



SB 104 GEOTHERMAL RESOURCES

Presented by

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AGENDA

- DGGS: Introduction
- DOG: Overview of SB104
 - Purpose of SB104
 - DNR geothermal leasing history
 - Sectional analysis summary
- DGGS: Examples of geothermal systems
- Supplemental Information
 - AGILE Act
 - Fundamentals of geothermal systems
 - Geothermal systems of Alaska
 - Sectional analysis details

INTRODUCTION

DGGS Director Steve Masterman

PURPOSE OF SB104

- **Modernize Alaska's geothermal exploration program**
 - Greater potential for providing affordable, renewable energy to rural communities and remote natural resource extraction projects
 - Promote clean energy industry job creation
- **Align geothermal licensing with the oil and gas exploration license program, thereby increasing feasibility for companies to develop resources**
 - More time for a company to identify and prove resource to convert to leases
 - Conversion to leases based on completion of work commitment and submission of exploration plan instead of proving discovery of commercial resource
 - Doubles maximum acreage allowed for exploration
- **Reforms definitions for geothermal resources to focus on *Commercial Use***
 - Explicitly excludes domestic, noncommercial, or small-scale industrial use from the need for a geothermal license or lease

OVERVIEW OF SB104

DOG Deputy Director Haley Paine

DNR GEOTHERMAL LEASING/PERMITTING HISTORY

Present

Mount Spurr Currently there are two pending applications for geothermal exploration prospecting permits in the Mount Spurr area. The final Best Interest Findings for the first was issued March 12, 2021 and the preliminary Best Interest Finding for the second was issued March 26, 2021.

2013

Augustine Island 26 tracts were offered. Only one tract was leased to a private individual and no exploration work was conducted as a result of that lease sale.

2008

Mount Spurr 16 tracts leased to Ormat and one private individual. Ormat purchased 15 leases in the 2008 sale and drilled on southern flank of volcano. They didn't find adequate temperatures in wells to pursue the project. The state has the data available [on DO&G's website](#).

1986

Mount Spurr On June 24, 1986, DNR offered 2,640 acres in two tracts. Both tracts received bids. The lease for Tract 1 expired in 1996, and the lease for Tract 2 was terminated in 1990.

1983

Mount Spurr DNR held its first geothermal lease sale in the Mount Spurr area on May 17, 1983. 10,240 acres in 16 tracts were offered in Competitive Geothermal Lease Sale 1. One tract received a bid. The lease for that tract was terminated in 1992.

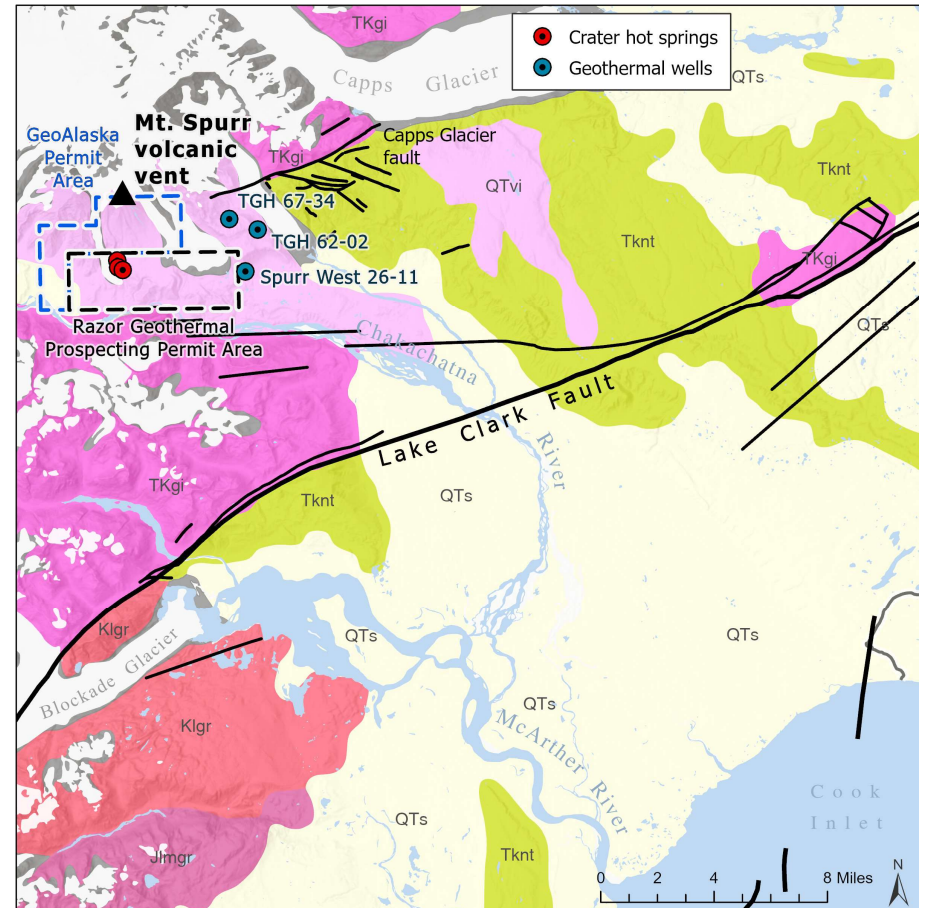
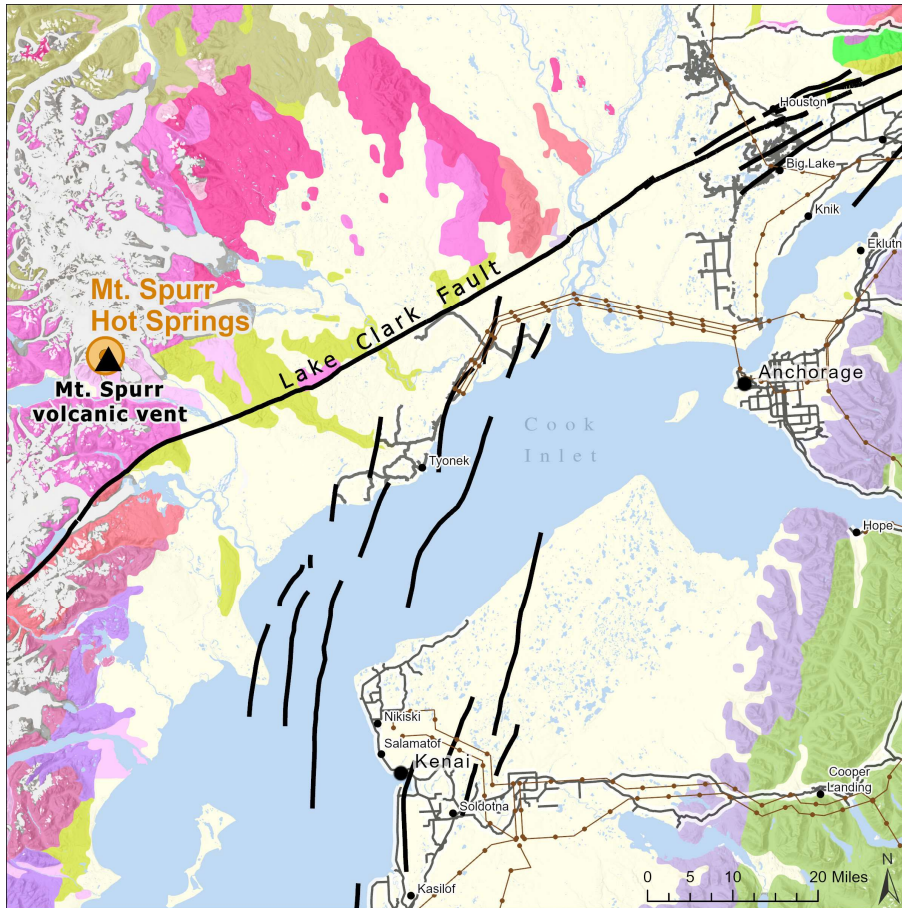
SECTIONAL SUMMARY

