load a GSHP under that park and do a distribution system?

Compared to other alternative energy solutions - GSHPs priced too high, too low, just right?

I think that they're priced alright. With solar coming down then we may have to take a look at it. But if you look at the big picture as far as what you're getting for your money, I don't see a problem with the pricing as a deterrent. Customers aren't the ones saying we need to get the drilling down - that sentiment comes from someone else.

Comments on Driller Survey: Augie has seen a lot of projects where the drillers subcontract for the mechanical and then the mechanical is subcontracted to the general contractor. In his experience, this can add a 30% mark-up for the customer. Drillers take on a lot of risk, as you don't know what you may run into underground. Augie pointed out that there's a shortage of qualified drillers. Augie mentioned that IGSHPA certification is good; if you have the IGSHPA training you're able to be involved in the first line of talking to the customer. However, once you're certified there's not a rush of business. When they do get GSHP projects, Augie says that they generally deal with middle men and people who are saying we need to be \$3 a foot cheaper - this starts drillers out on the defensive.

Augie does not anticipate big changes in the driller classifications in California. He is a licensed C-57 contractor and he mentioned that he would be opposed to a lesser classification.

Patrina Mack

Meeting Date: March 11, 2010

Patrina's conversation with Project Negatherm researchers varied from the other Advisory Board members in that her comments focus on her experience as a potential GSHP system customer. While consulting with Project Negatherm, Patrina's heater cracked and so she explored several heating options, including GSHPs.

She began her research by contacting a national referral service and found that instead of offering solely GSHP HVAC installers, they provided only traditional HVACs dealers. She was able to schedule 5 appointments with HVAC contractors who offered GSHP systems. The first contractor knew nothing about GSHP and was 20 minutes late. The next guy outsourced GSHP to an outfit in Santa Rosa. The next appointment talked a lot about a Mitsubishi air-source heat pump as an alternative for A/C, declaring that there was no point in pursuing GSHP because of the costs - too many cheaper alternatives to choose from especially given our usage levels and improvements in natural gas furnaces.

The next contractor gave an estimate of \$20-30,000 for the trenching and another \$10,000 for the system. He also emphasized replacing the ductwork and insulating the house to ensure we didn't oversize the GSHP system.

The last appointment turned out to be an experienced contractor; the husband and wife team learned about this technology 10 years ago, and proceeded to get certified at UC Davis in the design of systems. They have been in business doing geothermal exclusively for the past 9 years.

The breakdown of their estimate (which turned out to be uneconomic in the extreme at over \$22,000 a ton) was as follows:

\$20K for equipment and installation (heating unit, A/C and desuperheater) - \$12K was equipment only for heating unit and A/C

\$35K for drilling (design, permitting fees, vertical drilling, drilling spoils removal and cleanup)

Patrina uncovered several costs for a GSHP system that would not be required for a conventional HVAC application. She found that in San Mateo County, permitting fees are \$500 each for the first 5 bore holes and then \$50 each thereafter. Another special cost in California is the environmental impact costs for cleanup.

Due to her knowledge of Project Negatherm, Patrina asked several more questions to uncover some of the challenges that this particular contractor faces with GSHP technology. The contractor said that there are two challenges their company faces: out of state drillers who underbid their projects because they don't understand and don't include the costs for CA regulations, and new-to-geothermal HVAC contractors who create poor designs that inspectors have to QA, which keeps permitting costs high. In both cases, these situations they believed that it also created opportunities for their business. They are often brought in to fix what the out of state drillers have missed. Another practice this company employs is to bid "bad design" projects but not warranty them, which invites the conversation about what's wrong with the design and leads to the chance of suggesting a new design.

Patrina mentioned to the contractor that she was working on a project to help overcome barriers to geothermal adoption in California and then asked the contractor what top 3 issues she would like to see resolved by this project. They are:

- Establish a consistent permitting process
- Create a special geothermal permit (not water well drilling) at a reasonable price
- Help increase the design expertise of engineers designing the systems
- (She had 4 issues) Resolve the issue around environmental impact to help remove that cost from the equation

The contractor mentioned that it was really tough for them to make the case for geothermal over natural gas in urban and suburban areas. They have been most successful when being called to replace propane or fuels other than natural gas, custom homes (on large lots which can handle the drilling spoils) or schools, which have mandates to reduce energy consumption and lots of land.

