

SB 104 Geothermal Resources
Senate Finance Committee

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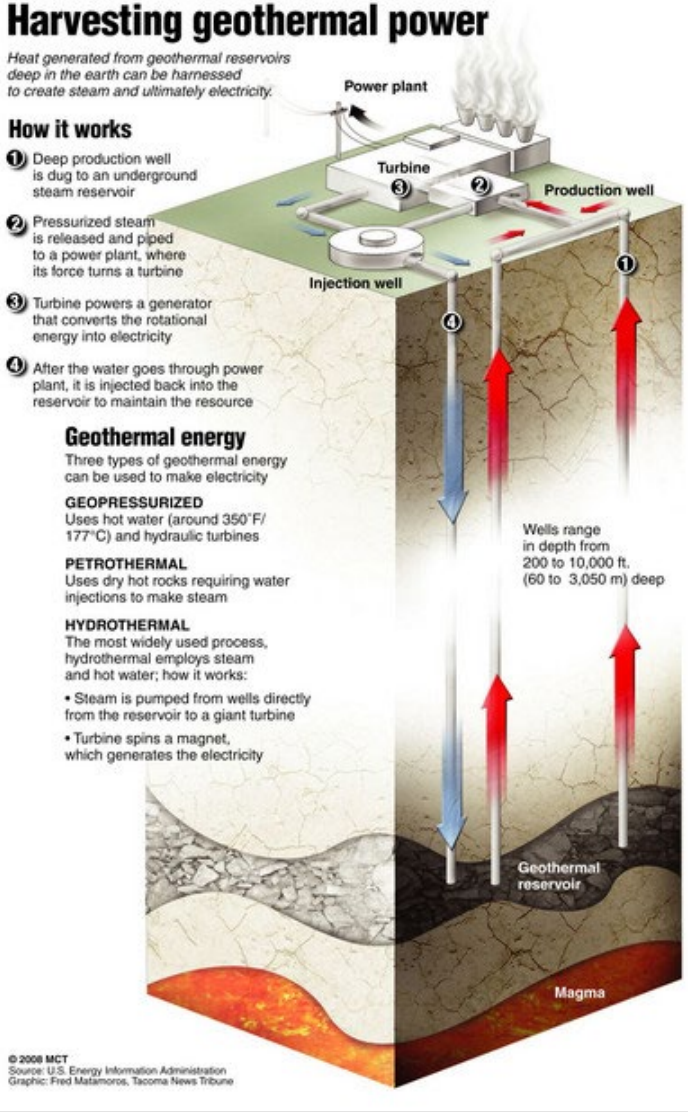
Agenda

- DGGS: Overview of geothermal resources
  - Fundamentals of geothermal systems
  - Examples of geothermal systems in Alaska
- DOG: Overview of SB 104
  - Purpose of SB 104
  - DNR geothermal leasing history
  - Sectional analysis summary
  - Sectional analysis details

