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# Questions to Consider Before Starting a Geothermal Venture

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# Executive Summary

The mission of the **SMU Geothermal Laboratory** is to promote and encourage research, education, and investment in the field of geothermal energy.

The purpose of this document is to give those interested in developing geothermal resources and undertaking business ventures in the geothermal field an aid in the form of a basic checklist of things that should be considered when engaging in such a venture, in order to increase the probability of project success.

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# Geologic Investigation

“Does the resource exist?” This is the starting block for any geothermal venture, simply because you need to identify a geothermal resource and its characteristics before you can develop it.

## **What is the geology of the area?**

- Geologic structure of the area
- Stratigraphic column and cross sections
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# Legal Investigation

“Can the resource be legally harnessed?” Legal issues often become some of the greatest obstacles in the development of many geothermal ventures. A thorough legal analysis will clearly identify potential issues with the site, amount of power produced, or other issues that could pose serious threats to the project. In the United States, the highest quality geothermal fields, such as in Yellowstone, are closed to all development.

## **What are the governing bodies of the area?**

- Federal, State, Local
- Geologic (Ex. Texas Railroad Commission)
- Environmental (Ex. EPA)
- Utility companies?
- Lobbyists, etc.

## **Is the resource in an area that can be developed?**

- What state, county, city permits are needed?
- Can you drill/inject in this area?
- What zoning laws exist that threaten the project? Noise bans, visible emission bans, aesthetic rules and regulations?
- What protocols are required in order to legally produce and sell power in your area?
- What is the interconnectivity charge to load your power onto the grid?

## **How do you get the rights to the resource?**

- It is important to note that in the state of
- Texas geothermal waters are considered a “mineral” and are subject to Texas mineral laws.
- Who owns the mineral rights?
- Who owns the surface land rights?

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# Engineering Investigation

“Can the resource be efficiently harnessed?” Once the geologic resource is well understood, it becomes essential to find the most efficient way of harnessing its full potential in order to maximize plant output as well as financial gain.

## **What type of plant design and system is best suited for harnessing the resource?**

- Dry steam, flash steam, or binary plant?
- Will the temperature, pressure, and fluid flow rate of my reservoir be able to support one of these plants?
- Can absorption chillers or geexchange units be incorporated?
- What diameter wells/ pipes do I need to produce my desired amount of energy?
- How many wells do I need to obtain my desired fluid flow rate to maximize power plant output?
- What insulation is needed in order to most efficiently transport the heat?
- What material should my casing/ pipes be made of to avoid corrosion, scaling, or other impurity related issues?

## **To what extent is reservoir engineering required in your resource?**

- Do you need to fracture the formation in order increase production?
- Does your reservoir require fluid injection such as an

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# Financial Investigation

“Can the project be financed?” Answering this question will be the true make or break of any business venture. If the numbers don’t make sense, then the project won’t make sense. Even in the case of green energy projects, there is no exception.

## Opportunity Analysis

- Who will you sell the energy to?
- What is the most profitable target market for your power generation— selling to the grid, distributed energy, coproduction, a combination of each?
- If gas is produced, will it be sold to a pipeline, used in a fuel cell, or in a turbine?
- How much energy is needed to satisfy the site demand?
- What are the resources already available?
- How can I maximize my profit from these resources?
- Can a Power Purchase Agreement be secured? At what price, for how many years?
- Who is the competition?
- What is the price to beat of the competitor?
- How will this project be financed (debt/equity)?
- What is the source of capital?
- What is the cost of capital?
- What financial risks are associated with the project?
- Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis is recommended.
- What is the anticipated performance of the plant?
- Note, that for coproduced systems these questions need to be addressed for both the geothermal and hydrocarbon production.

## Profit Analysis

- What is the estimated Cost of Capital for the project?
- Where will the funding from the project come from?
- What is the Net Present Value for the Project?
- What is the Future Value of the investment?
- What is the Required Rate of Return for the project?
- What discount rate is being used to account for risk.
- How many years does the project need to be in production to produce the required rate of return?
- How dependent are the estimates based on commodity prices.
- What is the effect of raising or lowering commodity prices?
- Are there government incentives or subsidies that may affect the outcome of these calculations?
- What is the potential for “cap and trade”/ carbon-credit earnings for this project, and how does this effect the calculations?
- Note that given a coproduction site, include the earnings from hydrocarbons should be included in the calculations.
- How much do I expect to make from the project?
- What is the projected timeline for the project?
- What are the risks associated with not being on schedule? Expenses, legal ramifications, etc.
- Given the calculations, the expected budget, and the potential payback, does the project make financial sense?

# Financial Investigation, cont.

## Cost Analysis

### What are the exploration and development costs?

- Seismic surveys, well logs and data, geologic analysis, chemical analysis of geothermal fluids, etc.
  - Short and long term flow tests, disposal and/or reinjection tests
  - What are the drilling costs? What are the costs for the drill rig, well fracturing, personnel, casing, etc.?
  - Is it possible to recomplete an existing well?
  - What is the cost to recomplete a well?
  - What is the estimated lifespan of a well?
  - Production well (new): drilling costs, casing costs, emplacement of the wellhead, preparing the site for power plant installation.
  - Production well (existing): work-over costs of well, perforation of casing, formation fracturing.
  - Injection well designed and drilled to necessary depth, casing, injection pump, etc.
  - What are the development costs for infrastructure on and off site?
- Purchase (or design and manufacturing) of the power plant, shipping, and installment costs.
  - Connection of pipes to other necessary infrastructure to the plant (separator, injection well, rock muffler, etc.).
  - What are the installation costs related to equipment, transmission wires and cables, cost of machinery, and personnel to install and test run the plant.
  - Connection to gas pipeline. Will the gas need to be cleaned or pressurized to meet pipeline requirements.
  - What are the production costs?
  - Taxes and interconnection tariffs cost of day-to-day plant operation, obtaining personnel, operational research

### What are the legal costs?

- Legal costs associated with zoning, siting, drilling permits and mineral right procurement.
- Legal costs associated with rules and regulations of how to properly case and prepare a well for production use.
- What are the permitting costs and procedures? (In Texas see Oil & Gas Permits from the Rail Road Commission Website  
<http://www.rrc.state.tx.us/licenses/og/index.php>)



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# US and Texas Contacts

***Companies with  
Technology Related to  
Geothermal Power  
Plants***

**Pratt & Whitney Power Systems**

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**Gulf Coast Green Energy**

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**Deluge, Inc.**

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**Power Engineers**

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***Geologic Data***

**UT Bureau of Economic  
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<http://www.beg.utexas.edu>

**IHS Energy**

888-645-3282 or 713-840-8282  
<http://energy.ihs.com/index.htm>

**Drillinginfo, Inc.**

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***For more contacts and  
discussion of materials***

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