

---

UNIVERSAL  
GEOPOWER

The logo consists of two lines of text. The first line is the word "UNIVERSAL" in a blue, serif, all-caps font. The second line is the word "GEOPOWER" in a green, serif, all-caps font. The letter "O" in "GEOPOWER" is replaced by a small, stylized globe showing continents and oceans. A thin, curved line passes behind the globe, suggesting a path or energy flow.

---

### **Summary Note:**

**The following is a redacted overview document used for investor purposes that give the background and rational for the Universal GeoPower LLC geothermal project.**

**As of April 1, the DoE grant was terminated, as the geothermal wells had not been test flowed long enough to demonstrate brine volume and temperature sufficient for a demonstration plant. This was chiefly due to running out of calendar time. While the formation temperature was significantly higher than anticipated, the ~2 day flow time was insufficient to establish a consistent flow, and heat up the well bore to achieve a stable well head temperature.**

**The delay in recompleting the wells was chiefly due to miss-understanding the willingness of private investors to contribute matching funds for this project, that funding was only achieved in May of 2014, almost 4 -1/2 years after the project start.**

**UGP will endeavor to demonstrate geothermal brine production and disposal over multi year periods and economics allow.**

# Table of Contents

---

	<u>Page</u>
<b>Executive Summary</b>	<b>3</b>
<i>Base Case – Minimal Free Gas</i>	<i>Error! Bookmark not defined.</i>
<i>Expected Case – with Free Gas</i>	<i>Error! Bookmark not defined.</i>
<b>1 Project Development plan</b>	<b>5</b>
<i>Goliad County Project</i>	<i>5</i>
<i>Management</i>	<i>6</i>
<b>Development Process</b>	<b>8</b>
<b>Financial Model Overview</b>	<b>9</b>
<i>Revenue</i>	<i>9</i>
<i>Operating Expenses</i>	<i>10</i>
<i>Demonstration project Cash flow requirements</i>	<i>Error! Bookmark not defined.</i>
<i>Full Goliad Project , 7 wells</i>	<i>Error! Bookmark not defined.</i>
<i>Full Roll out (90 Wells)</i>	<i>12</i>
<b>Geothermal Energy Industry Overview</b>	<b>13</b>
<i>Advantages of Geothermal Energy</i>	<i>13</i>
<i>Well-Established, Global Industry</i>	<i>14</i>
<i>Market Opportunity in the Texas Gulf Coast</i>	<i>16</i>
<i>Government Incentive Programs</i>	<i>18</i>
<b>Geothermal Power Plant Design</b>	<b>19</b>
<i>Site Selection</i>	<i>21</i>

## Charts

---

	<u>Page</u>
Capacity Factors of Conventional and Renewable Technologies	14
Wells in Texas Gulf Coast Region	17
Geothermal Power Plant Schematic	20
Organic Rankine Cycle	21

## Executive Summary

---

<b>COMPANY</b>	Universal GeoPower LLC (“UGP” or the “Company”)
<b>HEADQUARTERS</b>	Houston, Texas
<b>BUSINESS DESCRIPTION</b>	<p>UGP is a developer and operator of energy projects using abandoned oil and gas wells to commercially produce both geothermal electricity and incidental hydrocarbons.</p> <p>In October 2009, UGP was awarded a \$1.5 million U.S. Department of Energy grant to generate electricity using geothermal energy harnessed from wells in Liberty County, Texas.</p> <p>UGP will convert the wells to high-volume hot brine producers through standard oil and gas industry re-completion. Its wells will produce large volumes of hot brine which carries both natural gas and oil as condensate. UGP will demonstrate base load geothermal electricity production with near-zero emissions and bring the wells back to profitable, commercial production of hydrocarbons. Current market conditions for electricity in Texas will limit deployment of geothermal electricity production to the initial pilot well. When market conditions for green electricity allow, wells developed for hydrocarbon production to that point can be quickly brought on line as electricity producers</p>
<b>MARKET OPPORTUNITY</b>	<p>UGP’s primary development plan is to use the current low prices of natural gas to acquire low production and/or shut in existing natural gas wells, and redevelop them to flow large quantities of brine that will bring with it natural gas and condensate to the surface. Many of these wells will have significant geothermal electricity production potential</p> <p>UGP has developed proprietary resource validation criteria to locate and prove commercially exploitable hydrocarbon and geothermal resources from abandoned wells. The Company has examined public and private landowner data, including geophysical surveys, well site records, well completion histories, well logs, and well temperature data. Of the 4,192 candidate wells in Texas, UGP has identified approximately 500 priority targets that can produce a minimum of ½ BCF/year, &gt; 6000 bbl/y condensate and 2 MWe of geothermal electricity. Detailed modeling shows that these reservoirs should remain productive at close these levels for greater than 40 years.</p>
<b>MANAGEMENT</b>	<p>UGP’s senior management team has extensive business experience in both oil and gas exploration and production and geothermal engineering.</p> <p>George Alcorn, the Company’s CEO, has 27 years of experience in oil and gas discovery and development, most recently as president of Alcorn Development</p>

Company, an independent oil and gas exploration and production firm.

Chris Luchini, the Company's CTO, is a PhD physicist and has developed an innovative technology for geothermal and geopressure energy recovery and ancillary mineral extraction, with two patents in process.