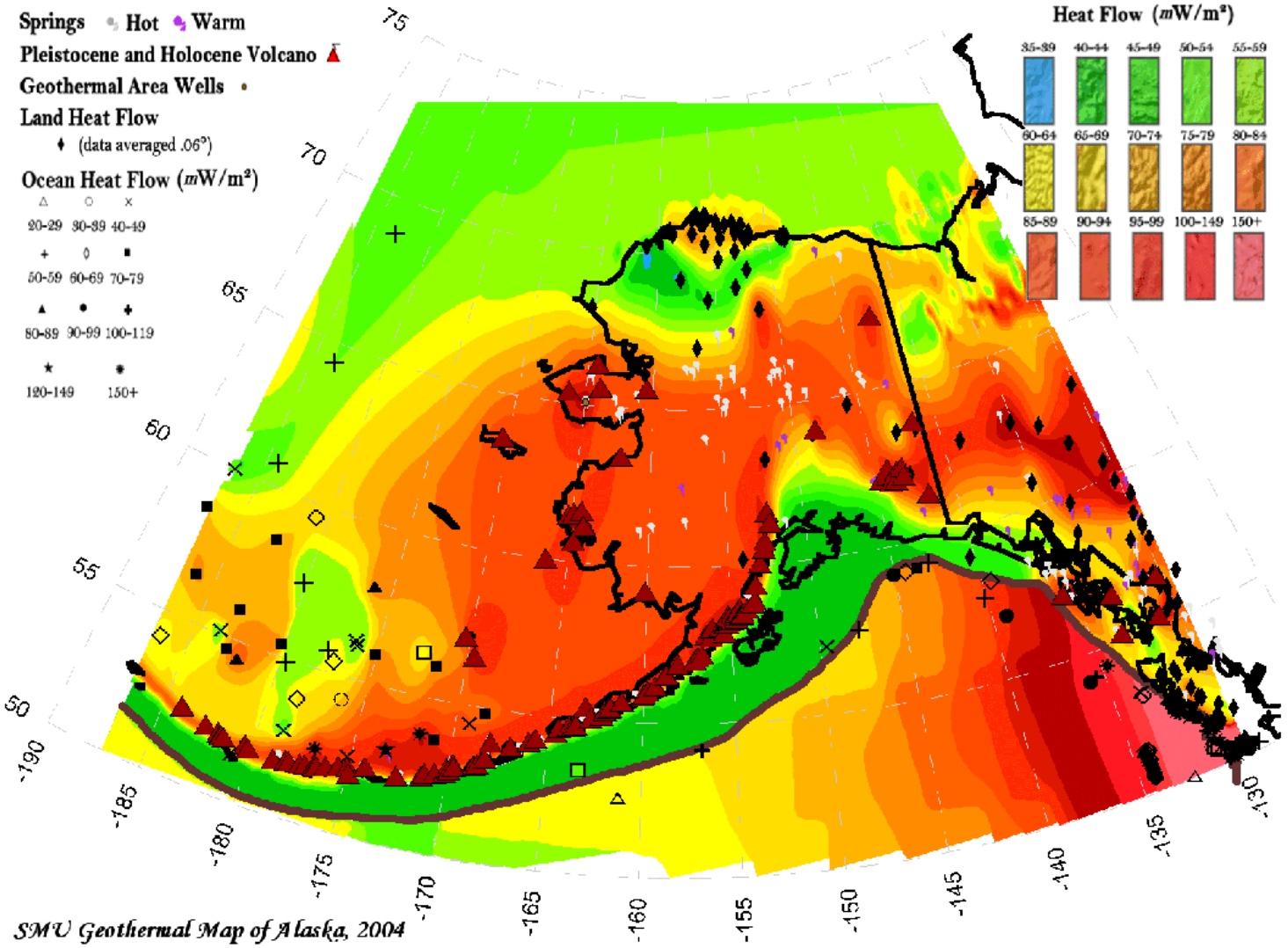
Fundamentals of Geothermal Systems

Fundamental Ingredients of Useable Geothermal Energy



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

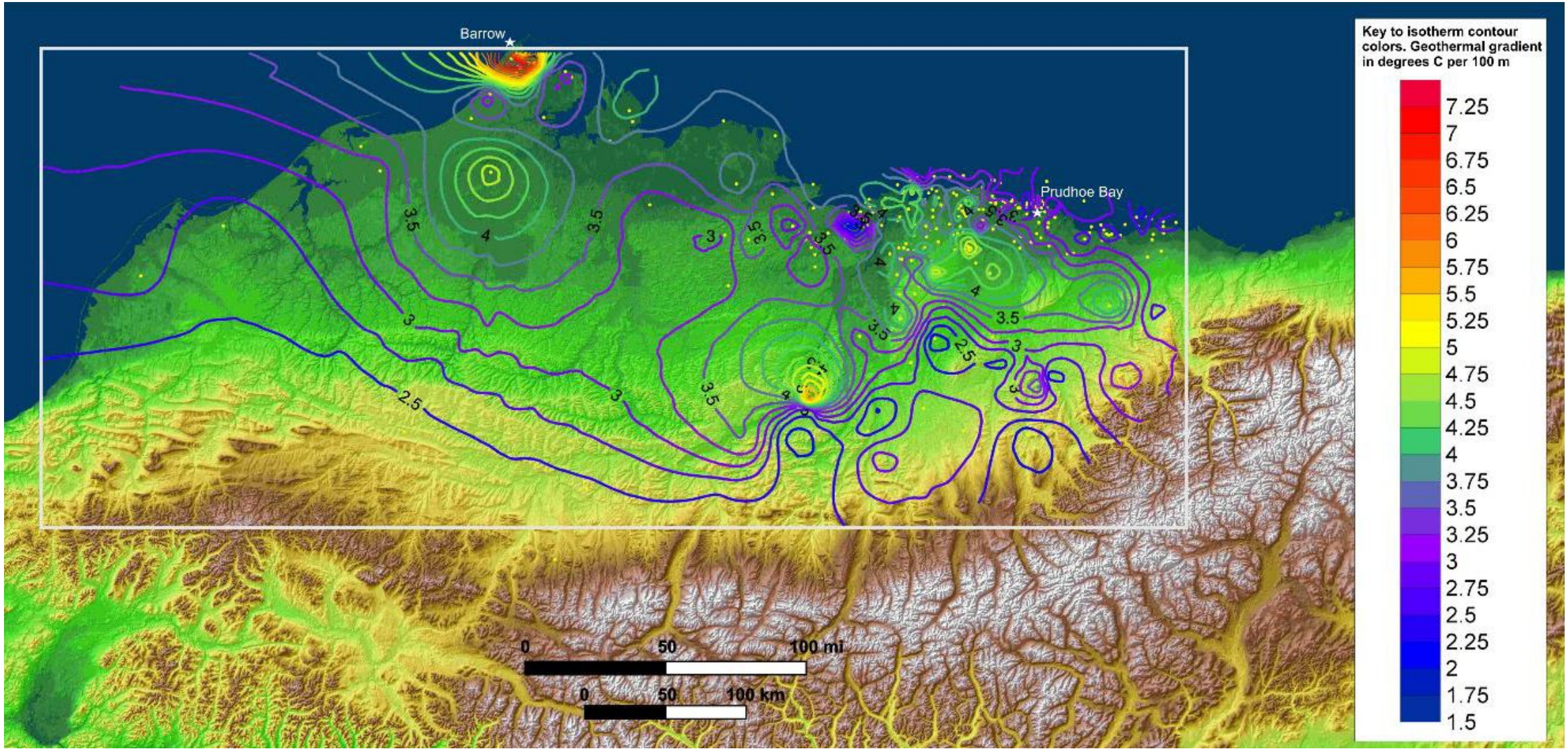
Heat Flow in Alaska



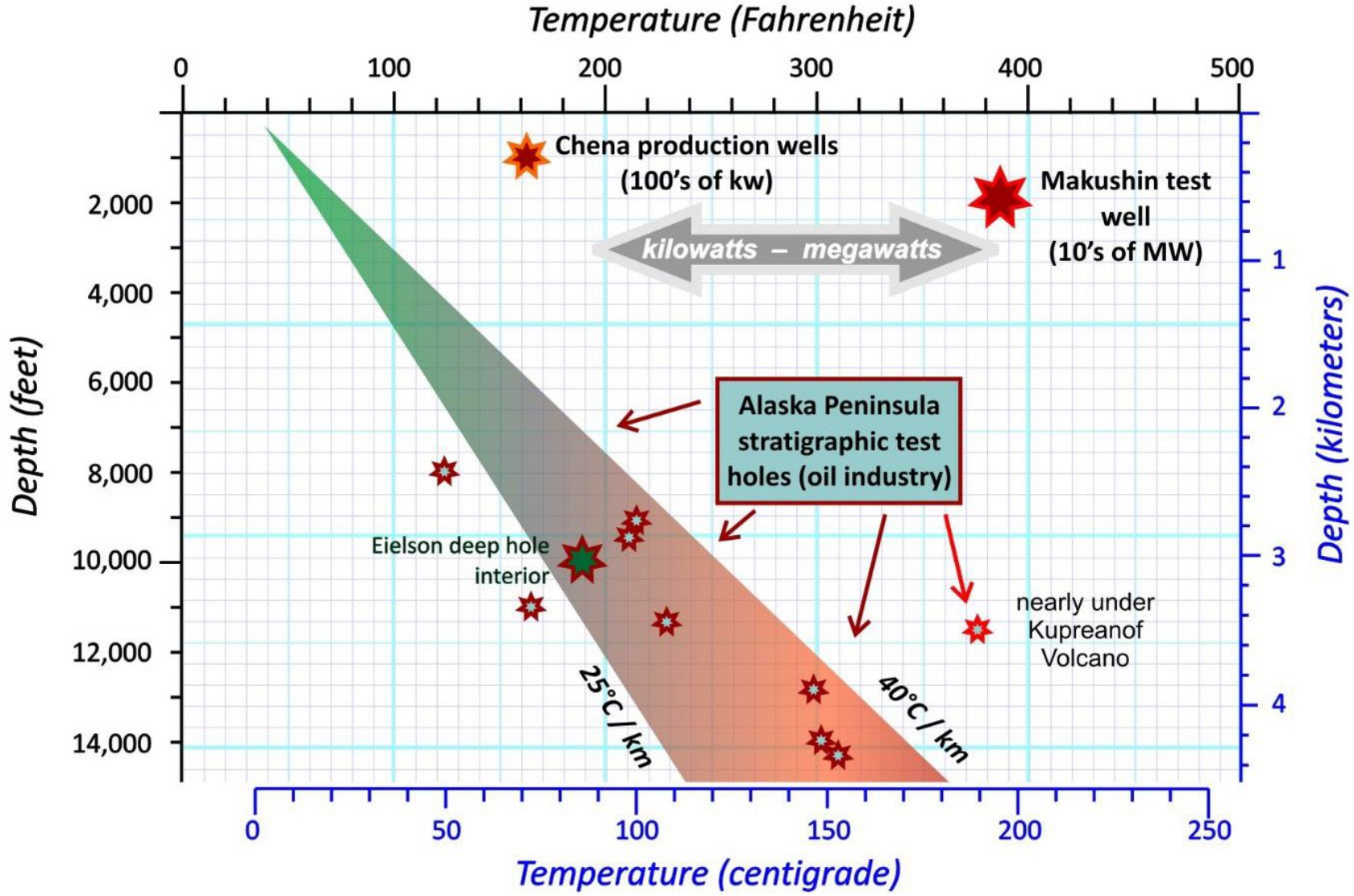
Most of Alaska is thought to have slightly elevated heat flow (red). However, only very localized areas will have all the ingredients for cost-effective geothermal energy use.