APPENDIX F: Driller Survey Questions

XXXXXXXXXX

http://www.cesars.com/Report.asp?SurveyID=14-L

The State of Drilling for Ground Source Heat Pumps

1 Does your company currently provide ground source heat pump (GSHP) drilling?

YES NO

2 How would you categorize your revenues from the GSHP product category?

- As your primary business
 - As an important segment of your business
 - As a small but growing part of your business
 - As an inconsequential part of your business (only if someone calls in)
 - We have no revenues from GSHP but hope to get into this segment
 - We have no revenues from GSHP drilling and do not plan to enter this market.
-

3 Does your company do any GSHP business or plan to do any GSHP business in California?

YES NO

SUBMIT 

Survey Page 1

The State of Drilling for Ground Source Heat Pumps

4 How did you first learn of GSHP technology?

1 of 12

2:15 PM 12/2/04

5

Have you seen demand for GSHP borehole drilling increase decrease or remain about the same since you started offering this service?

- Decrease
- About the same
- Increase
- N/A - no revenues yet from GSHP drilling



Survey Page 2

The State of Drilling for Ground Source Heat Pumps

6

How would you rate the relative importance of each of these factors in increasing demand for GSHP related bore hole drilling?

	1 Not at all important	2 Somewhat unimportant	3 Neutral	4 Extremely important	5 Very important
Government/Utility Incentives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rising cost of energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Word of mouth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Green building trends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase in contractors/engineers/designers for GSHPs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7

And have you been able to keep pace with the increased demand?

YES NO



Survey Page 4

The State of Drilling for Ground Source Heat Pumps

8 How would you rate the relative importance of each of these factors for the static or decreasing demand for GSHP related bore hole drilling?

	1 Not at all important	2 Somewhat important	3 Neutral	4 Somewhat important	5 Very important
Too much trouble/too much of a mess for customers	1	2	3	4	5
Not enough contractors in my area doing GSHP	1	2	3	4	5
Permitting too complicated/expensive	1	2	3	4	5
Hard to compete against solar incentives	1	2	3	4	5
GSHP systems too expensive	1	2	3	4	5
Too few certified drillers	1	2	3	4	5
Too much expense/hassle removing drilling spoils	1	2	3	4	5
Too few competent engineers/designers	1	2	3	4	5



Survey Page 4

The State of Drilling for Ground Source Heat Pumps

9

At what point in the sales cycle do you become involved with an installation project? (Check the one that best applies to your company.)

- At the beginning, we market directly to customers
 - After the sales process has started, to consult with installation design
 - After the heating/cooling system has been selected
 - After the contract for the installation has been signed
-

10

Who is typically your main point of contact for a GSHP drilling project?

- HVAC dealers/ reps
 - General Contractors
 - Design/engineer
 - Property owner/manager
 - Other please specify
-

SUBMIT 

Survey Page 5

The State of Drilling for Ground Source Heat Pumps

11

What is the typical sales cycle to close a deal with a *residential* customer?

- Less than 1 month
 - 1 to 3 months
 - 4 to 6 months
 - More than 6 months
 - Do not serve this market
-

12

What is the typical sales cycle to close a deal with a *commercial* customer?

- Less than 1 month
- 1 to 3 months
- 4 to 6 months
- More than 6 months
- Do not serve this market

13

What is the typical sales cycle to close a deal with a *school/government/military* customer?

- Less than 1 month
- 1 to 3 months
- 4 to 6 months
- More than 6 months
- Do not serve these markets

SUBMIT

Survey Page 6

The State of Drilling for Ground Source Heat Pumps

14

What role, if any, do you play in educating the customer about the benefits of ground source heat pumps?

- No role in customer education
- Complete responsibility for customer education
- Give additional information to help primary point of contact for the project
- Other, please specify

SUBMIT

Survey Page

The State of Drilling for Ground Source Heat Pumps

15

If an information resource, such as a website, existed that helped **educate customers** about the benefits of ground source heat pumps, the costs associated and the overall process for installing a system, how likely would it be to lower your marketing and sales expense?