Section (Affected Org)	Summary
1 (AOGCC)	Removes unnecessary reference to AS 41.06 from AS 31.05.030(m) because of changes made by Section 9.
2 (DNR)	Changes <i>permits</i> to <i>licenses</i> . Explicit exemption for geothermal resources intended for domestic, noncommercial, or small-scale industrial use (See also Section 9). Removes preferential rights clause. This provision is not appropriate for commercial development of State resources.
3 (DNR)	Changes <i>permit</i> to <i>license</i> . Extends term of licenses (formerly <i>permits</i>) from two to five years. Replaces lease conversion requirement of <i>commercial discovery and development plan</i> with <i>work commitment</i> and <i>exploration plan</i> .
4 (DNR)	Changes <i>permit</i> to <i>license</i> .
5 (DNR)	Changes <i>permits</i> to <i>licenses</i> . Increases maximum acreage from 51,200 to 100,000. Adds provision for rental fees to be defined in regulation, rather than statute (easier to update).
6 (DNR)	Adds new subsections to AS 38.05.181 to modernize unitization statute for geothermal leases to match the model we use for oil & gas under AS 38.05.180.
7 (DNR)	Replaces AS 38.05.965(6) definition of <i>geothermal resources</i> (Same as Section 11).
8 (AOGCC)	Amends AS 41.06.020(e), clarifies that AS 41.06 does not limit DNR's authority over geothermal resource management on state land.
9 (AOGCC)	Amends AS 41.06.020(f) to add explicit exemption for geothermal resources intended for domestic, noncommercial, or small-scale industrial use (See also Section 2).
10 (AOGCC)	Amends AS 41.06.060(4) definition of <i>geothermal fluid</i> to remove temperature references and better conform with other changes in this bill.
11 (AOGCC)	Replaces AS 41.06.060(5) definition of <i>geothermal resources</i> (Same as Section 7).
12 (AOGCC)	Repeals AS 41.06.005(b) and AS 41.06.030, since geothermal units are managed by DNR.
13-16	General provisions for applicability and effective dates. Includes applicability provision for prospecting permits currently being processed.

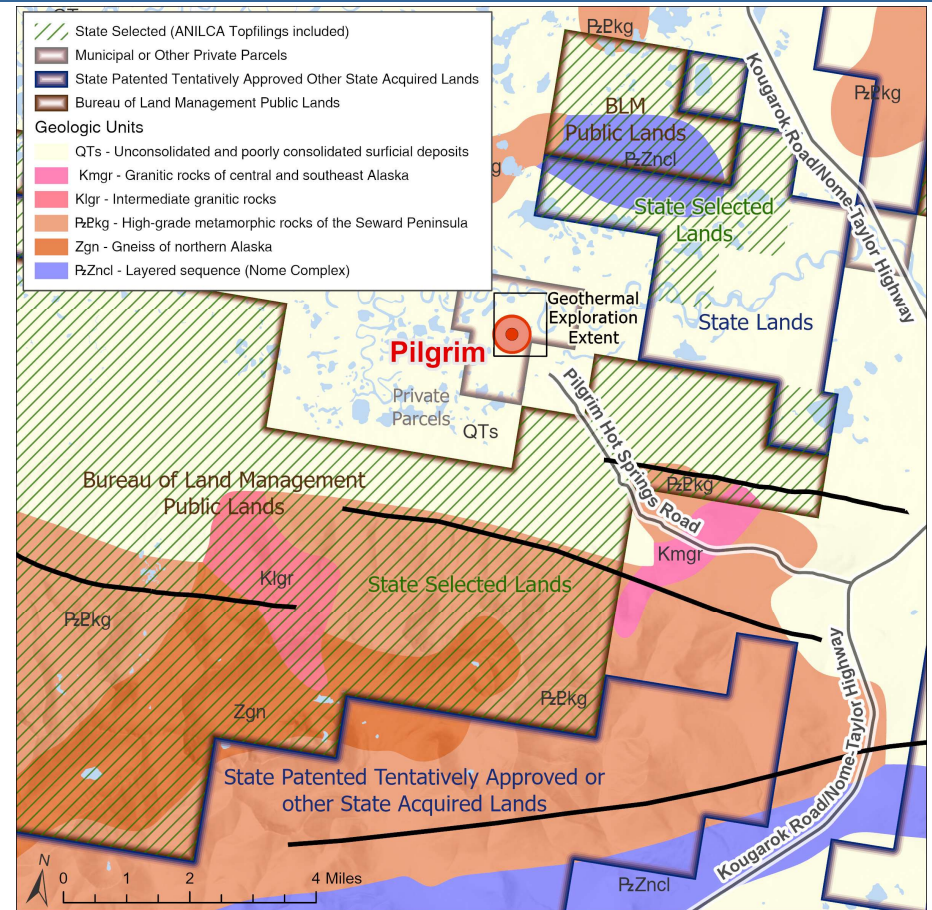
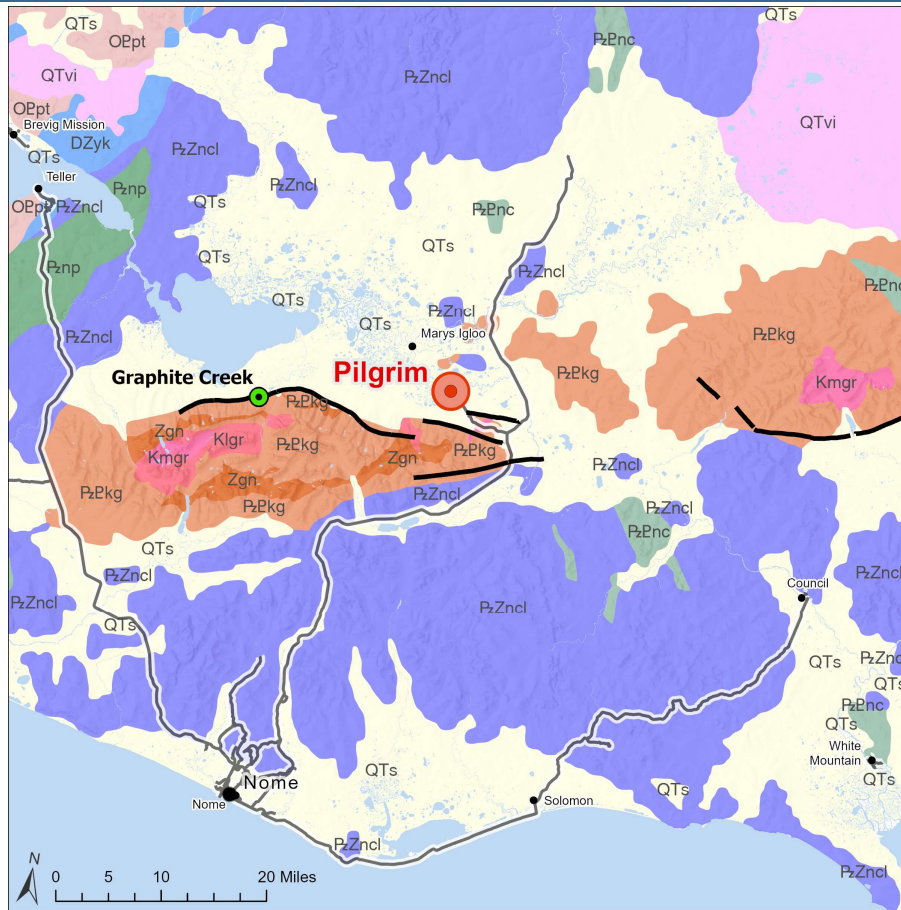
EXAMPLES OF GEOTHERMAL SYSTEMS