Source:
SMU Geothermal Map of Alaska, 2004

North Slope Geothermal Gradient



Geothermal Gradients



Geothermal Resource Quality

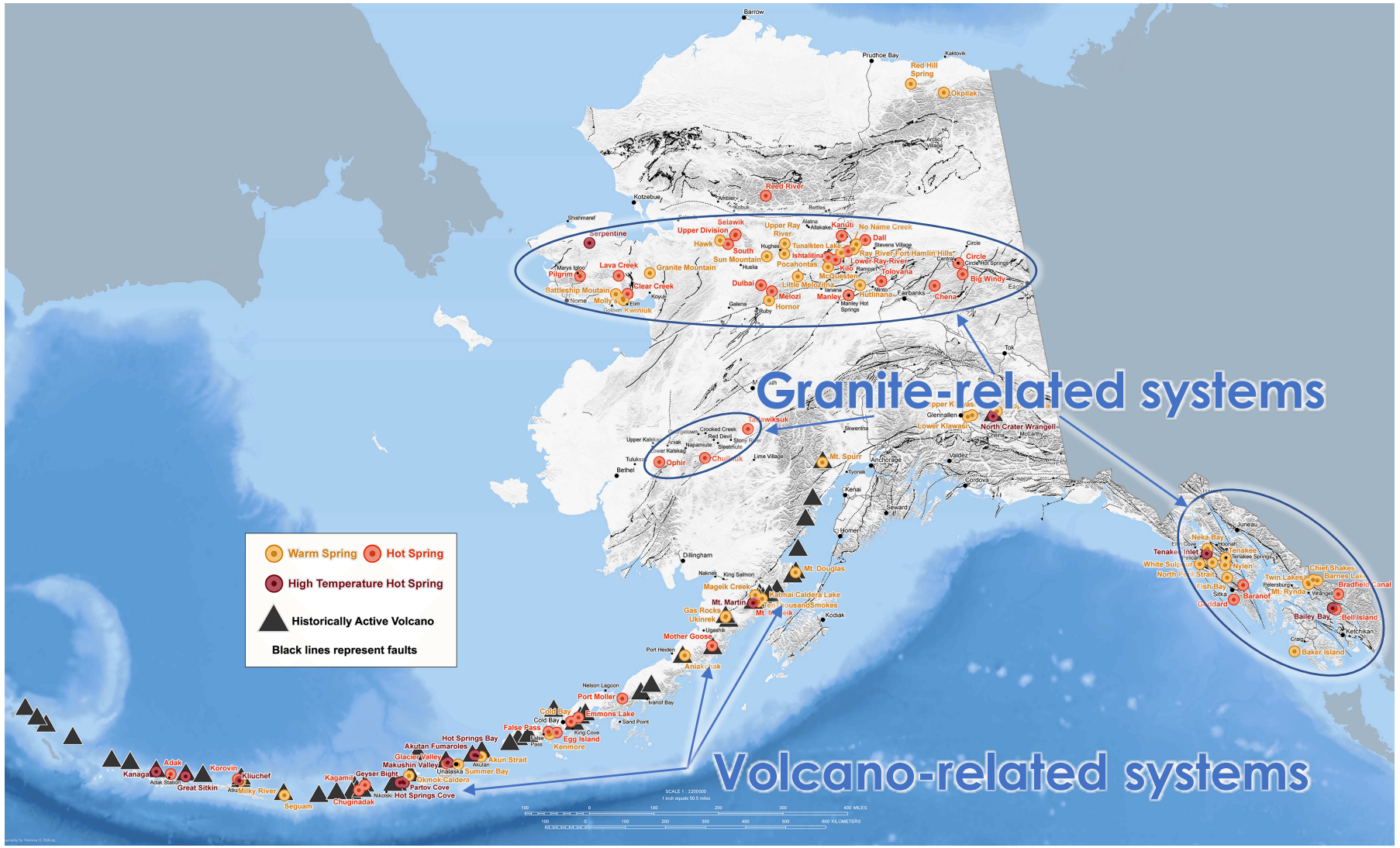
Generation capacity per unit cost depends on several geologic and economic factors:

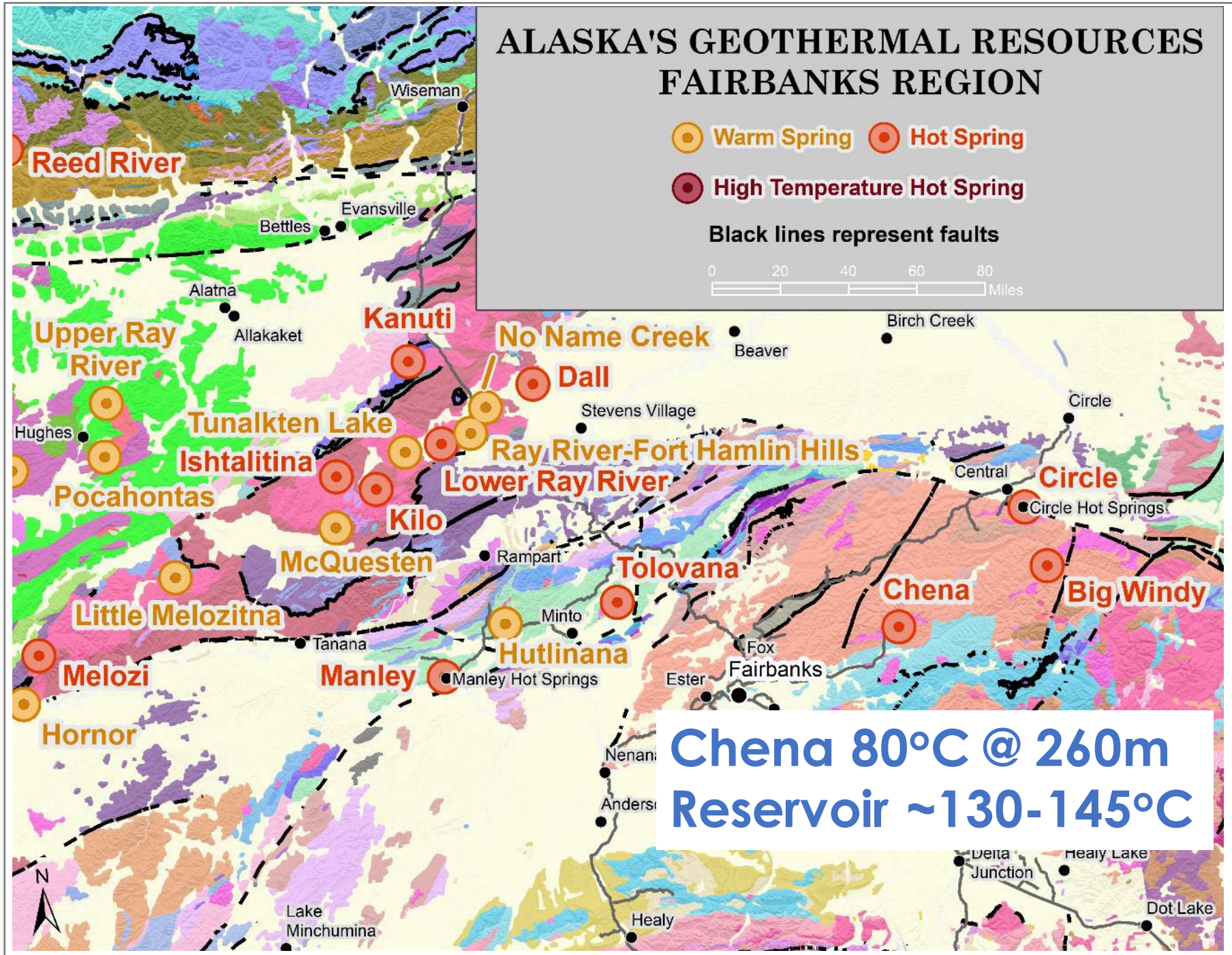
- Temperature (hotter is better)
- Flow rate (higher flow rates are better)
- Reservoir Framework (uniform porosity better than fractures)
- Recharge (partially natural better than all artificial)
- Depth (shallower is less expensive, thus better)
- Location, location,… (relative to population, transmission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