Not at all likely Somewhat unlikely Most likely not Somewhat likely Very likely

1 2 3 4 5

16

What, if anything, could be done from an industry perspective to help reduce your marketing and sales costs and cycle time?



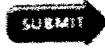
Survey Page 3

The State of Drilling for Ground Source Heat Pumps

17

There are new federal residential and commercial tax incentives for GSHP. In what way do you think they will impact demand for your drilling services?

- Incentives are not substantial enough to impact the industry or my business
- Will increase customer awareness overall but not impact my business
- Will increase demand for my drilling services
- Other, please specify



Survey Page 9

The State of Drilling for Ground Source Heat Pumps

18 From the time you get involved to the time the project is completed, about how many weeks have elapsed?

- Less than 1 week
- Less than 2 weeks
- Less than 4 weeks
- Less than 6 weeks
- Longer than 6 weeks

19 Of the following activities for a typical job, which ones take more time or adds more cost to your bottom line than you'd like? (Please check all that apply.)

- Site survey
- Test borehole
- Meeting with property owner
- Meeting with project manager/contractor
- Permitting process (inconsistent local rules)
- Drilling
- Working with engineering (loop field)
- Inspections
- State reporting
- Removal of drill cuttings
- Other, please specify



The State of Drilling for Ground Source Heat Pumps

20 How satisfied are you with your ability to find certified and trained drillers to meet the demands of your business?

Very dissatisfied	Somewhat dissatisfied	Neutral	Somewhat satisfied	Very satisfied
<input type="radio"/>				

21 Several schools located throughout the county are creating special "Green Collar Job" GSHP installation and borehole drilling programs. Some states, for example California, currently require four years of water well drilling field experience to drill closed loop vertical boreholes for GSHPs.

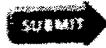
If a shorter certification program for closed-loop borehole drilling were put in place, do you think it would be possible to provide a *sufficient, or equal level*, of groundwater protection?

YES NO

22 Please describe how this new sub-classification would improve your business, if at all?

23 Would you support legislation for a special *shorter* "Green Collar Job" GSHP installation and borehole drilling certification?

YES NO



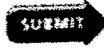


The State of Drilling for Ground Source Heat Pumps

27

Please rate the following in terms of how they *negatively* affect the profitability of your company:

	1 No effect at all	2	3	4	5 Very negative affect
Regulatory issues	1	2	3	4	5
Availability of drillers	1	2	3	4	5
Quality of driller training	1	2	3	4	5
Permitting fees	1	2	3	4	5
Lack of public drilling information	1	2	3	4	5
Upfront cost to buy drilling equipment	1	2	3	4	5
Ongoing equipment maintenance costs	1	2	3	4	5
Operational costs to run equipment	1	2	3	4	5
Travel costs	1	2	3	4	5
Sales costs	1	2	3	4	5
Inspection process	1	2	3	4	5
Disposal of drill spoils	1	2	3	4	5
Diesel Emission Regulation	1	2	3	4	5