**ADVANTAGES  
RELATIVE TO  
TRADITIONAL  
GEOTHERMAL**

The Company's use of marginal producing/shut in wells transforms the risk and revenue profile of geothermal energy production. Traditional geothermal is characterized by a lengthy project development process, high upfront capital costs, and the risk of drilling unproductive wells. UGP will develop existing oil and gas wells with geothermal production potential that is known through publicly available data. UGP's approach has no exploration risk and a dramatically reduced cost of drilling. The Company's use of converted wells and off-the-shelf equipment will cut the development process, and therefore time to revenue generation, from 5 years to 6 months.

# 1 Project Development plan

## GOLIAD COUNTY PROJECT

The demonstration project will be on a single production well, with another existing well converted into a brine disposal well. This project will validate the geothermal generation capacity of the site, and provide a concrete example of a functioning geothermal power plant.

The follow on utility scale project is a 14 MW power plant to include the pilot well as well as up to 7 additional abandoned oil and gas wells on over 2,345 acres.

UGP has obtained geothermal lease rights from the landowners. The Company has acquired the oil, gas, and mineral (“OGM”) lease and associated well bores for 3 of the wells, and is in negotiations to acquire the remaining 5 wells and OGM rights.

The Company’s analysis of the Goliad County geothermal reservoir yields an estimated generation capacity of 1-2 MWe per well along with the supplementary incidental hydrocarbons.

UGP will clean out and re-work the initial production well to modify it from a configuration for the production of gas, to one that will support brine production, as well as produce the newly identified free gas layer that has been found in the well.

Another well on the site will be converted to a brine disposal well. Both of these re-work/re-completions will take place over the course of approximately 2 weeks. Subsequent to re-work and re-completion of these wells, contractors will stimulate the production well. We estimate that a 2 month lead time will be needed between re-completion and the conclusion of the stimulation. After the stimulation is completed, the well will flow brine and gas and the Company will begin gas production.

To ensure that the flow will be stable over a long period of time, a several month flow test will take place. At the end of that test, any change in pressure and flow over that time period will be used to estimate the flow over time of the geothermal brine.

A single Calnetix 1/8 MW modular ORC power plant, or commercial equivalent, may be installed at a turn key price of \$375K.

Management anticipates producing hydrocarbons for another 3 months before moving to full development of the Goliad County site.

Based on the analysis of the brine flow after 1 year of operation, additional generation units may be installed to capture the remaining power potential of the demonstration site.

Upon completing the 6 month demonstration phase, UGP will recomplete the other 6 wells at the Goliad County site, as well as drill new brine disposal wells. These production wells will also flow hot brine with

co-produced hydrocarbons immediately upon recompletion, but will require approximately 6 months to geothermal electricity production, if demonstration power plant units are used, or 16-20 months if a High Efficiency Power Plant is commissioned.

## REVENUE AND BUSINESS STRUCTURE

UGP will conduct its business activities in two segments:

**Electricity Segment:** UGP will develop, build, own, and operate geothermal energy-based power plants and will sell electricity generated by the power plants under long-term power purchase agreements (“PPA”).

UGP revenues from the sale of electricity will be contracted under a PPA with a regional utility. The PPA is expected to include a fixed price per KWh with contractual annual increases in price. UGP is currently in discussions with a regional utility.

If the lower electricity production source ( Calnetix at 1/8 MW) is chosen for the initial pilot project, the electricity will be initially sold into the spot market. This will allow UGP to enter into PPA negotiations with an operating power plant, and hence in a better position to sign a PPA at above market rate and capture a ‘Green Premium’.

### **Hydrocarbon Segment:**

Revenues attributable to the hydrocarbon segment will be derived from the sale of natural gas and condensate oil. Since prices of commodities fluctuate daily and volumes of produced natural gas will vary over time and from well to well, revenues attributable to the hydrocarbon segment will be generally less predictable than revenues from the electricity segment. Long term volume and price hedging agreements can mitigate these fluctuations.

## MANAGEMENT

The Company’s senior management team has extensive petroleum geology and energy engineering business experience. A particular expertise is the geological knowledge to identify oil and gas wells that have co-produced fluid characteristics necessary to drive electricity production. Further, UGP understands the organizational requirements and political relationships surrounding the acquisition of geothermal site rights.

**George Alcorn, Jr., CEO** - Mr. Alcorn is a petroleum geologist with 27 years experience in the oil and gas industry. Mr. Alcorn has a wide-ranging business background in petroleum exploration and development including oil and gas finance, land management, drilling operations, marketing, and property valuation. He will be responsible for selection of potential sites, negotiation with land/mineral owners for geothermal and oil and gas rights, and acquisition of well bores. He is a proven developer of new oil and gas resources with extensive technical knowledge in geology and geophysics and long-term industry relationships.

Prior to co-founding UGP, Mr. Alcorn worked with Terralliance Technologies, Inc. in Houston, TX, a start-up focused on oil and gas exploration. While there, he managed 13 geoscience professionals and oversaw all geologic and geophysics operations for the company’s exploration and development program. Since 1989 Mr Alcorn concurrently has run his own oil and gas development company Alcorn

Development Co. Alcorn Development Co. allows Mr. Alcorn to leverage his many skills in oil and gas production and development, which he has mastered throughout his career. It is this valuable skill set that Mr. Alcorn will bring to UGP.