DGGS Director Steve Masterman

MT SPURR



PILGRIM HOT SPRINGS



QUESTIONS?



This presentation may be downloaded from the [Division of Oil & Gas website](#)

SUPPLEMENTAL INFORMATION

AGILE ACT

- Senator Murkowski's Advanced Geothermal Innovation Leadership Act of 2019
- Authorizes grants and incentives
- Establish a repository for geothermal drill data
- Supports research into Enhanced Geothermal Systems
- Supports heat pump improvements
- Defines geothermal energy as a renewable energy source
- Encourages co-production of geothermal with hydrocarbons and critical minerals
- Improves federal permit coordination

FUNDAMENTALS OF GEOTHERMAL SYSTEMS

FUNDAMENTAL INGREDIENTS OF USEABLE GEOTHERMAL ENERGY

Harvesting geothermal power

Heat generated from geothermal reservoirs deep in the earth can be harnessed to create steam and ultimately electricity.

How it works

- 1 Deep production well is dug to an underground steam reservoir
- 2 Pressurized steam is released and piped to a power plant, where its force turns a turbine
- 3 Turbine powers a generator that converts the rotational energy into electricity
- 4 After the water goes through power plant, it is injected back into the reservoir to maintain the resource

Geothermal energy

Three types of geothermal energy can be used to make electricity

GEOPRESSURIZED

Uses hot water (around 350°F/ 177°C) and hydraulic turbines

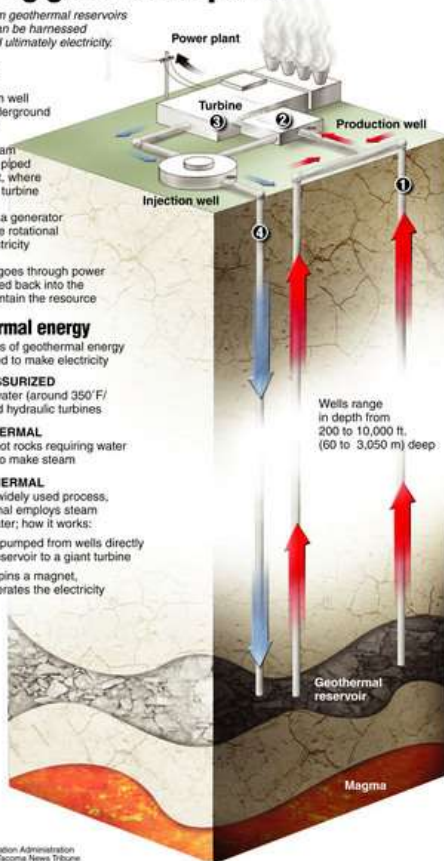
PETROTHERMAL

Uses dry hot rocks requiring water injections to make steam

HYDROTHERMAL

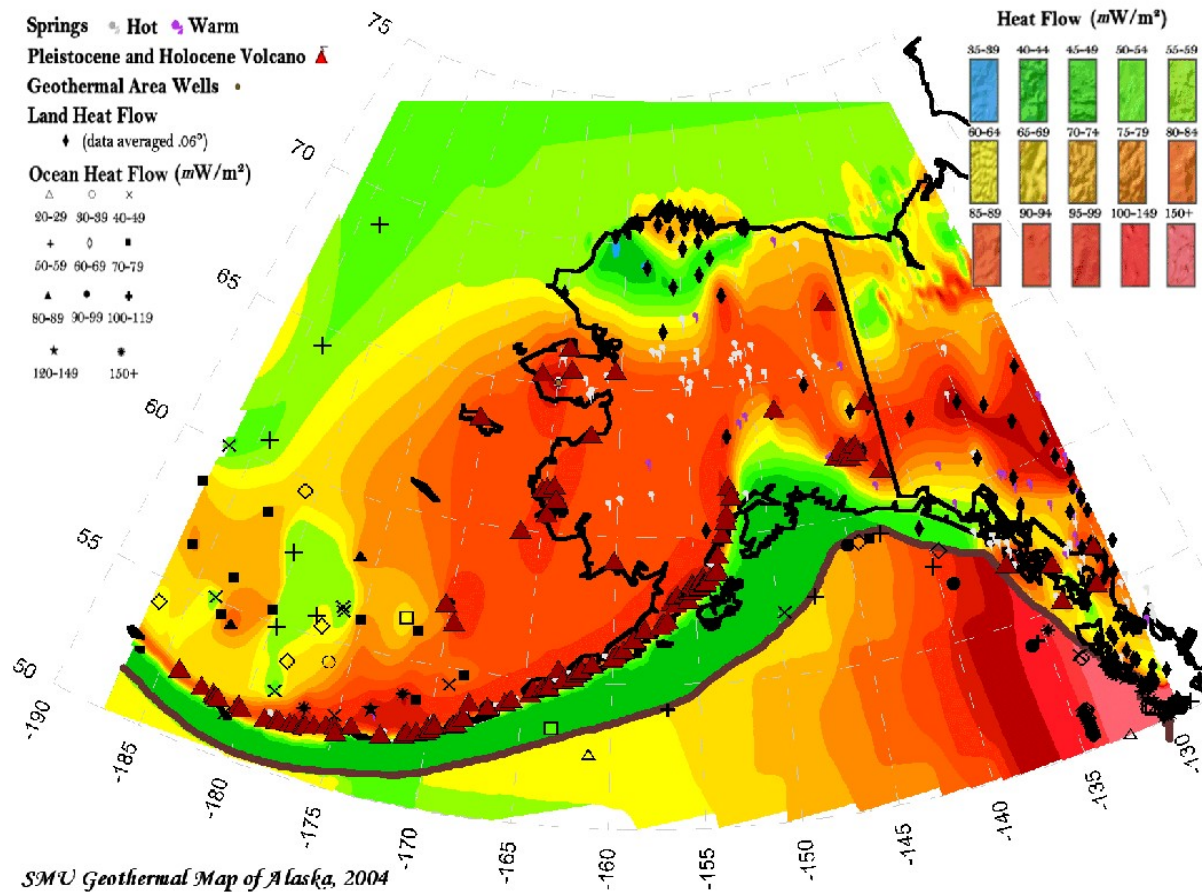
The most widely used process, hydrothermal employs steam and hot water; how it works:

- Steam is pumped from wells directly from the reservoir to a giant turbine
- Turbine spins a magnet, which generates the electricity



- Elevated geothermal gradient
- Porosity and permeability for the migration of fluids
- Surface access
- Sufficiently large thermal System
- Customers for energy

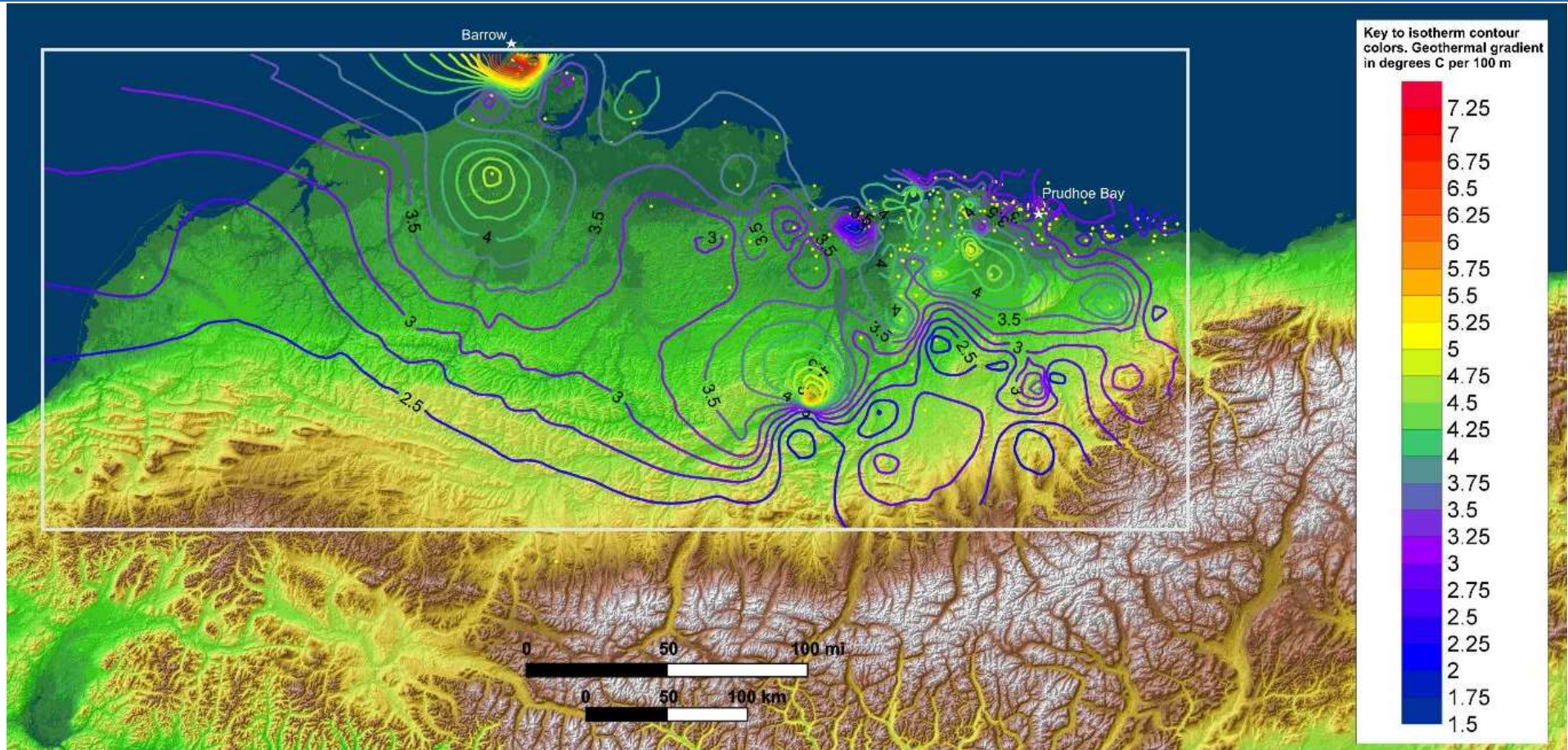
HEAT FLOW IN ALASKA



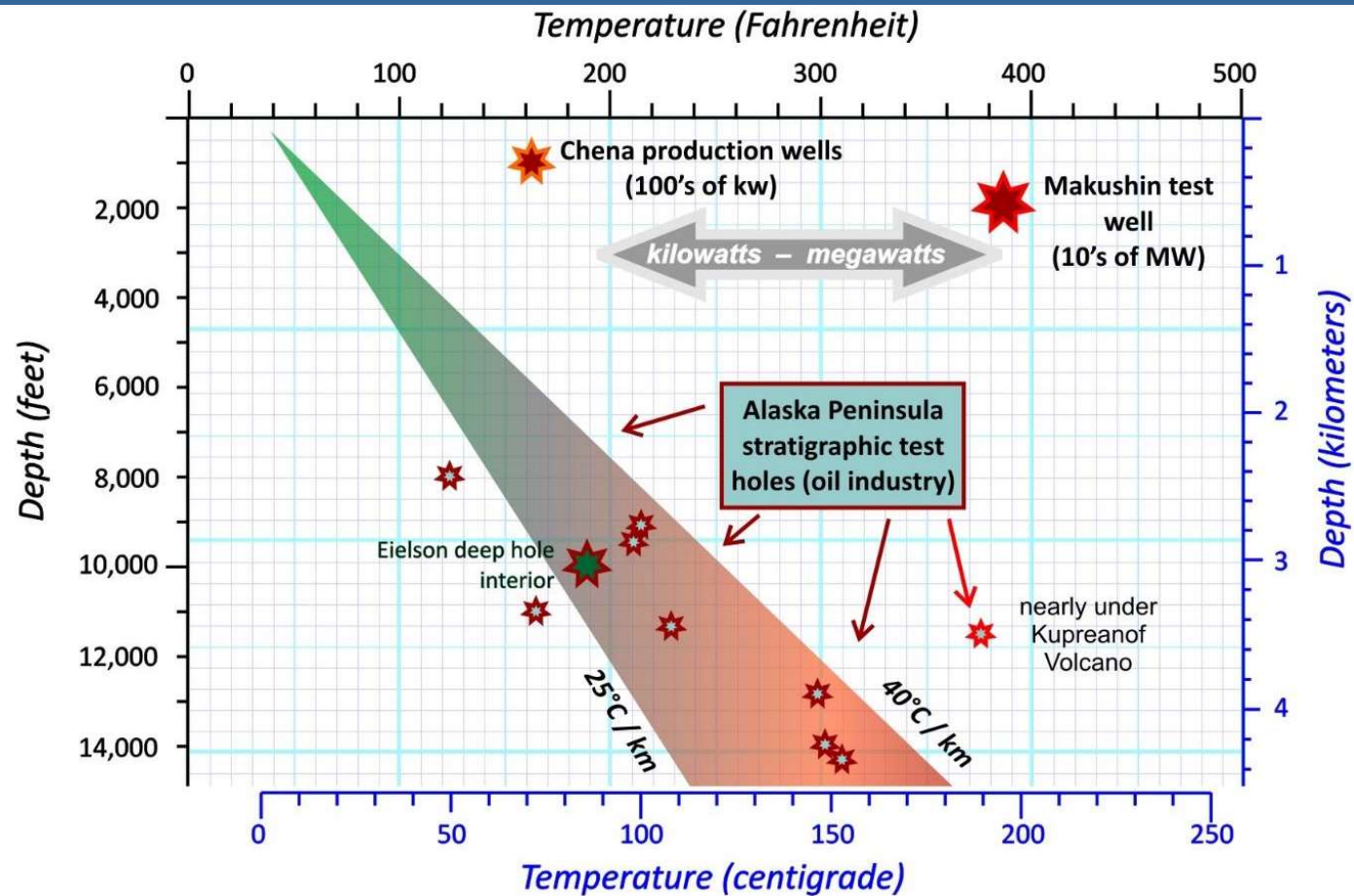
Most of Alaska is thought to have slightly elevated heat flow (red). However, only very localized areas will have all the ingredients for cost-effective geothermal energy use.