Survey Page: 15

The State of Drilling for Ground Source Heat Pumps

31 How many years has your company been drilling GSHP boreholes?

- None
- Less than 1 year
- 1 to 5 years
- 6 to 10 years
- More than 10 years

32 Please select the category that best describes the total number of employees at your company.

- Under 10 employees
- 10 to 19 employees
- 20 to 99 employees
- 100 or more



Survey Page: 16

APPENDIX G: Driller Survey Responses

Zoomerang India Survey FINAL2: Results Overview

http://www.zoomerang.com/Report/Results/DrillerSurvey

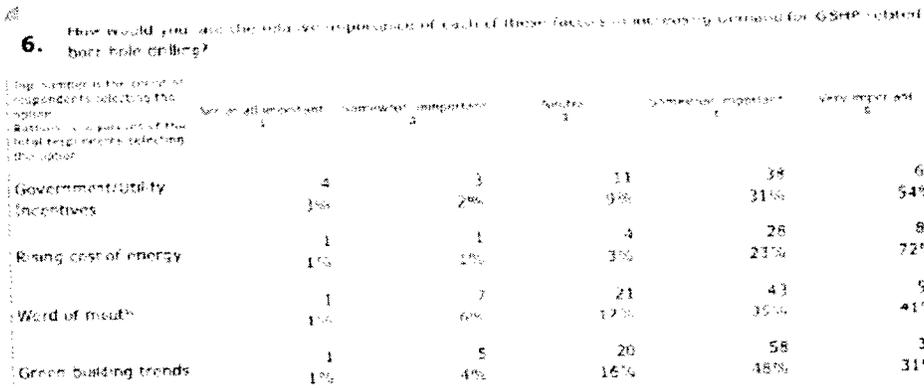
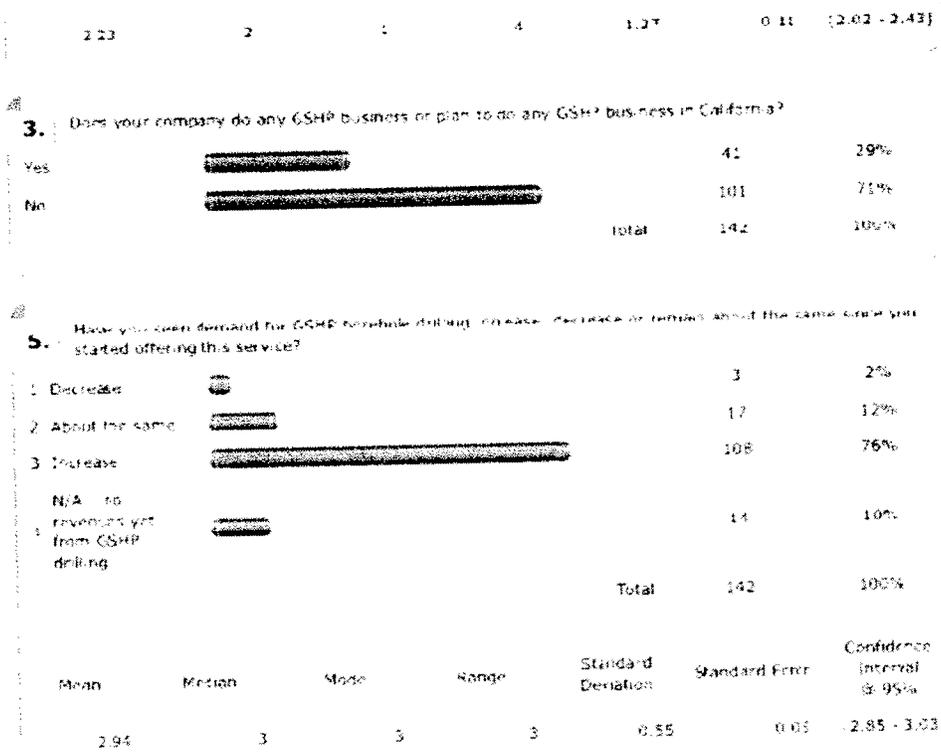
Driller Survey FINAL2



Results Overview

Date: 3/20/2012 12:28 PM EDT
 Responses: Completed
 Filter: No filter applied

1. Does your company currently provide ground source heat pumps (GSHP) drilling?						
Yes		109	78%			
No		31	22%			
		Total	140	100%		
2. How would you categorize your revenues from the GSHP product category?						
1	As your primary business		53	37%		
2	As an important segment of your business		38	27%		
3	As a small but growing part of your business		32	23%		
4	As an inconsequential part of your business (only if someone calls us)		4	3%		
5	We have no revenues from GSHP but hope to get into this segment		15	11%		
6	We have no revenues from GSHP drilling and do not plan to enter the market		0	0%		
		Total	142	100%		
Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%



	4 2%	7 7%	26 21%	49 40%	34 28%		
	Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
Increase in contractors/engineers /designers for GSHPs							
Government/Utility Incentives	4.30	5	5	4	0.97	0.05	(4.13 - 4.48)
Rising cost of energy	4.65	5	5	4	0.67	0.06	(4.53 - 4.77)
Word of mouth	4.10	4	5	4	0.94	0.05	(3.93 - 4.27)
Green building trends	4.04	4	4	4	0.83	0.08	(3.88 - 4.19)
Increase in contracts/engineers /designers for GSHPs	3.82	4	4	4	1.03	0.05	(3.64 - 4.00)

7. And have you been able to keep pace with the increased demand?

Yes		105	89%
No		14	11%
	Total	122	100%

8. How would you rate the relative importance of each of these factors for the stable or decreasing demand for GSHP related business?

