

**ALASKA STATE LEGISLATURE**  
**SENATE RESOURCES STANDING COMMITTEE**

April 12, 2023

3:30 p.m.

**MEMBERS PRESENT**

Senator Click Bishop, Co-Chair  
Senator Cathy Giessel, Co-Chair  
Senator Bill Wielechowski, Vice Chair  
Senator Scott Kawasaki  
Senator James Kaufman  
Senator Forrest Dunbar  
Senator Matt Claman

**MEMBERS ABSENT**

All members present

**COMMITTEE CALENDAR**

SENATE BILL NO. 78

"An Act relating to hunting, trapping, and fishing licenses for certain nonresident postsecondary students; and providing for an effective date."

- MOVED SB 78 OUT OF COMMITTEE

CONSIDERATION OF GOVERNOR APPOINTEES

Board of Game

Jacob Fletcher - Talkeetna

- CONFIRMATION ADVANCED

SENATE BILL NO. 92

"An Act relating to state ownership of submerged land underlying navigable water within the boundaries of and adjacent to federal areas; and providing for an effective date."

- HEARD & HELD

SENATE BILL NO. 69

"An Act relating to geothermal resources; relating to the definition of 'geothermal resources'; and providing for an effective date."

- HEARD & HELD

PRESENTATION(S): ALASKA'S GEOTHERMAL RESOURCES

- HEARD

**PREVIOUS COMMITTEE ACTION**

BILL: SB 78

SHORT TITLE: HUNT/FISH LICENSE FOR NONRESIDENT STUDENT

SPONSOR(S): SENATOR(S) WILSON

02/24/23	(S)	READ THE FIRST TIME - REFERRALS
02/24/23	(S)	RES, FIN
04/03/23	(S)	RES AT 3:30 PM BUTROVICH 205
04/03/23	(S)	Heard & Held
04/03/23	(S)	MINUTE(RES)
04/12/23	(S)	RES AT 3:30 PM BUTROVICH 205

BILL: SB 92

SHORT TITLE: STATE OWNERSHIP OF SUBMERGED LAND

SPONSOR(S): SENATOR(S) GIESSEL BY REQUEST

03/08/23	(S)	READ THE FIRST TIME - REFERRALS
03/08/23	(S)	RES
03/29/23	(S)	RES AT 3:30 PM BUTROVICH 205
03/29/23	(S)	Heard & Held
03/29/23	(S)	MINUTE(RES)
04/12/23	(S)	RES AT 3:30 PM BUTROVICH 205

BILL: SB 69

SHORT TITLE: GEOTHERMAL RESOURCES

SPONSOR(S): RULES BY REQUEST OF THE GOVERNOR

02/15/23	(S)	READ THE FIRST TIME - REFERRALS
02/15/23	(S)	RES, FIN
04/12/23	(S)	RES AT 3:30 PM BUTROVICH 205

**WITNESS REGISTER**

JACOB FLETCHER, Appointee

Board of Game

Alaska Department of Fish and Game (ADF&G)

Talkeetna, Alaska

**POSITION STATEMENT:** Testified for reappointment to the Board of Game.

MARK RICHARDS, Executive Director  
Resident Hunters of Alaska (RHA)  
Fairbanks, Alaska

**POSITION STATEMENT:** Testified that RHA was neutral on the reappointment of Jacob Fletcher to the Board of Game because the board is too weighted in favor of commercial hunting interests.

