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Chena Geothermal Area: A Low Temperature Case Study

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Introduction

Chena Geothermal Area

- Located near Fairbanks, Alaska
- Part of Chena Hot Springs Resort
- Currently the lowest temperature geothermal resource in the world at about 74 degrees C
- The energy for this site has historically been produced using diesel generators
- Now produces all its own electricity using geothermal generators

GeoRePORT

- The Department of Energy's Geothermal Technology Office has created a new methodology for reporting and analyzing geothermal data
  - Goal: make geothermal data easier to understand and compare
  - Allows for: evidence based, objective descriptions of current and possible geothermal sites using a grading system

Figure 1: Picture showing a hot spring at Chena hot Springs Resort. The hot water source from this hot spring is used for geothermal power production

Methods

GeoRePORT

- Geological, Technical, and Socio-economic grade categories
- Categories are broken into 4 main attributes then broken down further into sub-attributes.
- Sub-attributes are assigned character, activity, and execution grades that factor into the total attribute grade.
  - *Character*- the physical aspects of the resource
  - *Activity*- the way that data was collected
  - *Execution*- confidence in the character and activity grades
- Overall grades for attributes determined by sub-attributes' weights and grades

Data Collection

- Information about Chena Geothermal Area was collected using:
  - OpenEI- a wiki based page run by NREL to report data
  - NGDS- National geothermal data collection site to find research papers
  - Geothermal Prospector- a data visualization tool

Results

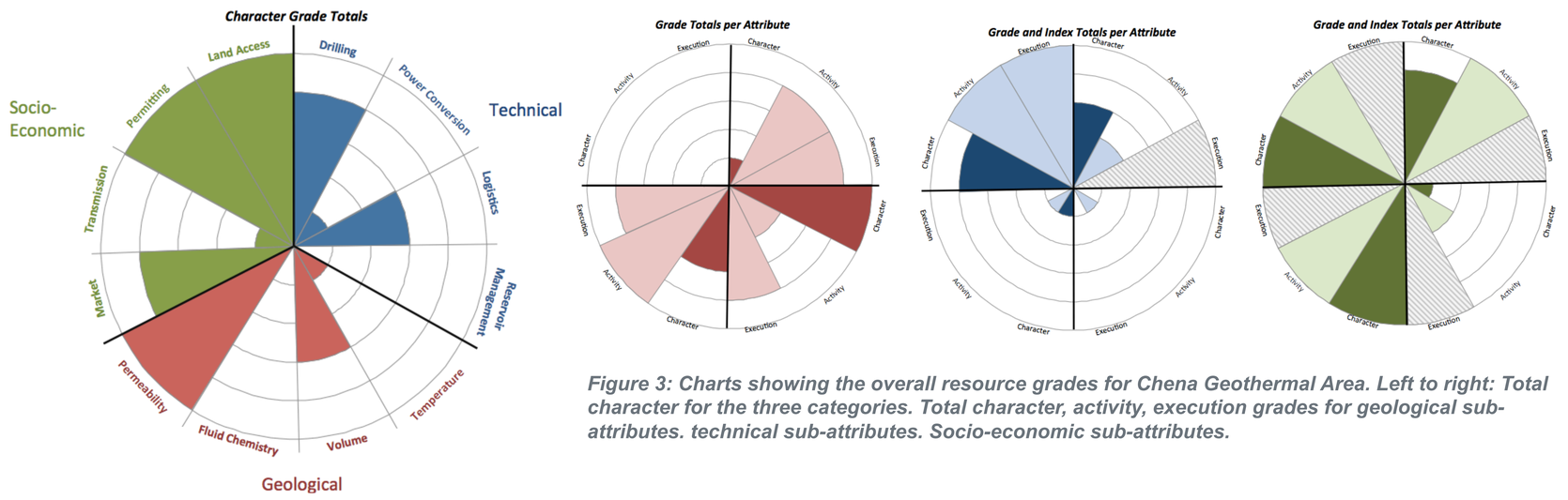

Figure 3: Charts showing the overall resource grades for Chena Geothermal Area. Left to right: Total character for the three categories. Total character, activity, execution grades for geological sub-attributes. technical sub-attributes. Socio-economic sub-attributes.

- The lack of available data may have skewed these charts in certain sub-attributes, so fluid chemistry (geological), power conversion and reservoir management (technological) and transmission (Socio-economic) will not be included
- The first chart shows the overall character grades for Chena are low in the technical and geological categories, but high in the socio-economic category
- Most activity and execution grades are high, so the data is reliable

Discussion

Geological

- The low character grades might lead someone to believe this would not be a site for geothermal
- Wouldn't be good for a direct dry steam power plant because no steam is produced- but other can use binary system

Technical

- The low technical character grades might make lead someone to believe think it wouldn't be a good choice either
- Got funding and worked around those difficulties with help from the state of Alaska

Socio-Economic

- High character grades all around in this category
- Shows there was a strong need for an alternative energy source
- No economic barriers to producing geothermal energy either

Overall

- Going off of just grades, the site doesn't seem like it would be fit for a geothermal power plant- this particular project was looking for low temperature geothermal
- Currently have generators installed- produce electricity, heat a greenhouse, cool an ice hotel

		Character		Activity		Execution	
Sub-Attribute	Wt	Grade	Wt Product	Grade	Wt Product	Grade	Wt Product
Well Depth	4	B (4)	16	A (5)	20	C (3)	12
Drilling Experience	3	A (5)	15	B (4)	12		
Bottom-hole Diameter	2	E (1)	2	A (1)	10	C (3)	6
Temperature	1	E (1)	1	A (5)	5	C (3)	3
Wellbore Control	2	A (5)	10	A (5)	10	C (3)	6
Rig Downtime	1	A (5)	5	A (5)	5	C (3)	3
Well Direction	2	A (5)	10				
Drilling Restrictions	2	A (5)	10	A (5)	10		
		Character Sum:	69/B	Activity Sum:	72/a	Execution Sum:	30/a

Figure 2: Screenshot of example GeoRePORT Power Conversion Attribute tab. Shows how overall attribute grades are calculated from sub-attribute grades

Figure 4 top to bottom: Picture of geothermal generators installed at the resort. picture of vegetables growing in the geothermally heated greenhouse

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