Top number is the count of respondents relating to the factor. Bottom number is percent of the total responses relating to the factor.	Not at all important 1	Somewhat unimportant 2	Neutral 3	Somewhat important 4	Very important 5
Too much trouble/too much of a mess for customers	1 5%	4 21%	4 21%	8 42%	2 11%
Not enough contractors in my area doing GSHP	3 15%	4 20%	7 35%	5 25%	1 5%
Permitting too complicated/expensive	3 15%	5 25%	5 25%	5 25%	2 10%
Hard to compete against solar incentives	6 32%	5 26%	2 11%	5 26%	1 5%
GSHP systems too expensive	0 0%	7 35%	3 15%	3 15%	10 60%
Too few certified installers	5 25%	3 15%	6 30%	4 20%	2 10%

	1	3	6	6	4		
	5%	15%	30%	30%	20%		
Too much expense/hassle removing drilling spoils							
Too few competent engineers/designers	3	3	6	5	3		
	15%	15%	30%	25%	15%		
	Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
Too much trouble/too much of a mess for customers	3.37	4	4	4	1.11	0.25	[2.82 - 3.81]
Not enough contracts in my area doing GSHP	2.83	3	3	4	1.14	0.25	[2.35 - 3.35]
Permitting too complicated/expensive	2.96	3	2,3,4	4	1.25	0.26	[2.35 - 3.45]
Hard to compete against solar incentives	2.47	2	1	4	1.35	0.31	[1.87 - 3.08]
GSHP systems too expensive	4.25	5	5	3	1.07	0.24	[3.78 - 4.72]
Too few certified drillers	2.73	3	3	4	1.33	0.30	[2.17 - 3.33]
Too much expense/hassle removing drilling spoils	3.44	3.5	3,4	4	1.15	0.26	[2.95 - 3.95]
Too few competent engineers/designers	4.16	3	3	4	1.24	0.29	[2.53 - 3.67]

9. At what point in the sales cycle do you become involved with an installation project? (Check the one that best applies to your company.)

1	At the beginning, we market directly to customers		77	54%
2	After the sales process has started, to consult with installation design		31	22%

Response	Count	Percentage
3 After the heating/cooling system has been selected	20	14%
4 After the contract for the installation has been signed	14	10%
Total	142	100%

Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
1.80	1	1	3	1.02	0.02	[1.63 - 1.96]

10. What is typically your main point of contact for a CREP financing project?

Response	Count	Percentage
1 HVAC dealers/trips	42	30%
2 General Contractors	32	23%
3 Designer/engineer	13	9%
4 Property owner/contractor	38	27%
Other, please specify	17	12%
Total	142	100%

Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
2.38	2	1	3	1.24	0.11	[2.16 - 2.59]

11. What is the typical sales cycle to close a deal with a residential customer?

Response	Count	Percentage
1 Less than 1 month	31	22%
2 1 to 3 months	75	53%
3 4 to 6 months	17	12%
4 More than 6 months	1	1%

5	Do not serve this market					16	11%	
						Total	142	100%
	Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%	
	2.28	2	2	1	1.17	0.11	(2.05 - 2.47)	

12. What is the typical sales cycle to close a deal with a commercial customer?

1	Less than 1 month					7	5%	
2	1 to 3 months					46	32%	
3	4 to 6 months					31	22%	
4	More than 6 months					12	8%	
5	Do not serve this market					26	18%	
						Total	142	100%
	Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%	
	3.17	3	2	4	1.21	0.11	(2.92 - 3.37)	

13. What is the typical sales cycle to close a deal with a school/government/military customer?

1	Less than 1 month					4	3%	
2	1 to 3 months					15	11%	
3	4 to 6 months					24	17%	
4	More than 6 months					51	36%	
5	Do not serve these markets					48	34%	
						Total	142	100%
	Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval	

Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
4.35	5	5	4	0.96	0.03	[4.19 - 4.50]

19. Of the following activities for a typical job, which ones take more time or add more cost to your bottom line than you'd like? (Please check all that apply.)