Source:
 SMU Geothermal Map
 of Alaska, 2004

NORTH SLOPE GEOTHERMAL GRADIENT



GEOHERMAL GRADIENTS



GEOHERMAL RESOURCE QUALITY

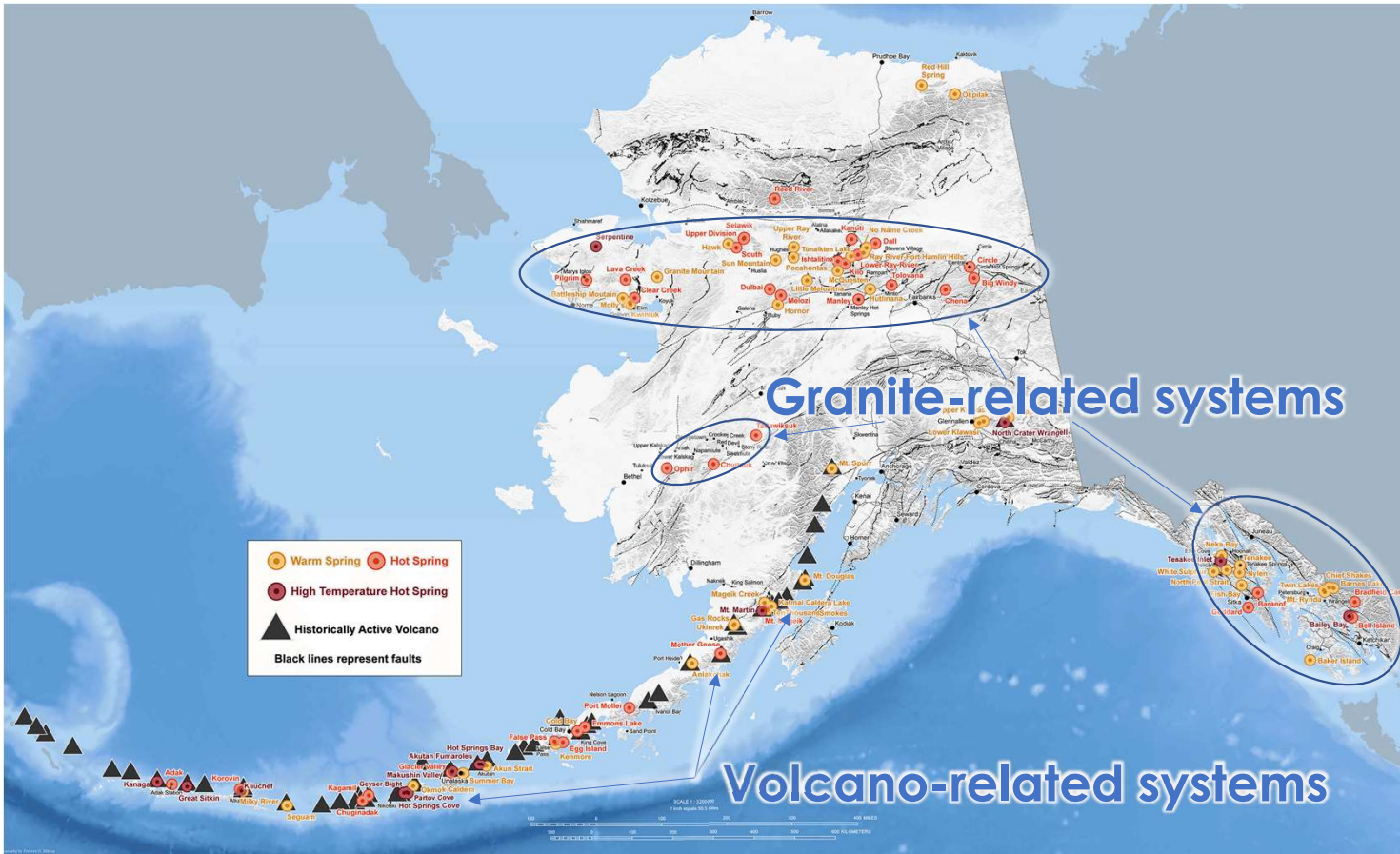
Generation capacity per unit cost depends on several geologic and economic factors:

- Temperature (hotter is better)
- Flow rate (higher flow rates are better)
- Reservoir Framework (uniform porosity better than fractures)
- Recharge (partially natural better than all artificial)
- Depth (shallower is less expensive, thus better)
- Location, location,... (relative to population, transmission system, development costs, etc.)

INTRODUCTION TO GEOTHERMAL RESOURCES

- Geothermal heat, where technically and economically accessible, is an excellent form of sustainable energy
- Hydrothermal systems are the most common form of energy extraction from geothermal heat
- Complex geologic parameters necessary for a viable geothermal resource, all present at one location, is rare
- Alaska contains several potential geothermal resources
- New technologies that will help expand geothermal development into less favorable geology are on the horizon