From 1982-1989, Mr. Alcorn participated in joint venture drilling programs as a geologist with Transco Exploration Company, of Houston. There he was responsible for all geological and geophysical information from numerous drilling projects. Mr. Alcorn holds a Bachelor of Arts in Geology from the University of Texas at Austin.

**Chris Luchini, CTO** - Dr. Luchini will be responsible for selection of the power plant technology, vendors and integrators. He has developed an innovative technology for geothermal and geopressure energy recovery and ancillary mineral extraction, and two patents are currently being processed. Dr. Luchini has over 24 years of experience in complex systems modeling, research and development for mineral discovery, and natural resource development (oil and gas, gold, diamonds).

Prior to his current efforts at UGP, Dr. Luchini founded Sci Tac LLC, a contract development company for an advanced geophysics sensor system. With Sci Tac, he has been active in geologic contract development for the last ten years. From 2001-2002, Dr. Luchini was a senior developer at Turbolinux, Inc., and worked to develop provisioning and management software tools for the Linux operating system. Prior to 2001, Dr. Luchini led software development at Los Alamos National Labs. Dr. Luchini holds a PhD in High Energy Physics and a Master of Science from the University of Illinois at Champaign Urbana.

## Development Process

---

After securing rights to the geothermal and hydrocarbon resources, the Company's plan of operations will be as follows:

- *Recompletion:* Well bore recompletion work will begin after title procurement of the OGM lease and authorization from any applicable joint operating agreement. The actual work will be performed by a petroleum engineering firm. As part of the recompletion process, UGP will perforate and fracture stimulate specific, selected, virgin pressured reservoir rock in the well bores and flow a full combined stream of brine and natural gas under high bottom hole pressures to the surface.
- Other than for the demonstration project, where an existing well will be converted to a brine disposal well, for future projects a new, custom-engineered reinjection well will be drilled at each site. The well will flow for a period of 3 months to evaluate power production capabilities.
- Well sites will already have in place natural gas field handling facilities to produce, process, and sell natural gas into existing gas sales pipeline systems. During this initial 3 month flow period, natural gas and condensate oil will be separated from the brine and sold into a pipeline system. The brine will be re-injected into the new injector well on the site.
- *Resource Validation:* Cumulative test data at the end of the test flow period will inform estimates of the long term power production capabilities of the well bore. The operating plan is to convert wells with the flow rate to 1 MWE Equivalent units for at least 10 years. The delivery time for most geothermal generators is 6 months. Natural gas will continue to be sold during this period.
- *Power Plant Installation:* 9+ months after the well is originally recompleted, the generation unit(s) will be installed. A geothermal engineering and construction firm will design, build, and install the power plant on a fixed price basis. The construction phase is expected to be completed within 3 months and the power plant will thereupon produce 1 MWe of geothermal electricity.

Well flow and power generation data over time will be evaluated to determine the size and capacity of a thermodynamically efficient, custom built ORC generating units. Delivery time for the custom generator is 16-20 months.

- *High-Efficiency ORC Equipment transfer:* UGP may install custom-built, high efficiency ORC generators 36 months after well recompletion, increasing power generation capacity to 2+ MW per well. Market price of electricity will drive this decision.
- *Operations and Maintenance:* The Company will initially outsource preventative maintenance and "break / fix" service for manufacturer of the generators on a contract basis. The estimated cost is 0.08¢ per KWh.

UGP will hire experienced oilfield hands to supervise oilfield operations on a 24x7x365 basis.

## Financial Model Overview

---

The financial presentation in this Memorandum assumes that UGP acquires and converts 90 abandoned wells to geothermal production. The Company's first project is a geothermal power plant on a site in Goliad County, Texas that includes 8 wells. UGP will initially convert two wells into a producer and disposal well, and produce geothermal electricity on a demonstration basis over a 7 to 9-month period. UGP will then develop the remaining 6 wells. The total cost of the full Goliad County project is \$30 million, of which \$14M is funded with equity, \$9M in short term debt, and the remainder in cash from gas operations.

After the Goliad County project, the model assumes the roll-out of 83 more wells, for a total of 90 wells, during the projection period. Development is financed through equity and debt financing and free cash flow. UGP believes that management bandwidth and well recompletion work are the key limiting factors on the pace of development. The model assumes a maximum of 3 wells are developed each month. Based on this pace assumption and on the financing assumptions described below, the full roll-out to 90 wells is projected to take four years.

### REVENUE

UGP will generate revenue from both geothermal electricity production and production of incidental hydrocarbons.

#### *Geothermal*

- UGP will generate revenue from the sale of geothermal electricity under a long-term PPA to a regional utility. The model assumes a contract price of between \$66 and \$85/MWh. Please see the table on page 33.
- The model assumes that UGP receives a 97.5% net revenue interest in the geothermal revenue, with the balance (2.5%) retained by the property owners.
- While geothermal production will vary by well, UGP management anticipates that the target wells will drive 1 MWe net with modular units.
- The High Efficiency Power Plants (HEPP) produce by Turboden, Ormat, General Electric and others, will require aggregating the flow from 2-4 wells, and will result in an average production of 2 MWe net /well.
- Due to the elevated temperature and humidity in the Goliad County Site, ORC generators are projected to run with 96.7% efficiency. This efficiency factor is based on actual temperature and humidity data in the operating region per UTC Pratt & Whitney's analysis.
- The assumed plant utilization rate is 98.3%, which accounts for downtime related to maintenance and repairs. This assumption is derived from historical operating data for the PureCycle machines and is consistent with historical geothermal industry power plant experience.
- Electricity generation and sales will begin 9 months after well recompletion.