1. Site survey		11	8%
2. Test borehole		8	6%
3. Meeting with property owner		17	12%
4. Meeting with project manager/contractor		28	20%
5. Permitting process (inconsistent local rules)		55	39%
6. Drilling		33	23%
7. Working with engineering (state level)		32	23%
8. Inspections		21	15%
9. State reporting		19	13%
10. Removal of drill cuttings		34	24%
Other, please specify		30	21%

Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
6.07	6	5	9	2.45	0.15	[5.77 - 6.37]

20. How satisfied are you with your ability to find certified and trained drillers to meet the demands of your business?

1. Very dissatisfied		14	10%
2. Somewhat dissatisfied		24	17%
3. Neutral		45	32%

4	Somewhat satisfied		30	21%														
5	Very satisfied		29	20%														
			Total	142	100%													
<table border="1"> <thead> <tr> <th>Mean</th> <th>Median</th> <th>Mode</th> <th>Range</th> <th>Standard Deviation</th> <th>Standard Error</th> <th>Confidence Interval @ 95%</th> </tr> </thead> <tbody> <tr> <td>3.29</td> <td>3</td> <td>3</td> <td>4</td> <td>1.24</td> <td>0.11</td> <td>[3.05 3.46]</td> </tr> </tbody> </table>					Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%	3.29	3	3	4	1.24	0.11	[3.05 3.46]
Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%												
3.29	3	3	4	1.24	0.11	[3.05 3.46]												

21. Several states located throughout the country are creating special "Green Collar Job" GSHR installation and borehole drilling programs. Some states, for example California, currently require four years of water well drilling field experience to drill closed loop vertical boreholes for GSHRs. If a shorter certification program for closed loop borehole drilling were put in place, do you think it would be possible to provide a sufficient, or equal level, of groundwater protection?

Yes		46	61%		
No		56	39%		
			Total	142	100%

23. Would you support legislation for a special, shorter "Green Collar Job" GSHR installation and borehole drilling certification?

Yes		46	61%		
No		56	39%		
			Total	142	100%

25. If a website were available with this information, how useful would it be to you in lowering your costs of doing business?

1	Not useful at all		13	9%														
2			16	11%														
3			28	20%														
4			43	30%														
5	Very useful		42	30%														
			Total	142	100%													
<table border="1"> <thead> <tr> <th>Mean</th> <th>Median</th> <th>Mode</th> <th>Range</th> <th>Standard Deviation</th> <th>Standard Error</th> <th>Confidence Interval @ 95%</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%							
Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%												

3.60	4	4	4	1.27	0.11	(3.30 - 3.91)
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26. Permitting processes and fees vary greatly by State, county and municipality. Please rate how important is it to your business to have uniform statewide permitting processes and fees?

Top number is the count of respondents selecting the option. Bottom is a percent of the total respondents selecting the option.

	Not at all important 1	Somewhat important 2	Neutral 3	Somewhat important 4	Very important 5		
Uniform permitting process	8 6%	5 4%	21 15%	34 24%	24 17%		
Uniform permitting fees	8 6%	6 5%	29 20%	45 32%	52 37%		
	Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
Uniform permitting process	4.13	5	5	4	1.14	0.10	(3.95 - 4.32)
Uniform permitting fees	3.88	4	5	4	1.14	0.11	(3.69 - 4.07)

27. Please rate the following in terms of how they negatively affect the profitability of your company:

Top number is the count of respondents selecting the option. Bottom is a percent of the total respondents selecting the option.

	Do not affect at all 1	2	3	4	Very negative affect 5
Regulatory issues	6 11%	13 9%	48 34%	35 25%	30 21%
Availability of drillers	24 17%	24 17%	45 32%	25 18%	24 17%
Quality of driller training	8 13%	24 17%	46 32%	33 23%	21 15%
Permitting fees	6 11%	31 22%	45 32%	29 20%	21 15%
Lack of public drilling information	8 13%	14 10%	45 32%	34 24%	31 22%
Upfront cost to buy drilling equipment	9 6%	9 6%	22 15%	33 23%	69 49%
Ongoing equipment maintenance costs	6 4%	16 11%	51 36%	47 33%	22 15%

