



well is for geothermal? *

Presentation Overview

¥ **Texas Land Situation**

¥ **Texas Geothermal Overview**

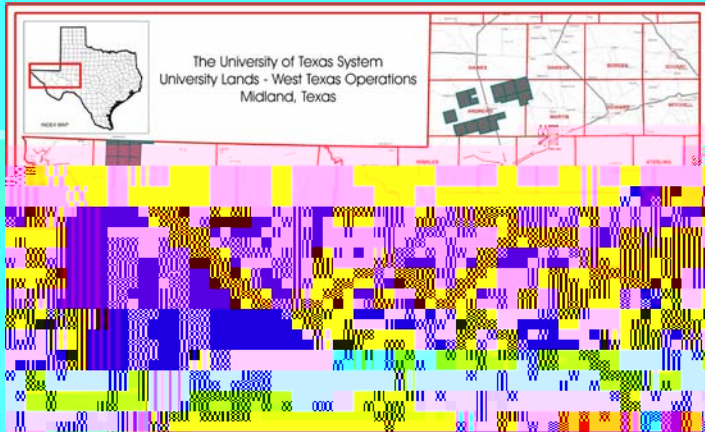
¥ **Policy Recommendations**

¥ **Conclusions**

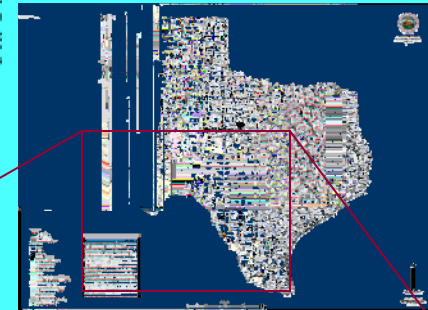
Texas Lands Are State Or Privately Owned

University Lands

2,104,772 acres in West Texas



Andrews	293,029	Crane	65,244	Crockett	368,523
Castro	1,065,000	DeWitt	1,000,000	El Paso	11,745
Cherokee	2,305	Hudspeth	493,405	Garland	25,353
Comanche	25,881	Martin	16,687	Gray	10,863
Concho	1,885	Reagan	218,105	Schleicher	61,835
Corral	1,885	Upton	86,429	Winkler	49,836
Counties	31,047	Total Acres:	2,104,772	Ward	8

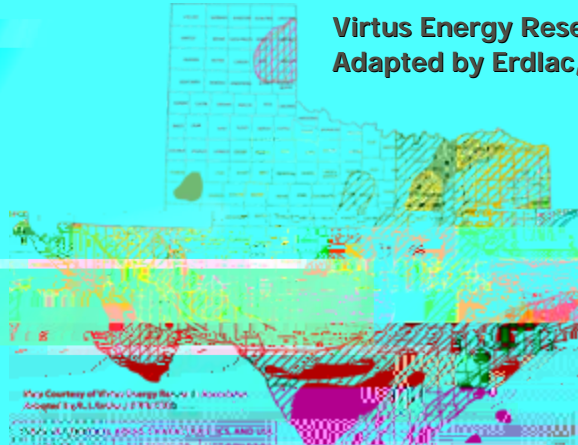


Texas General Land Office
20.3 million acres in West Texas, the Gulf Coast extending 10.3 miles from shoreline, state agency acreage & timber lands in East Texas