- For the initial 7 well Goliad project, Intermediate Efficiency Power Plants will be used, with High Efficiency Power Plants replacing these units after 36 months of production. No financial recover of the cost of the Intermediate Efficiency units has been included in the model, as the IEPPs are assumed to be moved to wells developed during the 90+ well roll out.
- For the 90 well roll out , any IEPP's will be used during test flow, and lead time for HEPP deliver, then moved to new sites once those HEPP's are installed.
- The model conservatively assumes that UGP will not generate revenues from the sale of renewable energy credits (RECs), although the Company believes there is potential to sell RECs in the future.

### *Hydrocarbons*

Redacted.

### **OPERATING EXPENSES**

At the project level, the cost structure and margins are similar to that of traditional oil and gas producers. At the corporate level, growth in general and administrative expense is based on the projected increase in headcount and related fixed costs.

### **PRODUCTION TAX CREDIT**

The Project is expected to qualify for the PTC, or the ITC. The model assumes election of the PTC of 2.2¢ per KWh of geothermal electricity produced, for all projects other than the demonstration single well project.

### **Electricity Price**

UGP intends to obtain a PPA for our demonstration plant at a rate between \$80 to \$85/MWh. This PPA, at this price, is only for the demonstration project. We assume that a larger plant, the full 7 well Goliad Project would be able to obtain a PPA at approximately \$66/MWh, which would not include a Renewable Energy Premium. Currently long term base load PPA's in the ERCOT grid are at \$66/MWh.

<b>PPA Price for Electricity expected as a function of project size.</b>			
	Demo Well	7 wells	90 wells
Power produced	0.77 MWe	14 MWe	180 MWe
Electricity price/MWh	\$85	\$66	\$66
Power Plant Cost /MWe	\$5.5	\$2.8M	\$2.3M



[cluchini@universalGeoPower.com](mailto:cluchini@universalGeoPower.com)

1800 Bearing St, Ste 510

Houston, TX 77057

While the spot price of electricity has been quite low in the ERCOT grid over the last few years, the recovery of the Texas economy, and the retirement of a large number of Coal power plants has been reflected in a significant jump in the cost of electricity. While the spot price has risen from ~\$23/MWH to ~\$35/MWH, this current higher price is still quite low by historical standards. A general rule of thumb is that long term PPA's are established at @\$20-\$25/ MWH higher than the yearly average spot price.

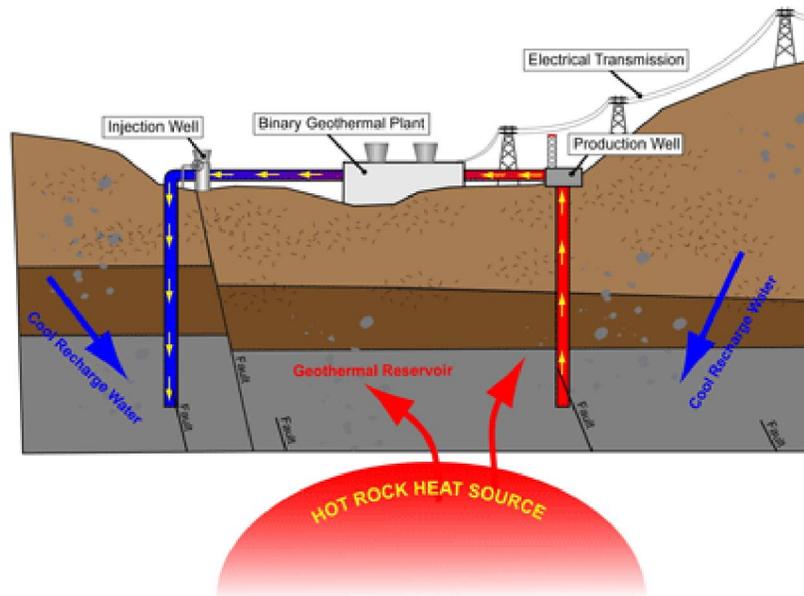
*Full Roll out (90 Wells)*

- After Goliad County, the 83 remaining well roll-out is assumed to be financed 33% with debt. The balance of the capital need (67%) is modeled to come from a combination of equity and cash flow from operations.
- The overall equity need is dependent on the scope and pace of the roll-out as well as assumptions regarding the amount and terms of debt financing. Given base case assumptions, the model anticipates a total equity need of \$60 million, and a roll out time of 4 years.
- Debt assumptions are 8% on a 10 year term
- Management expects that alternative sources of financing, such as grant funds and early access to debt financing supported by a DOE loan guarantee, can significantly reduce the overall cost of capital and equity need, thereby improving returns to shareholders. This is not currently reflected in the model.