Introduction to Geothermal Resources

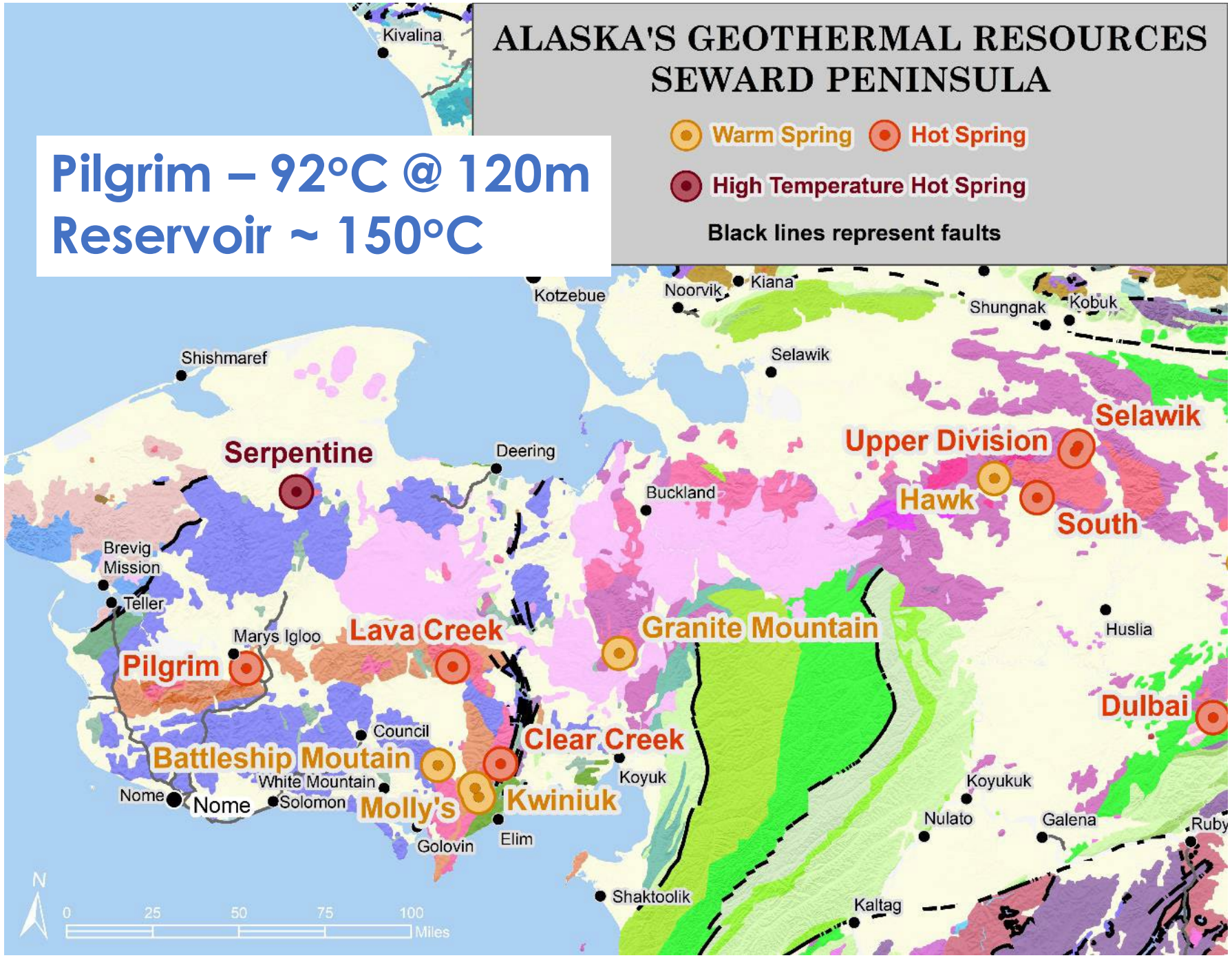
- Geothermal heat, where technically and economically accessible, is an excellent form of sustainable energy
- Hydrothermal systems are the most common form of energy extraction from geothermal heat
- Complex geologic parameters necessary for a viable geothermal resource, all present at one location,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