GEO THERMAL SYSTEMS OF ALASKA



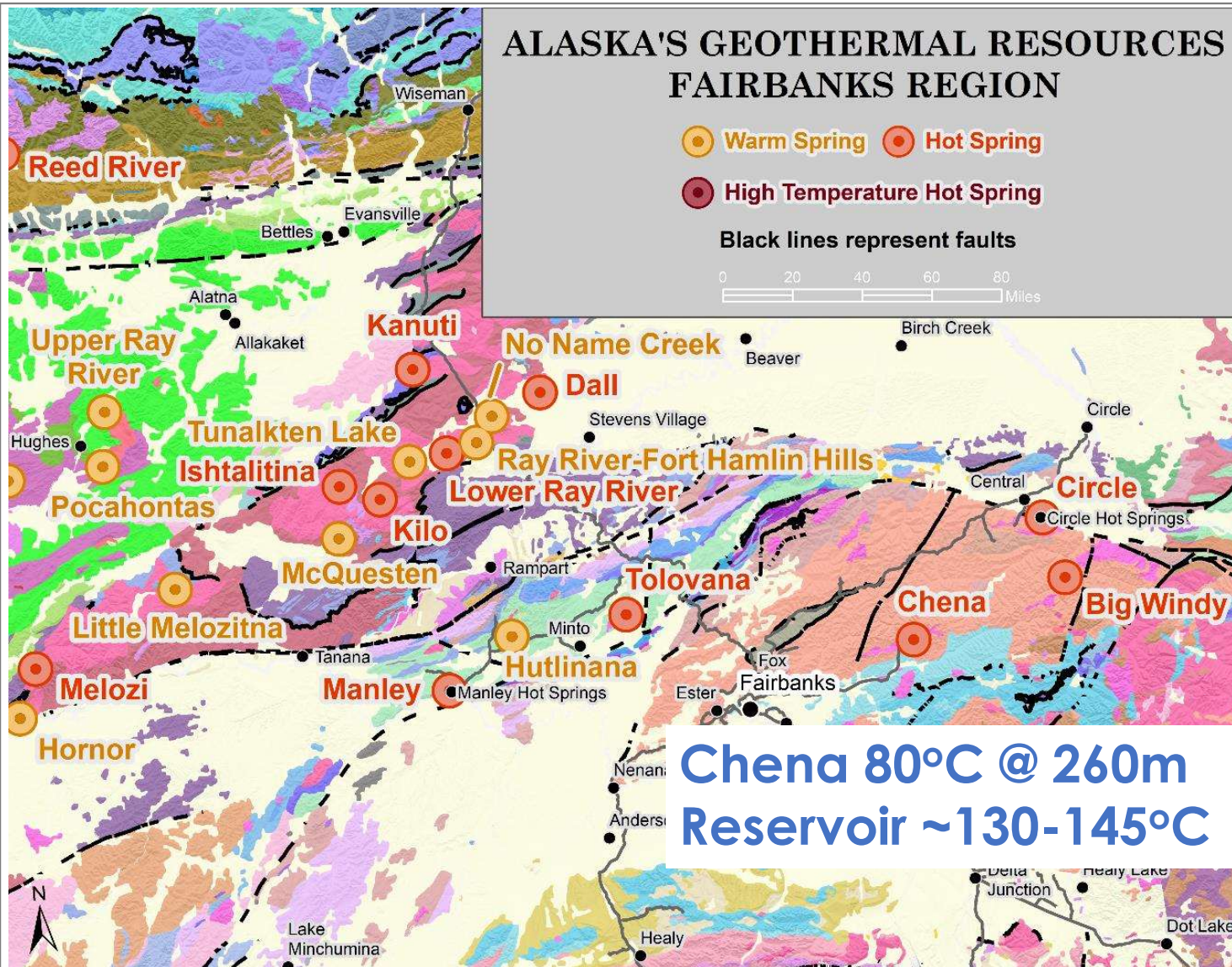
ALASKA'S GEOTHERMAL RESOURCES FAIRBANKS REGION