## Geothermal Energy Industry Overview

---

Geothermal energy is derived from the heat of the Earth. With an estimated temperature of 5,000°C, the Earth's core is as hot as the surface of the sun. This heat naturally flows outward and can produce molten rock, or magma, near the Earth's surface. The presence of magma in close proximity to water trapped beneath the Earth's surface creates geothermal reservoirs. Hot geothermal brine can manifest itself at ground level as hot springs or geysers, but it largely stays trapped underground in cracks and porous rock. Conventional geothermal resource development involves the identification, extraction, and use of the energy from these geothermal reservoirs. Once a suitable reservoir is identified, a production well is drilled to access the resource. At the surface, turbines are used to convert the hot fluid into electricity. The cooled fluid is then re-injected into the earth, forming a fully renewable system.



The energy content of U.S. domestic geothermal resources (to a depth of 3 kilometers) is estimated to be 3 million quads, equivalent to a 30,000 year supply of energy at the current rate of consumption in the United States.

### ADVANTAGES OF GEOTHERMAL ENERGY

Geothermal energy offers significant advantages over other renewable and traditional sources of energy, including:

- *Base load Reliability:* Geothermal power plants provide reliable base load electricity. Geothermal power production facilities can achieve capacity factors, as high as 98%. The power

output of other renewable energy sources, such as wind and solar, vary according to climatic conditions, rendering them unsuitable to supply base load energy.

### Capacity Factors of Conventional and Renewable Technologies

Technology	Capacity Factor (%)
Geothermal	86-95
Nuclear	90
Biomass	83
Coal	71
Wind	25-40
Natural Gas Combustion Turbine	30-35
Hydropower	30-35
Solar	24-33

- Clean, Renewable Energy:* Geothermal energy is a clean source of electricity with minimal environmental impact, even when compared with other renewable energy sources. Closed loop binary geothermal power plants produce no air emissions. Geothermal facilities have a much smaller physical footprint than biomass, solar, or wind facilities.
- Very Low Operating Cost:* When upfront exploration and drilling costs are kept in check, geothermal is cost-competitive with traditional energy sources, irrespective of renewable energy tax benefits. Beyond initial capital costs, the combination of very low operating costs and high capacity factors typically results in geothermal power production being one of the most inexpensive forms of new electricity generation available today. Geothermal power plants do not need to purchase carbon-based fuel (e.g. biomass waste, clean coal, or natural gas) in order to generate electricity. This lack of exposure to fuel price and delivery risk presents an opportunity for more predictable project returns.

### WELL-ESTABLISHED, GLOBAL INDUSTRY

The first geothermal plant was built in 1904 in Lardarello, Italy. Today, the geothermal power industry is well-established around the world. As of 2008, 24 countries have installed geothermal power generation capacity that aggregates to approximately 10,500 MW. Roughly 500 geothermal power plants are in service worldwide. This installed global capacity is estimated to increase to 13,500 MW by 2010. Countries with significant installed geothermal generation capacity are shown in the table below.

Geothermal Power Generation Capacity (in MW installed)	
	<b>2008</b>
United States*	3,153
Philippines	1,970
Indonesia	1,189
Mexico	953
Italy	811
Iceland*	580
Japan	535
New Zealand	472
El Salvador	204
Costa Rica	163
Other	525
<b>Total</b>	<b>10,555</b>
<i>Source: International Geothermal Association</i>	
<i>*Data as of 2009</i>	

The United States is currently the world’s largest producer of geothermal electricity, with installed generating capacity of 3,100 MW as of March 2009. Over the past several years, an investment focus on renewable energy, combined with tax incentives and renewable energy mandates, has ignited geothermal development.

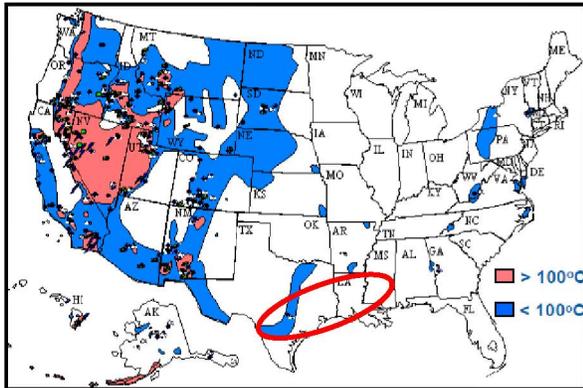
In the U.S., there is more than 10 GW of geothermal capacity in development and more than 6 GW in late stage development. The table below shows installed geothermal capacity and projects in development by state, as of September 2009.

	Installed Capacity and Project Overview by State		
	Installed Capacity	Projects in Development	
	September 2009	Low	High
Alaska	0.7	50.0	95.0
Arizona		2.0	20.0
California	2,605.3	1,554.9	1,938.9
Colorado		10.0	10.0
Florida		0.2	1.0
Hawaii	35.0	8.0	8.0
Idaho	15.8	238.0	326.0
Nevada	448.4	1,776.4	3,323.4
New Mexico	0.2	20.0	20.0
Oregon		317.2	368.2
Utah	47.0	259.0	332.4
Wyoming	0.3	0.2	0.0
<b>Total</b>	<b>3,152.7</b>	<b>4,235.9</b>	<b>6,442.9</b>
<i>Source: Geothermal Energy Association</i>			