Geothermal Systems of Alaska

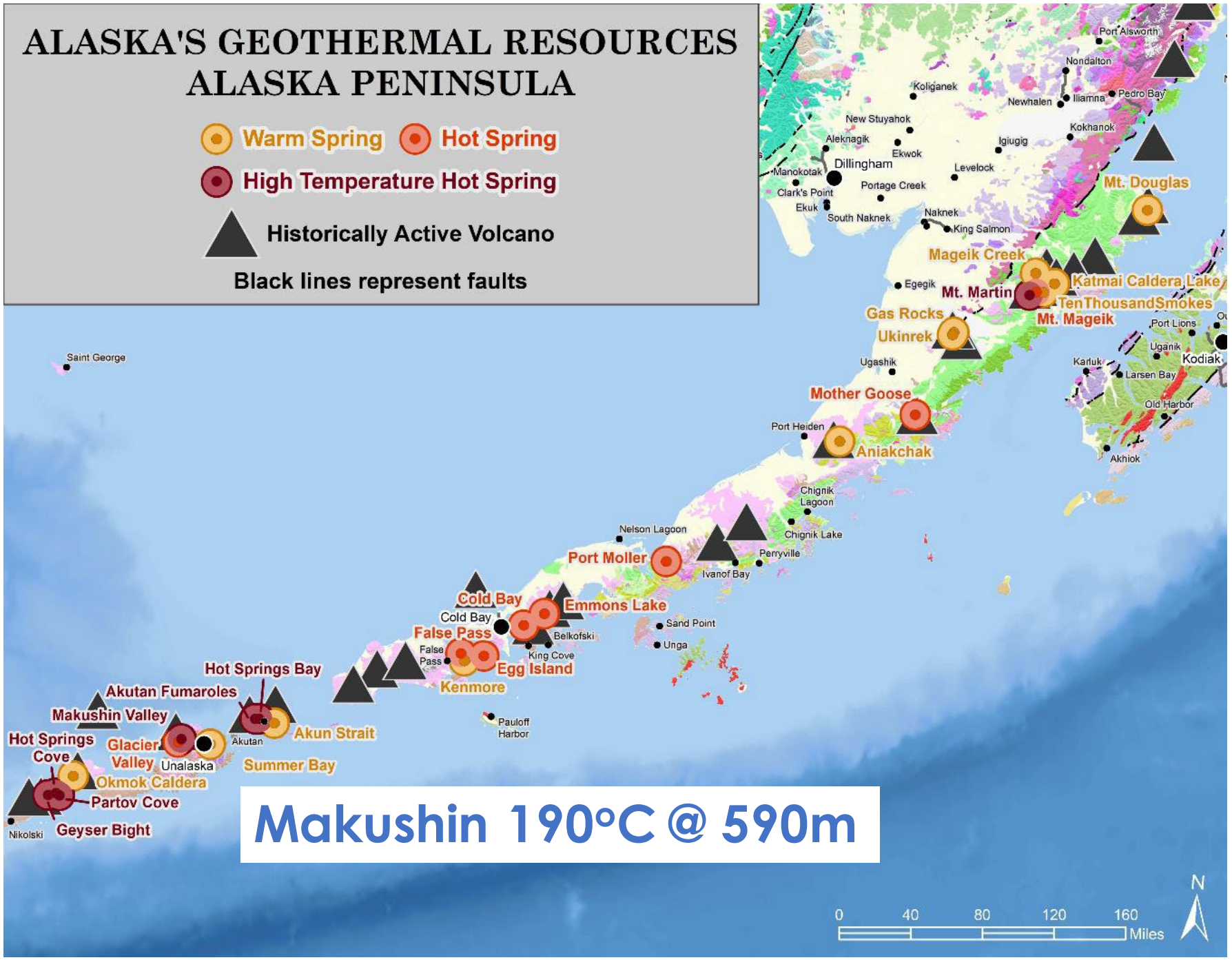




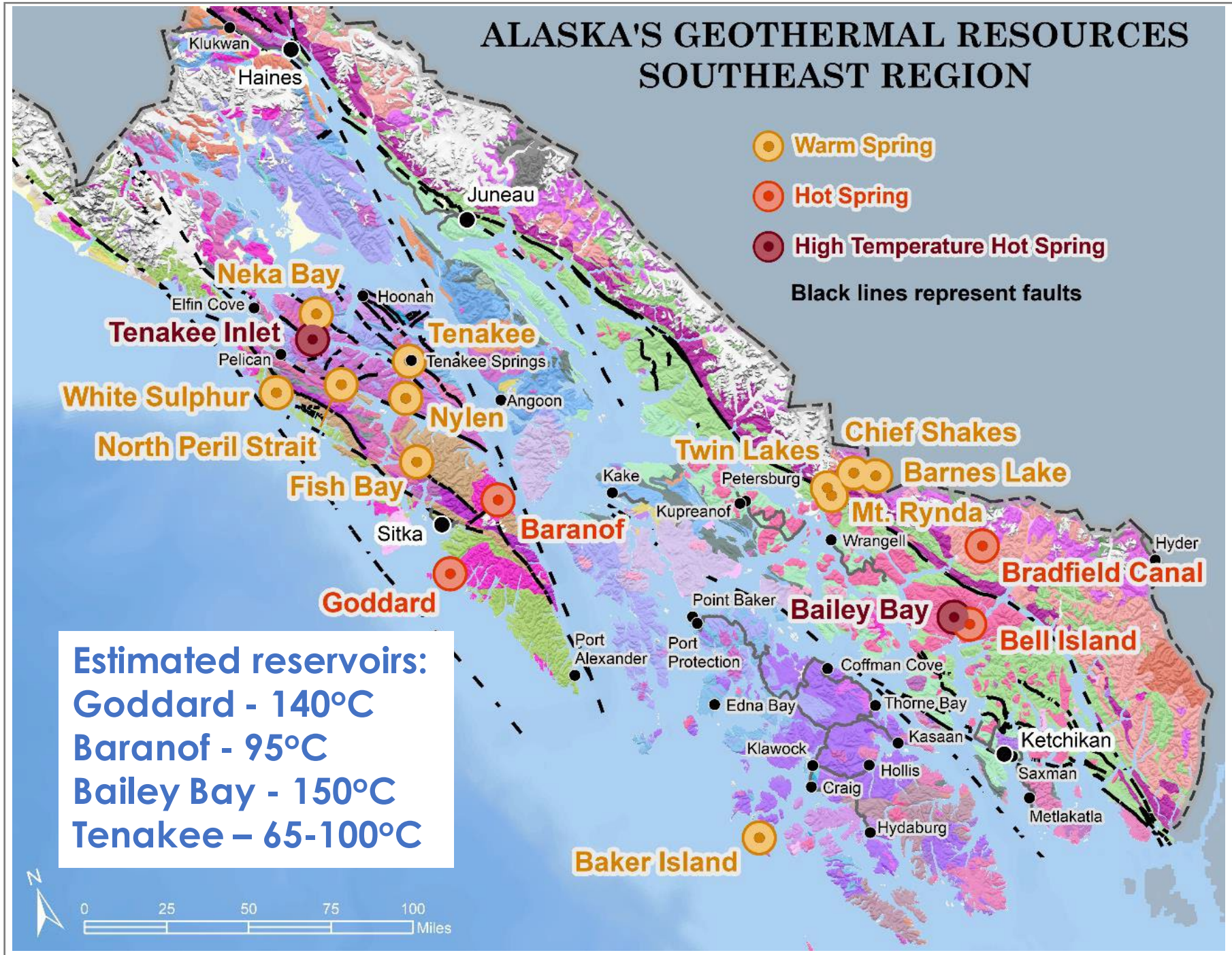
Geothermal Systems: Fairbanks Region



Geothermal Systems: Seward Peninsula Region



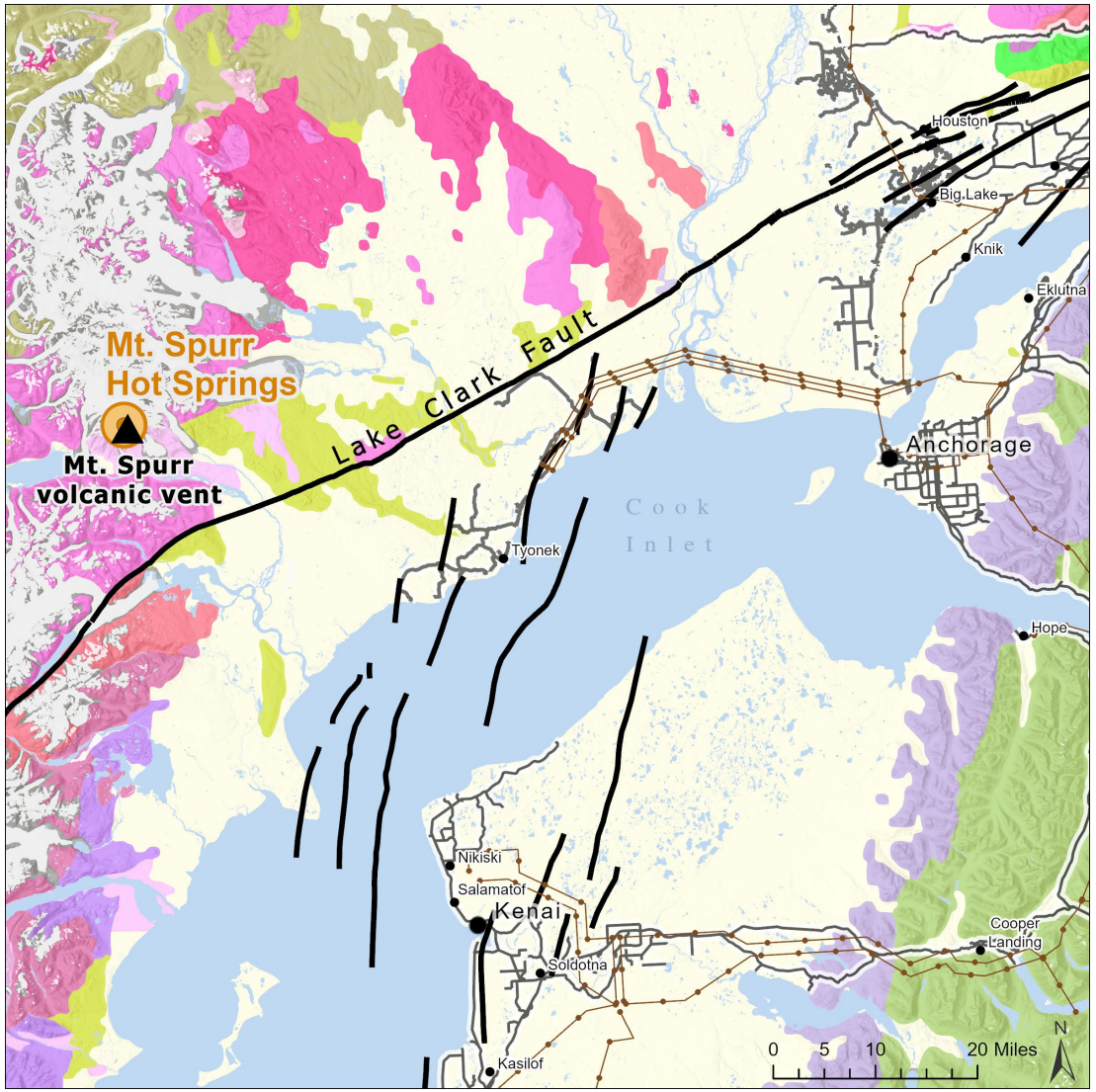
Geothermal Systems: Alaska Peninsula Region