WAYNE KUBAT, Vice President  
Alaska Professional Hunter's Association (APHA)  
Wasilla, Alaska

**POSITION STATEMENT:** Testified in support of the reappointment of Jacob Fletcher to the Board of Game.

CRAIG COMPEAU, representing self  
Fairbanks, Alaska

**POSITION STATEMENT:** Testified in support of SB 92.

MIKE TINKER, representing self  
Fairbanks, Alaska

**POSITION STATEMENT:** Testified in support of SB 92.

JOHN BOYLE, Commissioner-Designee  
Department of Natural Resources  
Anchorage, Alaska

**POSITION STATEMENT:** Introduced SB 69 on behalf of the administration.

JOHN CROWTHER, Deputy Commissioner  
Department of Natural Resources  
Anchorage, Alaska

**POSITION STATEMENT:** Participated in the presentation for SB 69.

DR. DAVID LEPAIN, Director and State Geologist  
Division of Geological and Geophysical Surveys  
Department of Natural Resources  
Fairbanks, Alaska

**POSITION STATEMENT:** Participated in the presentation for SB 69.

BRETT HUBER, Chair  
Alaska Oil and Gas Conservation Commission  
Anchorage, Alaska

**POSITION STATEMENT:** Provided information during the hearing on SB 69.

BERNIE KARL, President  
Chena Power

Fairbanks, Alaska

**POSITION STATEMENT:** Delivered a presentation on Alaska's geothermal resources.

#### **ACTION NARRATIVE**

[3:30:33 PM](#)

**CO-CHAIR CLICK BISHOP** called the Senate Resources Standing Committee meeting to order at 3:30 p.m. Present at the call to order were Senators Dunbar, Claman, Kawasaki, Kaufman, Wielechowski, Co-Chair Giessel, and Co-Chair Bishop.

#### **SB 78-HUNT/FISH LICENSE FOR NONRESIDENT STUDENT**

[3:31:47 PM](#)

**CO-CHAIR BISHOP** announced the consideration of SENATE BILL NO. 78 "An Act relating to hunting, trapping, and fishing licenses for certain nonresident postsecondary students; and providing for an effective date."

[3:32:01 PM](#)

**CO-CHAIR GIESSEL** moved to report SB 78, work order 33-LS0372\A, from committee with individual recommendations and attached zero fiscal note.

[3:32:16 PM](#)

**CO-CHAIR BISHOP** found no objection and SB 78 was reported from the Senate Resources Standing Committee.

#### **CONSIDERATION OF GOVERNOR APPOINTEES** **BOARD OF GAME**

[3:32:23 PM](#)

**CO-CHAIR BISHOP** announced the consideration of governor appointee Jacob Fletcher to the Board of Game.

[3:32:52 PM](#)

**JACOB FLETCHER**, Appointee, Board of Game, Talkeetna, Alaska, Testified for reappointment to the Board of Game. He stated that he owns a big game guide business that operates predominantly on Kodiak Island in the spring and fall. He was recently awarded a federal guide-use area in the Kenai Wildlife Refuge and looks forward to operating there in 2024. He is an outdoorsman and is very familiar with the way that game regulations are implemented in the field. He has served one previous term on the Board of Game and he believes the commitment from all participants makes

the process the best in the world. As a consumptive and non-consumptive user, he committed to continue to look out for the wild game in Alaska.

[3:35:07 PM](#)

CO-CHAIR BISHOP opened public testimony.

[3:35:18 PM](#)

MARK RICHARDS, Executive Director, Resident Hunters of Alaska (RHA), Fairbanks, Alaska, stated that RHA has more than 3,200 members statewide that advocate for sustainable wildlife management policies that enhance and prioritize resident hunting opportunities. Therefore, RHA was neutral on the reappointment of Jacob Fletcher because the board is more heavily weighted in favor of commercial hunting interests than ever before. Mr. Fletcher is currently one of the five licensed guides and one retired guide on the seven-member board. If he is reappointed, he will be one of four guides on this seven-member board. He emphasized that RHA is not against guides and not against Mr. Fletcher; RHA is only looking out for the interests of resident hunters. He expressed interest in having conversations about how to reform both the Board of Game and the Board of Fisheries to ensure balance, regardless of whom the governor appoints.