Association	Number of respondents selecting the option						Confidence Interval @ 95%
	Mean	Median	Mode	Range	Standard Deviation	Standard Error	
Geothermal Heat Pump Consortium	41 43%	11 8%	12 8%	37	20%	21 15%	
International Ground Source Heat Pump Association (IGSHPA)	13 9%	2 1%	1 1%	12.5	8.7%	3 2%	
California Groundwater Association	43 30%	3 2%	1 1%	12	8%	83 58%	
National Ground Water Association	43 30%	15 11%	13 9%	56	39%	15 11%	
American Ground Water Trust	51 36%	13 9%	14 9%	11	8%	53 37%	
	Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
Geothermal Heat Pump Consortium	2.21	1	1	3	1.34	0.12	[1.97 - 2.45]
International Ground Source Heat Pump Association (IGSHPA)	3.68	4	4	3	0.98	0.08	[3.53 - 3.83]
California Groundwater Association	1.69	1	1	3	1.22	0.10	[1.39 - 2.04]
National Ground Water Association	2.65	3	4	3	1.34	0.12	[2.41 - 2.88]
American Ground Water Trust	1.83	1	1	3	1.16	0.12	[1.60 - 2.05]

30. Which of these industry associations have provided the most value to your business?

1 American Ground Water Trust		1	2%
2 Geothermal Heat Pump Consortium		2	1%
3 IGSHPA		106	75%
4 National Ground Water Association		20	14%

Response	Count	Percentage
California Groundwater Association	6	4%
Other, please specify	5	4%
Total	142	100%

Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
3.18	3	3	4	0.63	0.05	[3.07 - 3.28]

31. How many years has your company been drilling GSP boreholes?

Response	Count	Percentage
1 None	23	16%
2 Less than 1 year	15	11%
3 1 to 5 years	52	37%
4 6 to 10 years	11	8%
5 More than 10 years	41	29%
Total	142	100%

Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval @ 95%
3.23	3	3	4	1.40	0.11	[3.00 - 3.45]

32. Please select the category that best describes the total number of employees at your company.

Response	Count	Percentage
1 Under 10 employees	61	57%
2 10 to 19 employees	30	21%
3 20 to 99 employees	29	20%
4 100 or more	2	1%
Total	142	100%

Mean	Median	Mode	Range	Standard Deviation	Standard Error	Confidence Interval

Accounting Data Service PERS. & Health Care

http://www.irs.gov/efile/efilehelp/efilehelp.html

						8.95%
1.66	1	1	3	0.85	0.07	[1.52 - 1.80]

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APPENDIX H: Financial Links for Web Portal

CaliforniaFIRST: <http://www.californiafirst.org/>

PACE Now: <http://www.pacenow.org/>

Green Finance SF: <https://greenfinancesf.org/systems/energy>

DSIRE: <http://www.dsireusa.org/>

DSIRE information on PACE

financing: <http://www.dsireusa.org/solar/solarpolicyguide/?id=26>

Sonoma County Energy Independence Program: <http://www.sonomacountyenergy.org/>

Plumas-Sierra Rural Electric

Cooperative: http://www.psrec.coop/energy_renewable_geo.php?sec=enersol&pag=enerrenew

Delta Montrose Electric Association: <http://www.dmea.com/>

ENERGY STAR tax credits: http://www.energystar.gov/index.cfm?c=tax_credits.tx_index#c6

Coalition for a Green Capital: <http://www.coalitionforgreencapital.com>

[China Leads G-20 Members in Clean Energy Finance and Investment - The Pew Charitable Trusts](#)

[SCEIP Financial Assessment Calculator | Sonoma County Energy Independence Program](#)

[Can We Put a Price on Solving Climate Change? | Triple Pundit](#)

[UK to Start \\$3 Billion "Green" Investment Bank | Triple Pundit](#)

[DSIRE USA Incentive Listings](#)

[DSIRE: Incentives/Policies by State: California: Incentives/Policies for Energy Efficiency](#)

[Federal Tax Credits for Energy Efficiency : ENERGY STAR](#)

[MRV: Energy Programs: Energy Efficiency](#)

[Recurrent Energy | Recurrent Energy Advantage](#)