Warm Spring Hot Spring

High Temperature Hot Spring

Black lines represent faults

0 20 40 60 80 Miles



GEOTHERMAL SYSTEMS: FAIRBANKS REGION

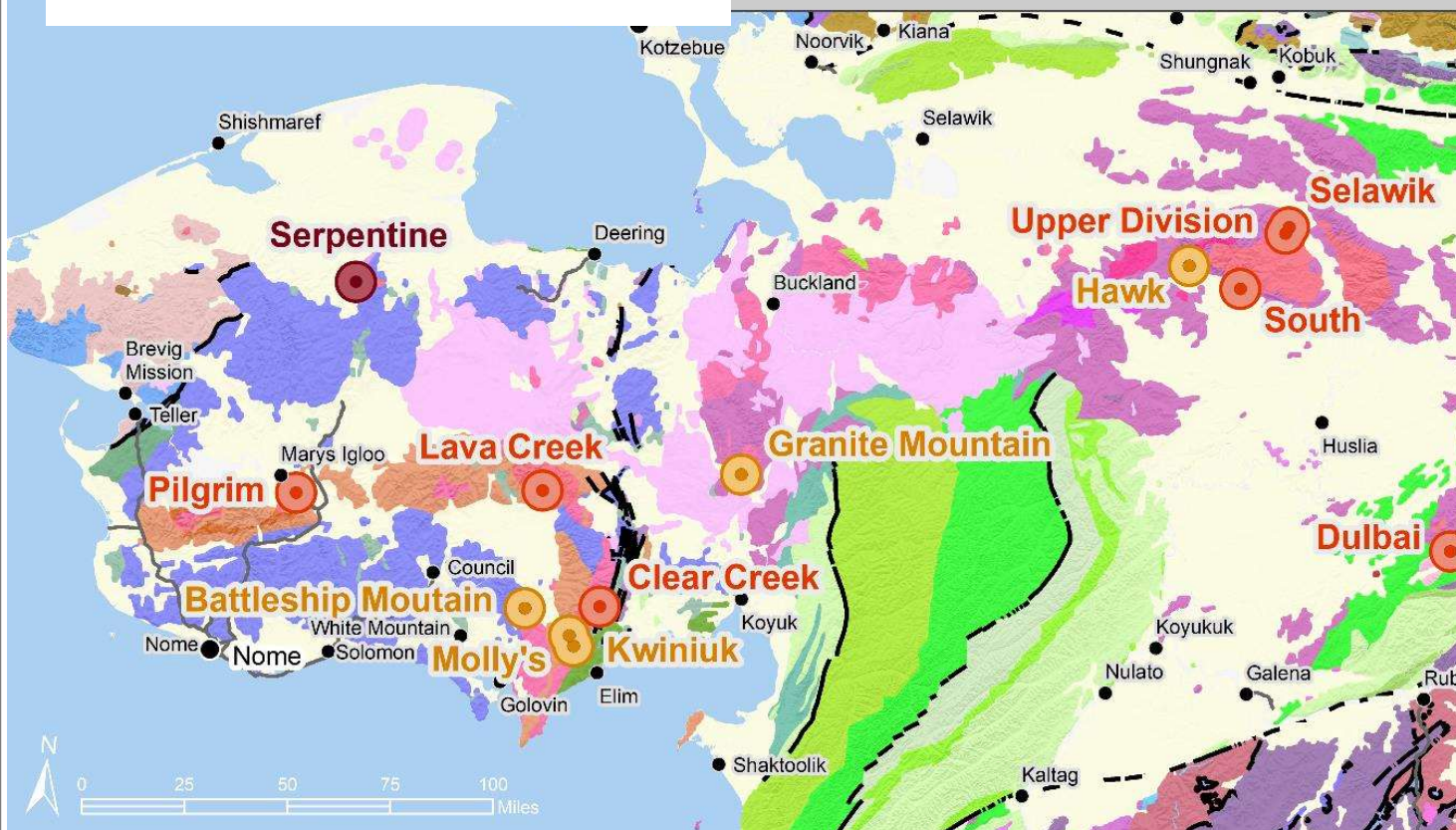
Pilgrim – 92°C @ 120m
Reservoir ~ 150°C

ALASKA'S GEOTHERMAL RESOURCES SEWARD PENINSULA

○ Warm Spring ○ Hot Spring

● High Temperature Hot Spring

Black lines represent faults



GEOHERMAL SYSTEMS: SEWARD PENINSULA REGION

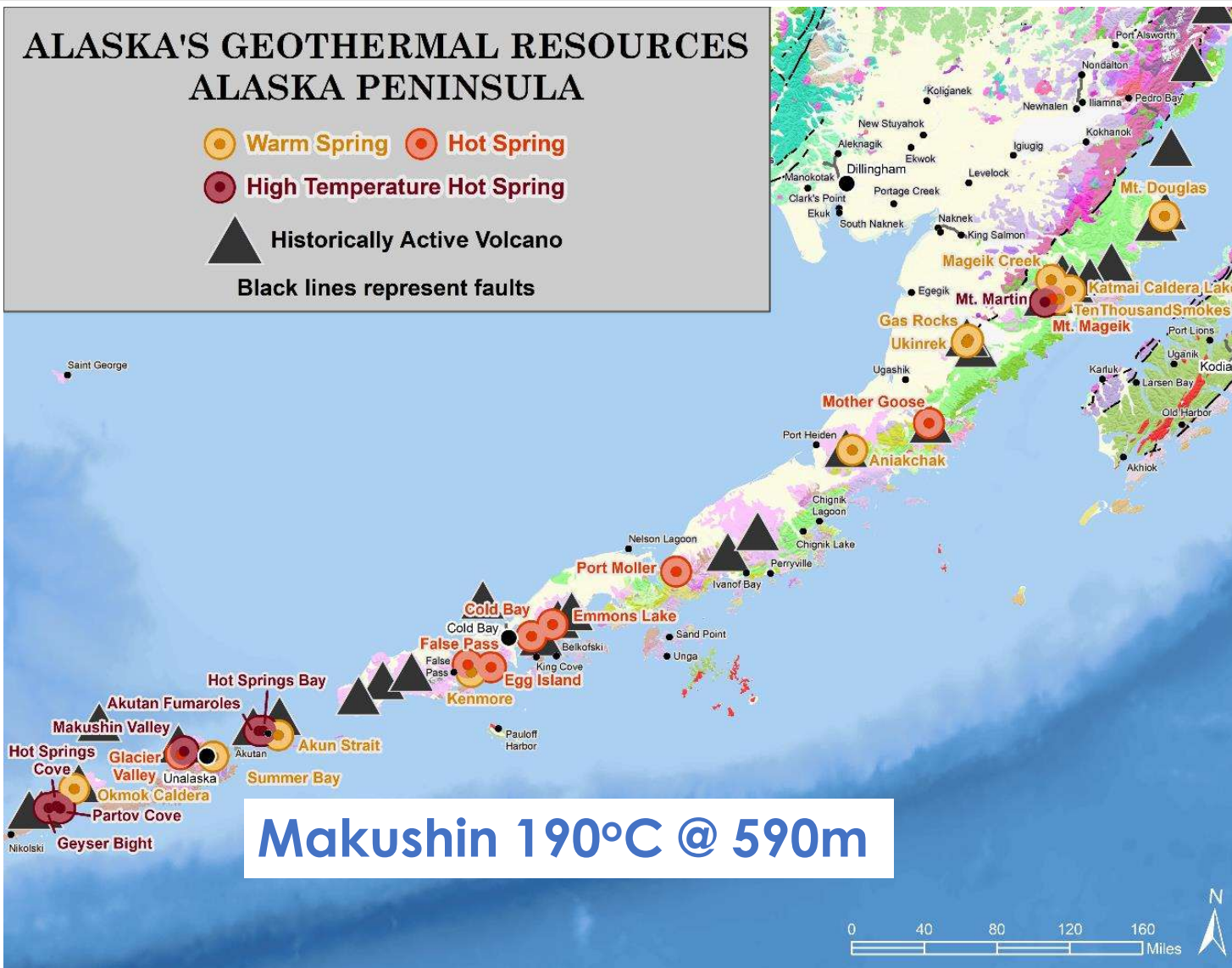
ALASKA'S GEOTHERMAL RESOURCES ALASKA PENINSULA