[3:37:26 PM](#)

WAYNE KUBAT, Vice President, Alaska Professional Hunter's Association (APHA), Wasilla, Alaska, testified that APHA supports the reappointment of Jacob Fletcher to the Board of Game. He lives fulltime in rural Alaska, understands the unique challenges of living and working remotely, and he knows how important fish and wildlife resources are to rural communities. He brings unique viewpoints and experiences to the board process, is accessible to the public, is willing to listen to all sides of the issue, and is committed to making the best decisions he can on wildlife issues. He restated support for the appointment.

[3:38:37 PM](#)

CO-CHAIR BISHOP closed public testimony.

[3:38:47 PM](#)

CO-CHAIR GIESSEL stated that the Senate Resources Committee reviewed the qualifications of the governor's appointee, and recommends the following name be forwarded to a joint session for consideration:

Board of Game

Jacob Fletcher - Talkeetna

Signing the reports regarding appointments to boards and commissions in no way reflects individual members' approval or disapproval of the appointees; the nominations are merely forwarded to the full legislature for confirmation or rejection.

CO-CHAIR BISHOP stated that the name would be forwarded to the joint session.

**SB 92-STATE OWNERSHIP OF SUBMERGED LAND**

[3:39:14 PM](#)

CO-CHAIR BISHOP announced the consideration of SENATE BILL NO. 92 "An Act relating to state ownership of submerged land underlying navigable water within the boundaries of and adjacent to federal areas; and providing for an effective date."

[3:39:30 PM](#)

CO-CHAIR BISHOP opened public testimony on SB 92.

[3:39:44 PM](#)

CRAIG COMPEAU, representing self, Fairbanks, Alaska, testified in support of SB 92. He pointed out that the state was given ownership of submerged lands at statehood, that there were nearly one million miles of river in Alaska, and that the federal government had recognized just nine percent as navigable. He commented that at this rate it would take hundreds of years for the federal government to designate all the rivers. He opined that it was time for the state to say enough. The landmark Sturgeon decision hasn't changed the mindset in some federal agencies; no change has been made to the US National Park Service (USNPS) regulation on the use of hovercraft in Alaska. SB 92 makes it clear that the state is finally taking control of what was promised at statehood.

CO-CHAIR BISHOP asked him to send the testimony to his office for distribution because some of it was broken.

[3:42:48 PM](#)

MIKE TINKER, representing self, Fairbanks, Alaska, testified in support of SB 92. He stated that he had been involved in natural resources issues for decades. He characterized SB 92 as a fight against federal overreach. He mentioned the Sturgeon decision and noted that there had been no changes in regulation. He voiced support for the systematic approach and the committee substitute (CS) that was adopted during the previous meeting.

[3:44:38 PM](#)

CO-CHAIR BISHOP closed public testimony on SB 92 and held the bill for further consideration.

[3:44:50 PM](#)

At ease

**SB 69-GEOTHERMAL RESOURCES**

[3:47:14 PM](#)

CO-CHAIR BISHOP reconvened the meeting and announced the consideration of SENATE BILL NO. 69 "An Act relating to geothermal resources; relating to the definition of 'geothermal resources'; and providing for an effective date."

He noted that this was the first hearing.

[3:47:40 PM](#)

JOHN BOYLE, Commissioner-Designee, Department of Natural Resources, Anchorage, Alaska, stated that a most important priority for DNR is to advance energy security in Alaska. He highlighted that while a number of areas within the state should be very conducive to geothermal exploration and development, these areas had not been delineated and characterized for decades. He said it is also important to ensure that the leasing statutes and regulations encourage and promote the exploration and development of the identified energy resources. DNR believes that advances in technology provide multiple opportunities to develop geothermal resources along the volcanic chain and areas in the Interior with both warm and hot springs. SB 69 is important to this effort.

[3:51:15 PM](#)

JOHN CROWTHER, Deputy Commissioner, Department of Natural Resources, Anchorage, Alaska, described the presentation and introduced DR. LePain.