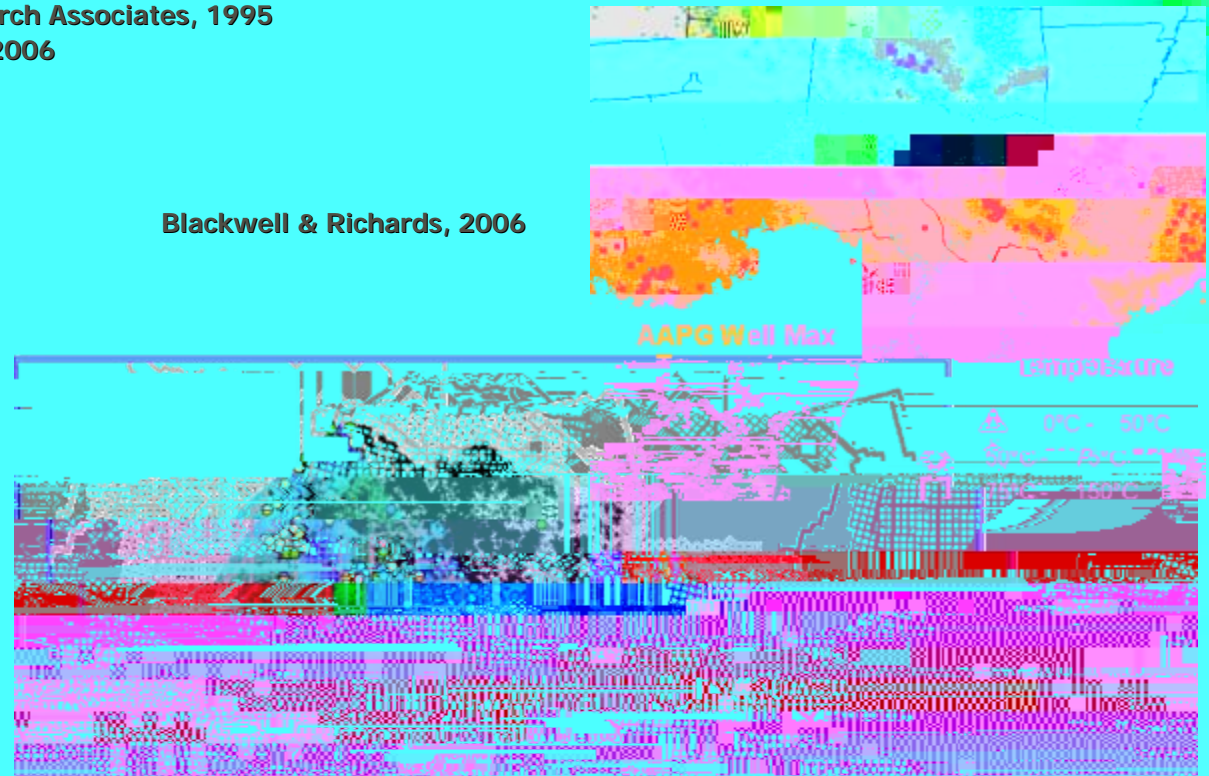


Texas Geothermal Energy As: Geoexchange – Direct Use – Electrical

Virtus Energy Research Associates, 1995
Adapted by Erdlac, 2006



Blackwell & Richards, 2006



Erdlac & others, 2006

Well symbol color intervals every 1000 ft:
18,000 – 30,000 ft

Lower yellow half circle indicates BHT
data available.

CI for BHT data every 5°F: 270 – 410°F

Texas State Recommendations On Geothermal Energy Development

Recommendations Are In Four Categories:

¥ **Technical Assistance**

¥ **Industrial / Economic Development**

¥ **Advocacy**

¥ **Policy / Legal Action**

ditions: Economic Development

Texas dependence

Renewable Energy Jobs

Texas Wind Resource

Tech / 10 MW* # Tech / 2898

Businesses For Midland & Ector Counties	
Businesses	Number People Employed
9,923	78,345
9,784	77,851
1,795	
228	

Market Place Low Pages

Businesses For Midland & Ector Counties	
	Sales
	\$7,408,100,000
	\$91,600,000
	\$91,600,000

^ From D&B Market Place

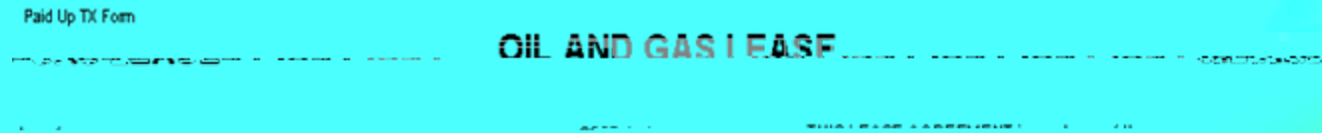
Recommendations: Industrial / Economic Development

Recommendation 2 – Leasing Definition And Clarification

The typical O&G lease does not directly include geothermal in the agreement with the mineral owner...or do they?

If the word 'geothermal' is not used does this type of wording also include heat?

And if not, does the injection of hot brine constitute a breach of law under the Geothermal Resources Act whereby the heat is being wasted?



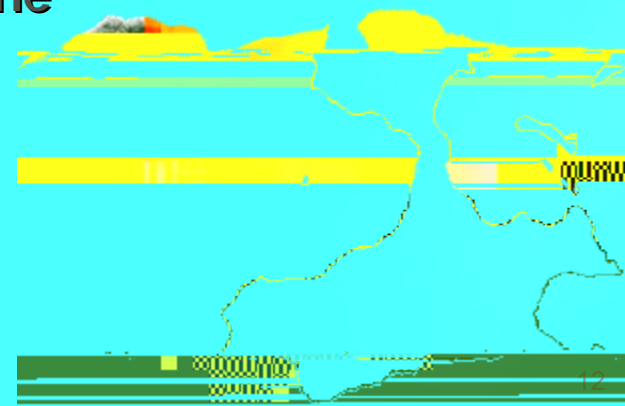
Recommendations: Advocacy

Recommendation 4 – Financial Forums

- ¥ Renewable energy finance forums that include geothermal.
- ¥ Separate geothermal finance forum due to uniqueness of resource – long lead time in establishment.
- ¥ Location of forums be in different locations throughout the state.

Recommendation 5 – Nesting

- ¥ The planned development of two or more (renewable) resources in concert with each other in the same geographic area for the purpose of:
 - Offsetting a weakness of one resource by the strength of another.
 - Guaranteeing that a minimum amount of electrical power is available for baseload use at all times.



Recommendations: Policy / Legal Action

Constraints on geothermal development.

CONSTRAINTS TO GEOTHERMAL DEVELOPMENT			
Natural (Geological/Geographical)		Technical	Human
Surface	Subsurface		
Landforms/Geography/ Geology	Heat Resource Available	Drilling (techniques- horizontal, radial patterns)	Economics (cost vs. profit) (drilling costs)
	Reservoir Characteristics	Heat Acquisition Methods	Permitting



Ternary Constraint Diagram
Erdlac, 2005

While Natural and Technical constraints may be hard to overcome, the Human constraints can be more directly addressed. Constraints that are 'manmade' can be 'unmade'.

Recommendations: Policy / Legal Action

Recommendation 9 – Shallow Geothermal Use

- ¥ **Past Legislation defined geothermal as a mineral and energy resource, managed by the Texas Railroad Commission (Oberbeck, 1977) suggesting ownership by the mineral owner.**
- ¥ **Texas Oil And Gas Conservation Laws: Title 5: §141.003 Definitions: (4) “Geothermal energy and associated resources” means: (C) heat or other associated energy found in geothermal formations;**
- ¥ **What legislation, if any, covers the access to shallow heat use with geoexchange systems?**
- ¥ **What constitutes the legal definition of a “geothermal formation”?**
- ¥ **May need a revisit of terms by legislation to more clearly define the forms of geothermal, its ownership, and its use.**