○ Warm Spring ● Hot Spring

● High Temperature Hot Spring

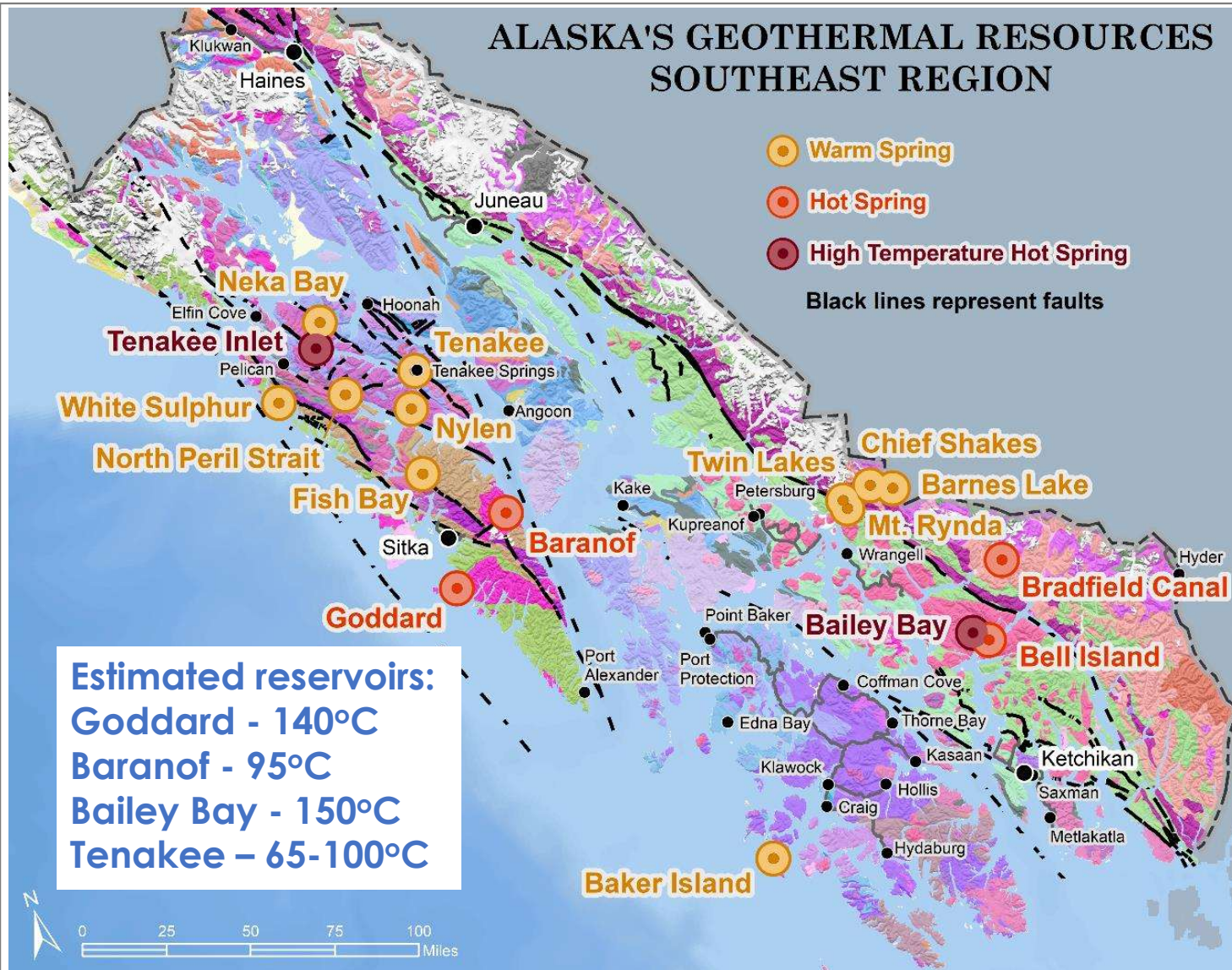
▲ Historically Active Volcano

Black lines represent faults



GEO THERMAL SYSTEMS: ALASKA PENINSULA REGION

ALASKA'S GEOTHERMAL RESOURCES SOUTHEAST REGION



GEOTHERMAL SYSTEMS: SOUTHEAST REGION

DRILLING REGULATIONS

Division of Oil & Gas (DO&G)

- Licenses or leases access to the resource (subsurface use).
- Surface permitting (pads, facilities, and infrastructure) in support of exploration and development.

Alaska Oil & Gas Conservation Commission (AOGCC)

- Ensures prevention of waste, protects correlative rights, improves ultimate recovery, and protects underground freshwater.
- Issues of permits to drill wells is AOGCC's jurisdiction.
- Jurisdiction over geothermal triggered by temperature ($>120^{\circ}\text{C}$) or commerciality. *New definition ignores temperature.*
- Domestic, noncommercial, or small-scale industrial geothermal well not under AOGCC authority.
- Exception: if well *may encounter geothermal resources, fluid, or water of enough heat/pressure to threaten life/health.*

Department of Environmental Conservation (DEC)

- If the incidental discharge enters surface water, an Alaska Pollutant Discharge Elimination System (APDES) permit is needed.
- DEC Division of Water has permitted geothermal discharges using Plan Review in Lieu of Permit.
- Engineering Support and Plan Review (ESPR) conducts plan reviews for smaller systems in municipality (heating or cooling pumps at UAA, U-med district, hatchery, etc.).
- DEC issues permits for *hydrostatic testing, including flushing and aquifer pump testing.*
 - General permit AKG003000 provides for coverage of land disposal or discharge to surface water.
 - One geothermal-related authorization, issued in 2015 for the Akutan Geothermal Project.

SECTIONAL ANALYSIS DETAILS

SECTION 2: PRIVATE USE EXEMPTION

- **New language added:**

A prospecting license or lease is not required under this section to explore for, develop, or use geothermal resources if the geothermal resource is intended for domestic, noncommercial, or small-scale industrial use.

- **This explicitly excludes private geothermal users from a requirement to apply for a license or lease.**

SECTION 2: PREFERENTIAL RIGHTS

- **The preferential rights provision is being deleted because it is inappropriate to the situation (it's more relevant to water rights or other surface use cases not associated with the mineral estate).**
- **Surface owner rights are protected under AS 38.05.130.**
 - If conflict arises, DNR ensures private landowners would not be left without heat or power, or otherwise damaged by commercial development.
 - Scenario is unlikely because private landowners usually don't have financial resources to develop a commercially-viable geothermal resource.
- **Rights to access the mineral estate are reserved under AS 38.05.125.**
 - Surface owners must provide reasonable access to resource developers.
 - The same condition exists for oil & gas or mining.
- **If a surface use agreement can't be reached, resolution process is in 11 AAC 86.145.**
 - DNR holds a hearing wherein the developer must prove there is no other alternative location for the well or data acquisition.
 - If the Commissioner concurs, developer posts a bond to compensate landowner for any impacts and work progresses.
- **Public notice is a part of the license issuance process, and surface owners would be included.**

SECTION 3: WORK COMMITMENT

- **Changes prospecting *permit* to *license* and increases term from 2 to 5 years**
 - Creates greater opportunity for success of noncompetitive geothermal program
- **Conversion to noncompetitive lease through completion of agreed upon work commitment**
 - Current process for oil and gas exploration license
 - Commitment expressed in dollar figure
 - Annual reporting and performance objectives

SECTION 10: GEOTHERMAL FLUIDS

AS 41.06.060(4) is amended to read:

(4) “geothermal fluid” means liquids, **brines, water, gases, or** ~~and~~ steam at temperatures ~~greater than 120 degrees celsius or any commercial use of liquids and steam~~ naturally **or artificially** present in a geothermal system; **“geothermal fluid” does not include oil, hydrocarbon gases, or other hydrocarbon substances** ~~at temperatures less than 120 degrees celsius;”~~

- Aligns with modernized definition for geothermal resources.
- Not limited by temperature because current technology enables development of cooler geothermal systems.
- Distinguishes geothermal fluids from hydrocarbon resources.

SECTIONS 7 & 11: NEW DEFINITION

“Geothermal resources” means the natural heat of the earth; the energy, in whatever form, below the surface of the earth present in, resulting from, or created by, or which may be extracted from, such natural heat; and all minerals in solution or other products obtained from naturally heated fluids, brines, associated gases, and steam, in whatever form, found below the surface of the earth; but excluding oil, hydrocarbon gases, or other hydrocarbon substances.

- Modern definition for geothermal resources.
- Not limited by temperature because current technology enables development of cooler geothermal systems.
- Ensures all the State’s mineral estate resources are captured in definition.
- Same definition being applied to both DNR & AOGCC statutes.

SECTION 6: ROYALTY

- **Royalty reductions are not permanently established under a unit agreement (AS 38.05.181(i)).**
 - They are adjudicated under the authority described in sections AS 38.05.181(f) and (j).
 - Same language used in AS 38.05.180(p) (oil and gas unitization).
 - This aligns geothermal management with existing processes in oil and gas management.
- **Royalties have never been paid on geothermal resources, so exact process not yet established.**
 - Will be like the system used for oil and gas.
 - Royalties are 1.75% of gross revenue for the first 10 years of commercial operation
 - Royalties are 3.5% after 10 years (See AS 38.05.181(g)).
- **This is like oil and gas royalties.**
 - Royalties are paid upon removal of the resource from the lease or unit (i.e. sale), regardless of profit.
 - Geothermal energy isn't a measurable volume, so royalties are paid on gross revenues (AS 38.05.181(g)).
 - Royalty reduction provisions exist in statute for oil and gas and are evaluated by application to the Commissioner under specific circumstances provided for in statute (See AS 38.05.180(j), for example).
- **If there is no production, there are no royalties.**
 - License/lease rental rates are paid per acre.