[3:51:41 PM](#)

DR. DAVID LEPAIN, Director and State Geologist, Division of Geological and Geophysical Surveys, Department of Natural Resources, Fairbanks, Alaska, began the presentation on slide 4, "Fundamental Ingredients of Useable Geothermal Energy." He explained that the graphic on the left shows a typical high temperature hydrothermal system that used hot water at depth to power turbines that generate electricity. There is a power plant at the surface and production wells (represented with the red

arrows) that move hot fluid up from depth. The hot fluid goes into the system and turns a turbine that generates power. The fluid that has gone through this process has cooled and is reinjected at some distance from the production wells.

He described the following requirements:

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

[3:54:11 PM](#)

CO-CHAIR BISHOP asked Mr. Crowther if this type of reinjection well would need Class VI certification.

MR. CROWTHER answered that geothermal wells fall under Class V of the Environmental Protection Agency's (EPA) underground injection control program for the Safe Water Act. The Class V category applies to the injection of non-hazardous fluids. He noted that Class VI certification is for injection of carbon dioxide for carbon sequestration purposes.

CO-CHAIR BISHOP asked what the timeline is to get Class V certification.

MR. CROWTHER relayed his understanding that the EPA currently is not permitting Class V wells for geothermal, but SB 69 does authorize the Alaska Oil and Gas Conservation Commission (AOGCC) to investigate it in the event that the EPA provides that authorization in the future. He said he didn't know the timeframes for other Class V permits, but the EPA has the ability to issue the permits directly to the applicant without the state assuming primacy. Geothermal wells are not complex and should not take the 2-3 years that it can take for the EPA to issue a permit for a Class VI well.

[3:56:56 PM](#)

CO-CHAIR GIESSEL asked the likelihood that the geothermal fluids would contain minerals.

DR. LEPAIN replied it's a possibility, depending on the rocks that the fluid comes from. He noted that lithium has been found in some of the produced geothermal fluids in Nevada.

CO-CHAIR GIESSEL asked whether lithium is considered a hazardous substance.

DR. LEPAIN replied that it would depend on the concentration. He deferred to Mr. Crowther to discuss how that would affect the regulations for the wells.

MR. CROWTHER said he'd follow up with the exact specifications for the different classes of wells, but DNR's understanding is that mineral concentrations that typically cycle in geothermal systems fit within Class V. Most geothermal water is saline brine with trace elements.

[3:59:21 PM](#)

DR. LEPAIN referenced the graphic on slide 4 and advised that if there are hot dry rocks at depth, water can be injected and circulated through those rocks then produced some distance away for use in a power plant. The cooled water can then be reinjected some distance from the production hole and the process can be repeated. The fluid doesn't have to be hot but hot rocks are a necessity.

DR. LEPAIN advanced to slide 5, "Heat Flow in Alaska." It shows the color-coded natural heat flow from the earth superimposed on a map of the state. He explained that the earth is a layered system that has radioactive minerals at depth that generate heat as they decay. He acknowledged that the map conveys the inaccurate impression that every hole that's dug will result in an elevated heat flow. He added that it does correctly convey that much of the state has slightly elevated heat flow. Importantly, the white symbols that run in a belt from the Seward Peninsula to Circle and Central reflect geothermal springs. He highlighted that of the 97 geothermal sites scattered throughout the state, there was advanced understanding of the system in just five of those sites. These are the Makushin Volcano, Akutan, Spur, Pilgrim, and Chena. Only Chena is producing. Little is known about the other 92 sites scattered across the state, but widespread geothermal potential is suggested.

[4:02:49 PM](#)

DR. LEPAIN advanced to the chart on slide 6, "Geothermal Gradients." He explained that he provided this depth temperature plot for reference. It shows that at the Makushin Volcano, the temperature of the water at 2000 feet is a little warmer than 380 degrees Fahrenheit. It is a high temperature system. By

comparison, the temperature at Chena is a little more than 160 degrees Fahrenheit at a depth of 1000 feet. He underscored that little is known about the other 92 spots and where they fit in this depth temperature space.

[4:04:00 PM](#)

DR. LEPAIN advanced to slide 7, "Geothermal Resource Quality," and discussed the following:

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...