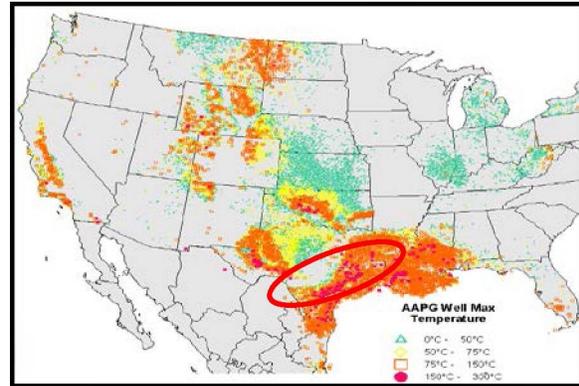
As shown in the table above, geothermal electricity generation has been highly concentrated in the Western U.S., with California and Nevada representing more than 95% of installed capacity. To date, resource development has focused exclusively on the geothermal potential of volcanoes, geysers, and other tectonic heat sources in the Western United States, in proximity to the Pacific “Ring of Fire.”

UGP is the first to focus on the known geothermal resources in the gulf coast region, despite DOE and academic studies dating back to the 1970s based on actual data that validate the resource. The contrasting

geothermal resource maps below tell the story. The map on the left, prepared by a geothermal industry group based on resource estimates, highlights the traditional geothermal geographies and omits the known geothermal fairways along the gulf coast. The map on the right below, prepared by the SMU Geothermal Lab based on actual well temperature data, shows the geothermal resource potential of the gulf coast.



Source: Geo-Heat Center/Oregon Institute of Technology



Source: SMU

## MARKET OPPORTUNITY IN THE TEXAS GULF COAST

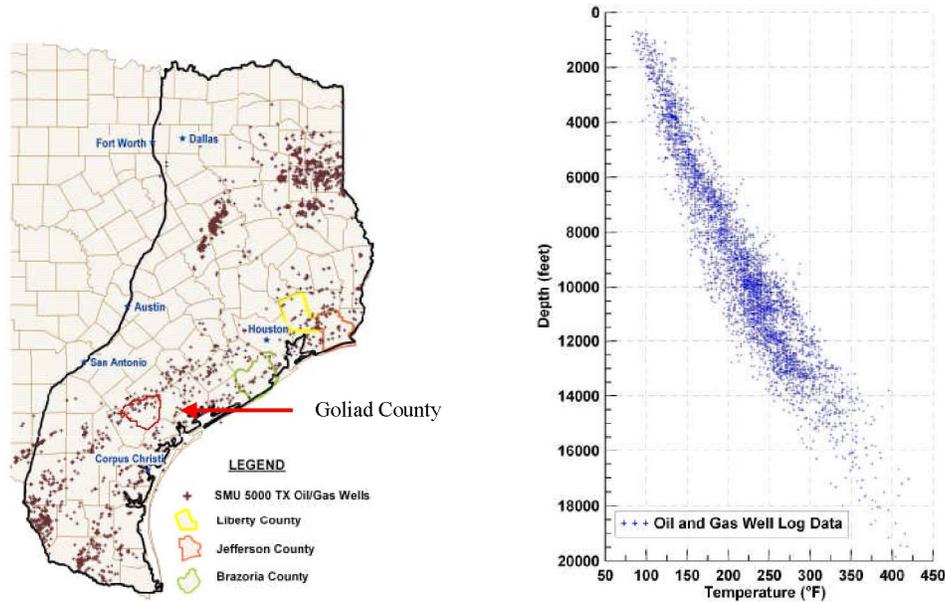
UGP's initial focus is on Texas gulf coast wells. UGP estimates that inactive wells along the Texas gulf coast have the potential to produce in excess of 2,000 MW of geothermal electricity and economically recover more than 1 trillion SCF per year of natural gas.

Of the Texas wells, there are approximately 250,000 active oil and gas wells and an estimated 110,000 inactive wells. There are approximately 50,000 inactive wells in the Texas gulf coast region.

### Geothermal Electricity

In 2007 the SMU Geothermal Laboratory conducted a detailed study of the geothermal potential of Texas gulf coast wells. SMU examined the well logs of 5,000 wells, shown in the map below. The corresponding graph shows their bottom hole water temperature and well depth.

### Wells in Texas Gulf Coast Region



Source: Southern Methodist University

The optimal conditions to convert geothermal energy to electricity are brine temperatures of 250° to 460°F and a minimum well depth of 13,000 feet. The data indicates that approximately 25% of the wells in the SMU study have good potential for geothermal power generation if sufficient brine production is available. Applying the SMU study findings to the inactive well population in the Texas gulf coast indicates that 12,500 inactive wells in UGP’s target geography are good candidates for geothermal production.

A typical Texas well has the flow potential to drive a minimum of 250 MWE from a Intermediate Efficiency turbine, generating 250 KWe of renewable electricity delivered to the grid. Electricity production potential is a product of temperature at the well head of the brine, and the mass of brine flow. As an example 150 gallons per minute of pure water at a temperature of 300F will drive a single PureCycle unit at maximum capacity.

Based on the conservative assumption of one 250 KW gross per turbine per well, the geothermal power potential of inactive wells Texas gulf coast wells is approximately 3,100 MW.

The Pratt and Whitney PureCycle, or similar Calnetix small modular power plants do give up thermodynamic efficiency due to their small scale. Intermediate efficiency power plants (IEPP) >1MW per installation, can produce 50% more power from the same flow. Large scale High Efficiency Power Plant (HEPP) of >5 MW per installation can produce 95% more power per unit flow of similar temperature brine.