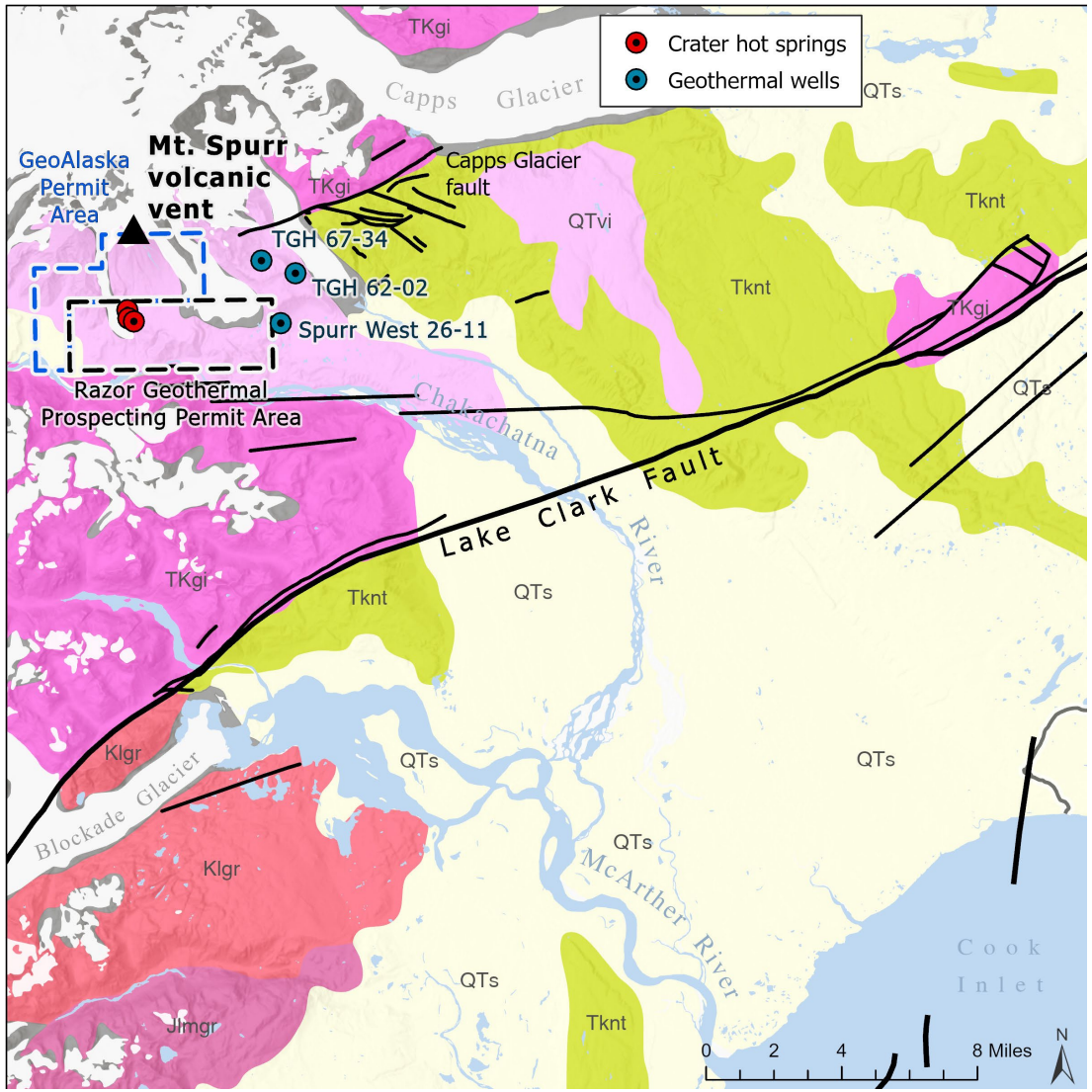


Geothermal Systems: Southeast Region

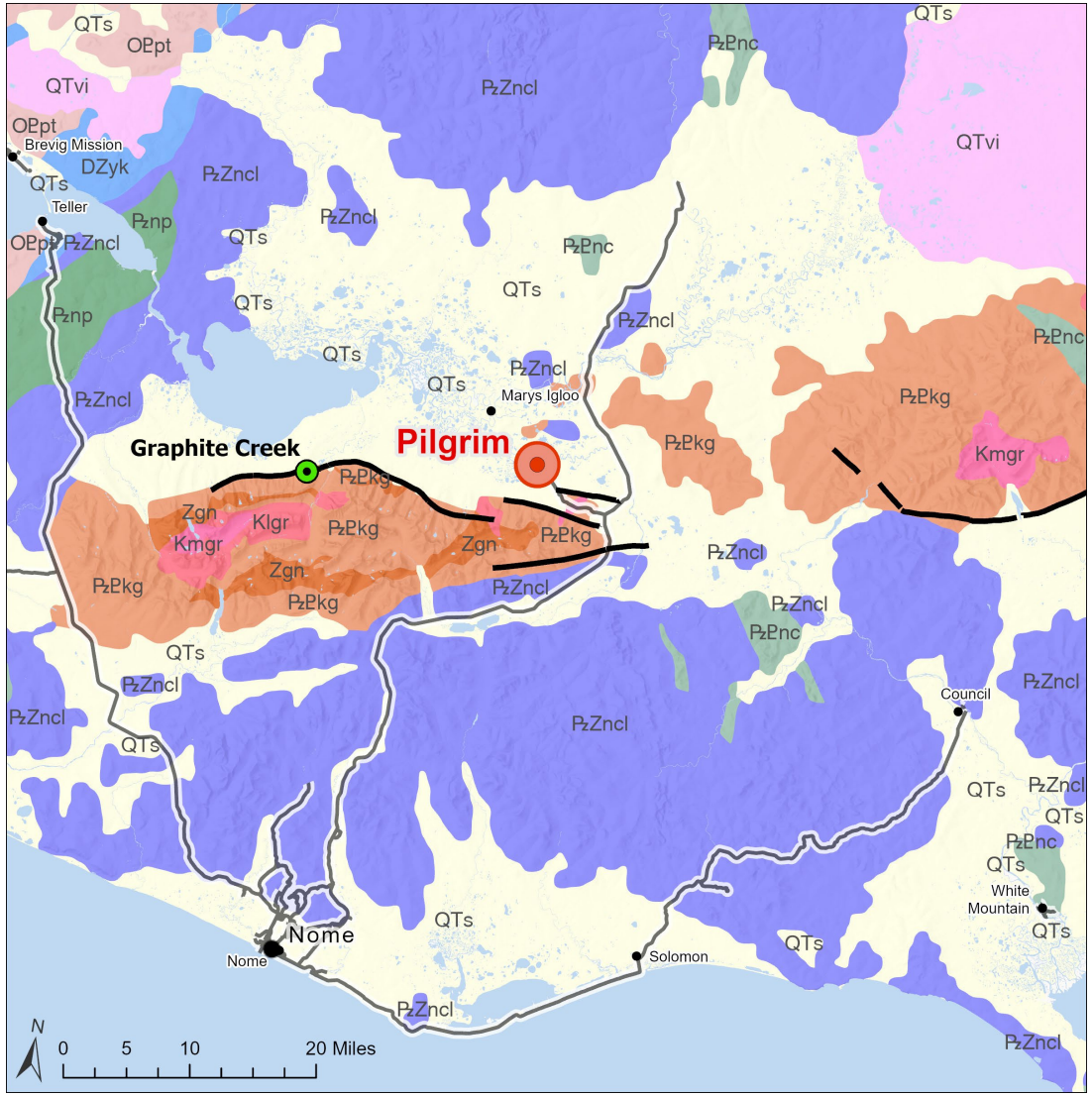
Examples of Geothermal Systems in Alaska

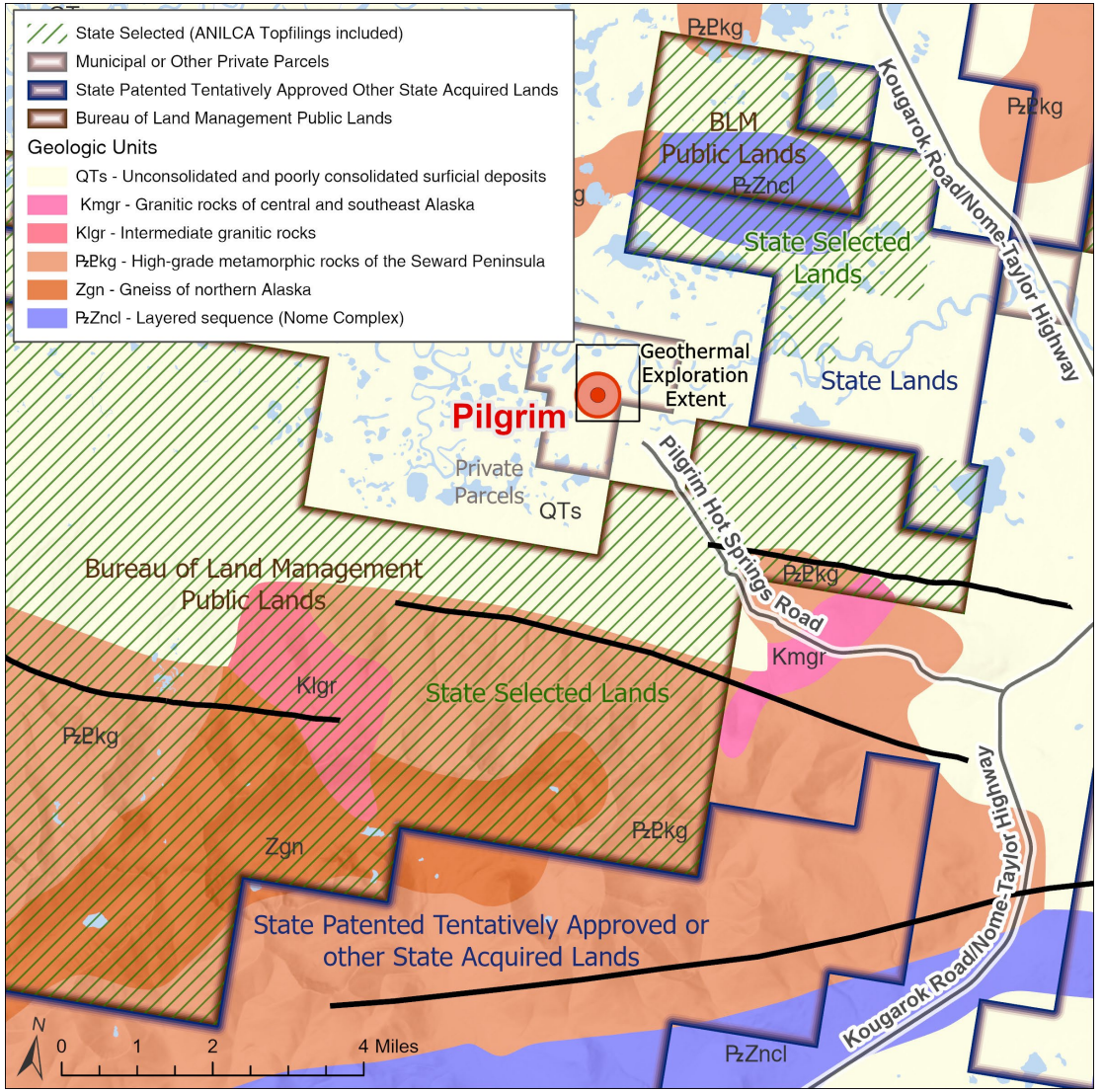
Mt Spurr


Mt. Spurr
Hot Springs
Mt. Spurr
volcanic vent
Lake Clark Fault
Houston
Big Lake
Knik
Eklutna
Anchorage
Cook
Inlet
Tyonek
Hope
Nikiski
Salamatof
Kenai
Soldotna
Cooper
Landing
Kasilof
0 5 10 20 Miles
N


Crater hot springs
Geothermal wells
GeoAlaska
Permit
Area
Mt. Spurr
volcanic
vent
Capps Glacier
fault
TGH 67-34
TGH 62-02
Spurr West 26-11
Razor Geothermal
Prospecting Permit Area
Capps Glacier
Chakachatna River
Lake Clark Fault
Blockade Glacier
McArther River
Cook
Inlet
TKgi
QTs
Tknt
QTvi
Klgr
Jmgr
0 2 4 8 Miles
N

Pilgrim Hot Springs





Overview of SB 104

PURPOSE OF SB 104

- **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

DNR Geothermal Leasing/Permitting History

Present	**Mount Spurr** Currently there are two geothermal exploration prospecting permits in the Mount Spurr area, both issued during 2021. **Augustine Island** An application for a prospecting permit is under review for Augustine Island.
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.