### Hydrocarbons

In addition to geothermal heat, the brine contains dissolved methane gas. Production from dissolved methane is typically steady-state with a slow decline. The dissolved methane content is estimable based on flow rate, pressure, and salinity. There is an abundance of historical data showing dissolved methane levels of gulf coast well brine ranging from 5 to 88 SCF per barrel. The Company’s base case assumes 24 SCF per barrel, which is at the low end of typical dissolved methane values. Based on the 24 SCF per barrel assumption, the Company projects an estimated 1.69 trillion SCF of natural gas can be economically recovered from inactive wells in the Texas gulf coast region.

Natural Gas Recovery	
12,500	Wells at Sufficient Temperature and Depth
x 15,431	bbl / day brine production per well
x 365	Days per Year
x 24	SCF per Barrel of Water
<b>1.69</b>	Trillion SCF per Year

In addition to dissolved methane gas, it is anticipated that the converted wells will produce significant amounts of free gas – gaseous hydrocarbons present in the brine-producing zones. Free gas will be released at the time of stimulation, flow to the well bore, and decline quickly relative to the dissolved methane production. UGP estimates free gas production will begin at 1,250 MCF per well per day and decline to 50 MCF over 5 years. Due to the complexity of projecting free gas, the UGP base case conservatively assumes no production of free gas in its forecasts.

Evolved gas is produced during the depressurization of the gas saturated production zones. Like a soda bottle with the lid cracked, the dissolved gas will come out of solution to produce gaseous non-dissolved gas. This gas will tend to be produced faster than it would have been if it simply flowed in the brine to the well bore.

The National Renewable Energy Laboratory is currently collaborating with UGP to do a detailed computational mode of the initial Goliad site. The current predictions in this business plan are based on conservative ‘generic’ models published by NREL in June of 2011.

## GOVERNMENT INCENTIVE PROGRAMS

The stimulus bill enacted in February 2009 extended and enhanced federal tax incentives for renewable energy power development. The bill extended the placed-in-service date for the production tax credit (“PTC”) by 3 years to December 2013. The PTC for geothermal is 2.2¢ per kilowatt-hour of electricity produced over a 10-year period, beginning when the facility is placed in service.

The bill also gives geothermal developers the option of claiming an investment tax credit (“ITC”) in lieu of the PTC. The ITC allows developers to recoup 30% of the cost of the facility in the year a project is placed in service. A third option to renewable energy developers – to forgo tax credits entirely and instead receive cash grant (“ITCG”) from the federal government equal to 30% of the project cost. This options has expired at the end of 2011.

## Loan Guarantee Programs

The Energy Policy Act of 2005 provides for the issuance of loan guarantees by the DOE that support the commercialization of innovative energy efficiency, renewable energy, and advanced transmission and distribution technologies

### **Renewable Portfolio Standards**

Another driver of renewable energy investment is due to Renewable Portfolio Standards (“RPS”). Currently, there is more than 3,000 MW of installed generation capacity from renewable sources in Texas, well above its original 2009 requirement and ahead of schedule. In August 2005, the legislature increased the “new capacity” requirement to 5,880 MW by 2015. In addition, non-wind RPS requirements are currently in the legislative process in Texas.

*Source: Pew Center on Global Climate Change, data as of September 18, 2009*

### ***Carbon Legislation***

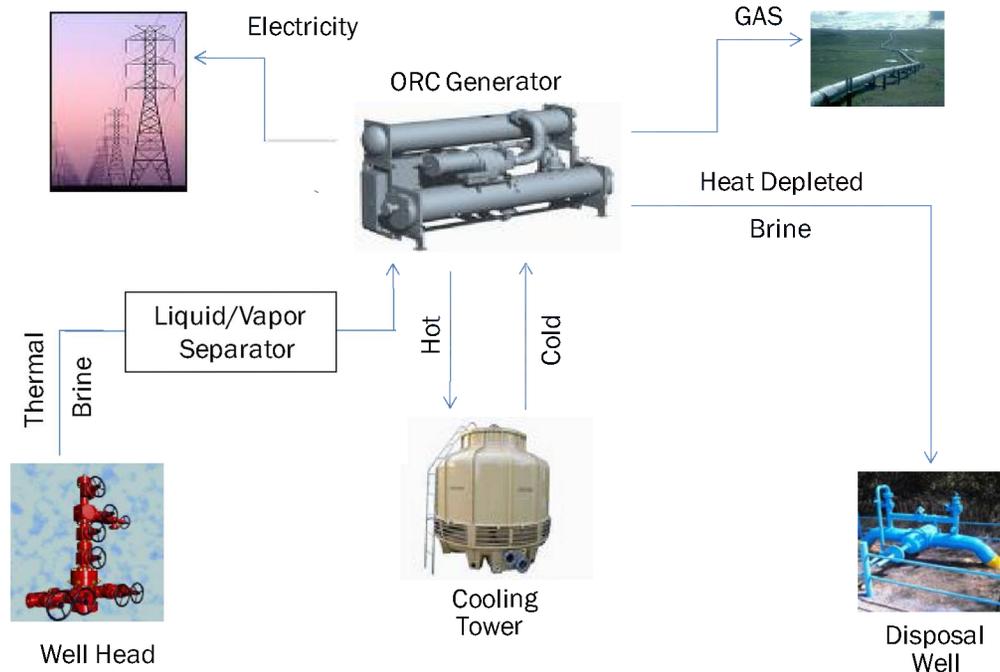
International efforts to limit the amount of greenhouse gas emissions create a potential economic upside for renewable energy facilities. Carbon mitigation programs, which include the much debated Kyoto Protocol and proposed domestic Cap-and-Trade legislation, have been designed to create economic incentives for companies to reduce their greenhouse gas emissions. While carbon mitigation programs and their corresponding markets are nascent, carbon legislation presents attractive prospects for the renewable energy industry moving forward.

## **Geothermal Power Plant Design**

---

The UGP geothermal power plant is based on a modular design of field-proven, mature commercial equipment. The plant schematic is shown below:

### Geothermal Power Plant Schematic



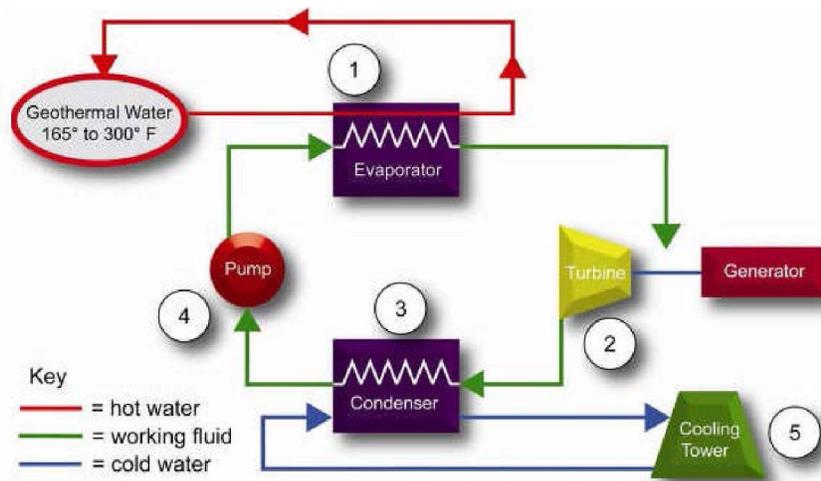
The power and gas production generation process is described below:

1. Hot brine is produced through corrosion resistant casing and a wellhead gathering system of insulated stainless steel. Note that this standard oil and gas field handling equipment is already installed at acquired wells.
2. Liquid / vapor separator splits brine and vapor and reduces pressure to power plant.
3. Power plant heat exchanger extracts heat from brine / vapor into working fluid, which spins turbine.
4. Working fluid is cooled by the water cooling tower.
5. Heat and gas-depleted brine is injected in newly drilled, shallow (< 5,000 feet) brine disposal well.
6. Heat-depleted vapor is de-watered, and natural gas is delivered to the nearby pipeline.

The system is driven by a simple reverse refrigeration cycle using a non-flammable refrigerant. The system is entirely enclosed and produces near-zero emissions. The warm brine is re-injected back into the ground. Its working process is described and depicted in the figure below:

1. Hot brine enters the evaporator to heat the R-245fa refrigerant working fluid until it is vaporized.
2. High pressure, hot vaporized working fluid then enters the power module and drives a turbine to produce electrical power.
3. Low pressure, expanded vapor cycles through a condenser where it is condensed into liquid form.
4. The cooled liquid is then sent to the pump, boosted in pressure and sent back to the evaporator to repeat the cycle.
5. A cooling tower provides the heat sink for the condenser heat transfer.

### Organic Rankine Cycle



The demonstration power plant will be delivered as fully assembled units

### SITE SELECTION

UGP has developed proprietary resource validation criteria to locate and prove commercially exploitable geothermal and hydrocarbon resources from abandoned wells. It has closely examined public and private landowner data, including geophysical surveys, well site records, well completion histories, well logs, and well temperature data.

The Company has identified 4,912 validated wells in Texas alone that can support a minimum of 1 MWe of power generation. Based on temperature and flow rate data, the top 10% of the validated wells can support a minimum of 2 MWe of power generation with high efficiency, large > 5MWe power plants.

The resource validation criteria include the following:

- *Well age and casing condition:* UGP's focus is on wells drilled within the past 15 years that reflect advances in drilling technology and procedures, such as polymer mud systems and alloy casing. These wells typically have wider diameters, enabling higher flow rate. Good condition of the casing is a threshold issue to the Company's ability to economically convert a well to geothermal production.
- *Hot brine* with a significant concentration of hydrocarbons, as well as well head temperature greater than 300°.
- *Flow rate potential:* UGP examines the brine production potential for achieving the high-volume flow rate necessary for hydrocarbon production, as well as geothermal production. Brine production records are reported at the county level in Texas. The flow rate for an individual well is estimable based on sand thickness, porosity, permeability, bottom hole pressure, and casing size/condition.

- *Access to transmission:* The Company's focus is on wells situated near transmission lines.

Beyond its initial assessment of high resource potential, the Company will contract with petroleum and geothermal industry engineering firms to validate the resources of candidate wells through geophysical surveys, sampling and analysis of fluids, and other methods.