DNR Leasing/Permitting Process

- **Competitive Lease Sale**
- **If no competing interest, issue prospecting permit with two-year time limit**
  - This bill would update this, replacing 2-year prospecting permits with 5-year exploration licenses designed after our modern oil & gas exploration license program.
  - Only after the stipulations of a permit/license are met can the operator opt to convert to a lease.
- **Both processes require Best Interest Finding prior to disposal**

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 *permits* to *licenses.* 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 *permit* to *license.* Extends term of licenses (formerly *permits*) from two to five years. Replaces lease conversion requirement of *commercial discovery* and *development plan* with *work commitment* and *exploration plan*.
4 (DNR)	Changes *permit* to *license.*
5 (DNR)	Changes *permits* to *licenses.* 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 *geothermal resources* (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 *geothermal fluid* to remove temperature references and better conform with other changes in this bill.
11 (AOGCC)	Replaces AS 41.06.060(5) definition of *geothermal resources* (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.

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

- **Current statute grants preferential rights to a surface owner to apply for a geothermal prospecting permit once notice is received of existing application**
  - Potentially discouraging to commercial development
  - Private landowners usually don't have financial resources to develop a commercially-viable geothermal resource.
- **Surface owner rights are already 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.
- **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. Surface owner notification is also part of later surface-use permitting.**

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 celcius 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.

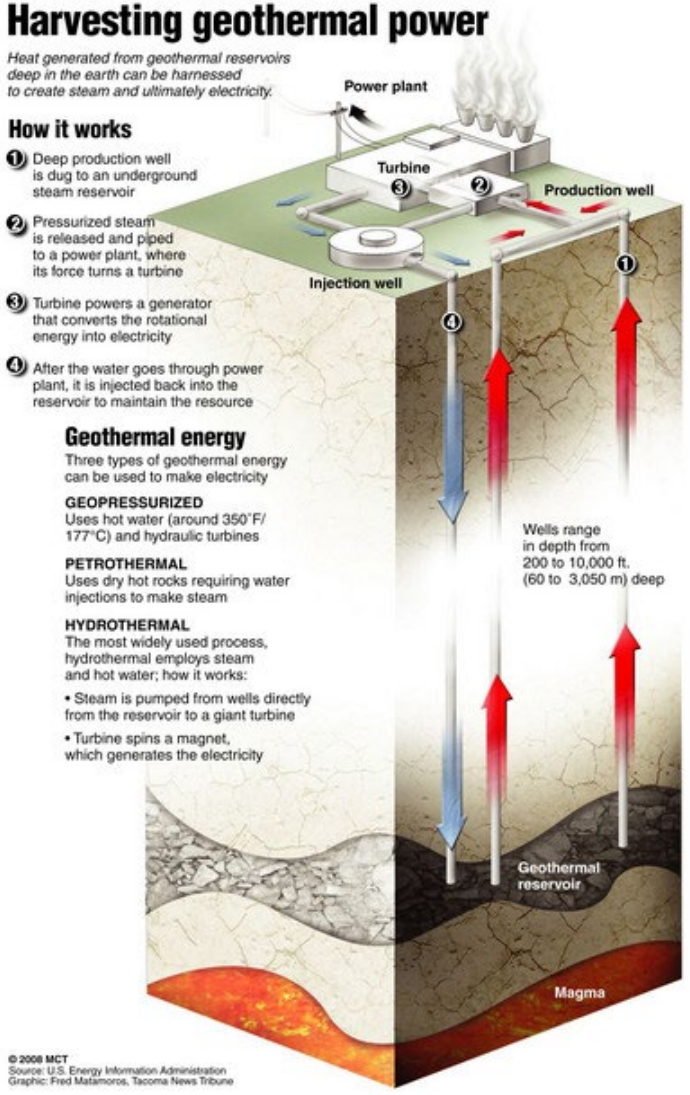
- Modern definition for geothermal resources.
- Not limited by temperature because current technology enables development of cooler geothermal systems.
- Ensures all the State's mineral estate resources are captured in definition.
- Same definition being applied to both DNR & AOGCC statutes.

QUESTIONS?

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

Supplemental Information

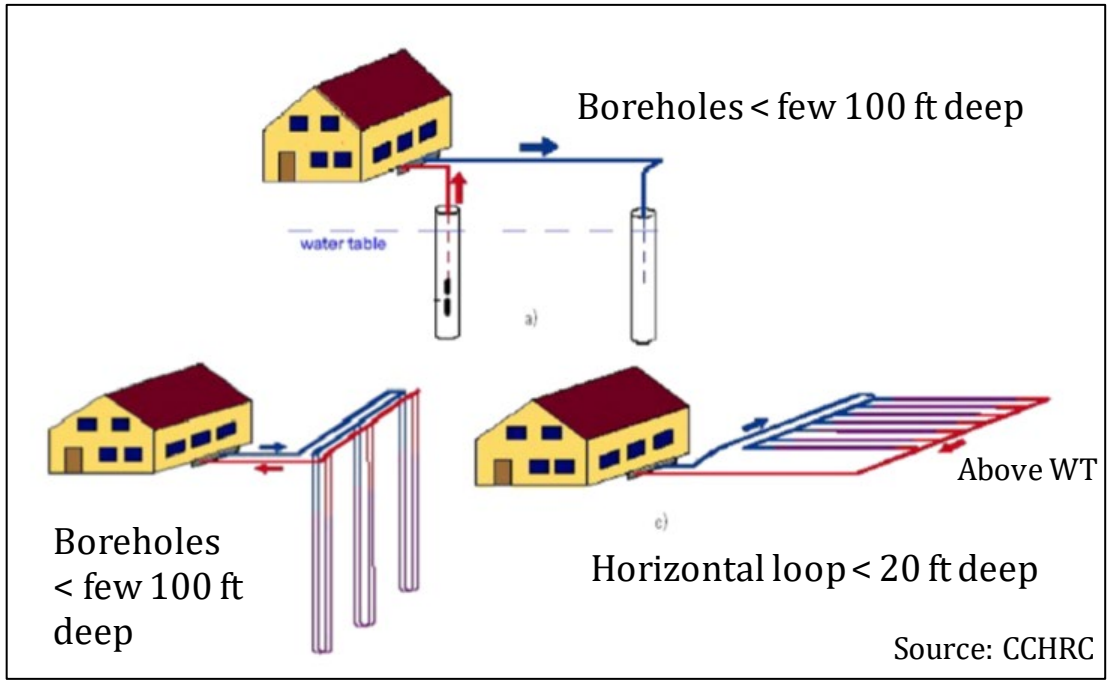
Commercial Geothermal Power Plants and Non-Commercial Systems



- Commercial power plants – wells 1000s of feet deep tapping hot, non-potable water
- Non-commercial systems – heat pumps - loops above WT or wells < few 100 ft deep

Deep subsurface vs near-surface systems separated by 1000s of feet

Vertical communication is unlikely



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 °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, need Alaska Pollutant Discharge Elimination System (APDES) permit.
- 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.

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.

Examples of Geothermal power plants

Dieng, Indonesia, 10MW

Te Mihi, New Zealand, 166MW