CO-CHAIR BISHOP commented that he could envision several villages tied together to take advantage of one geothermal site.

[4:06:22 PM](#)

DR. LEPAIN advanced to slide 8 and spoke to the following summary:

#### 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

MR. CROWTHER advised that Mr. Huber was online to clarify the interaction between Class V and the requirements for permitting wells for geothermal.

[4:08:07 PM](#)

BRETT HUBER, Chair, Alaska Oil and Gas Conservation Commission, Anchorage, Alaska, stated that Class V is only necessary for the injection portion of the wells. AOGCC currently has the authority to permit to drill for exploratory wells, delineation wells, and stratigraphy wells. Statute directs that the turnaround time for those permits is to be as expedient as practicable. In practice this translates to turnarounds in about two weeks.

MR. CROWTHER advised that the supplemental information he mentioned earlier begin on slide 29, "Supplemental Information."

[4:09:09 PM](#)

At ease

[4:09:41 PM](#)

CO-CHAIR BISHOP reconvened the meeting.

[4:09:55 PM](#)

DR. LEPAIN directed attention to the map on slide 30, "Geothermal Systems of Alaska." It shows two broadly classed geothermal systems: granite-related systems and volcano-related systems. The latter are located in the Aleutian arc, up the Alaskan Peninsula, and along the west side of the Cook Inlet basin. Three granite-related systems have been identified: 1) the east-west system that trends from the Seward Peninsula to the hot springs at Circle and Central, 2) the Southwest system that runs from Tatawiksuk in the northeast to Ophr, and 3) the Southeast system. There are large granitic bodies that have been intruded at 3000 to 5000 feet up into shallower crustal depths, some of which are on the surface. These systems are up to 100 million years old. They've been cooling for a long time and are still extremely hot.

The volcano-related systems stem from the Pacific crust subducting under Southcentral Alaska. This generates magma that rises and creates volcanoes. He advised that the next few slides provide a closer look at each area.

[4:12:33 PM](#)

DR. LEPAIN advanced to slide 31 that identifies the geothermal systems in the Fairbanks region. Each site is classified as high temperature hot spring, hot spring, or warm spring. This region has quite a few warm and hot springs, but no high temperature hot spring. These sites are widespread and all are granite-related. Many are off grid but have villages close by.

DR. LEPAIN advanced to slide 32 that identifies the geothermal systems on the Seward Peninsula. He identified Pilgrim Hot Springs, the high temperature hot spring at Serpentine, and hot springs at Lava Creek, Koyuk, Golovin, Elim, Nome, and Kotzebue. With the exception of Pilgrim, not much is known about these systems.

DR. LEPAIN advanced to slide 33 which identifies the volcano-related systems along the Alaska Peninsula and the eastern part of the Aleutian chain. He identified the Makushin Volcano and the high-temperature hot springs at Hot Springs Cove, Partov Cove, and Akutan. Makushin is in the process of being developed and work has been done at Akutan, but it's not being developed. These systems are widely distributed along the chain and up into the upper peninsula, but not much is known about most of them.

[4:15:07 PM](#)

DR. LEPAIN advanced to slide 34 which shows geothermal resources in Southeast Alaska. There are high-temperature hot springs at Bailey Bay and Tenakee Inlet, and a number of warm and hot springs are scattered throughout the region. They are all granite-related systems, and not much is known about them other than the temperature and flow rate of the water coming from the spring, and perhaps the chemistry of the water.

DR. LEPAIN underscored how widespread the geothermal resource potential is in the state and how little is known about it.

[4:16:26 PM](#)

CO-CHAIR BISHOP asked if he had more details on what Nevada has been doing to produce power from geothermal resources.

DR. LEPAIN offered to follow up with details for Nevada. He noted that California, Idaho, and potentially Utah have been producing power with geothermal resources.

[4:17:38 PM](#)

SENATOR DUNBAR commented that it seems that the geothermal resources generally are where the population isn't. He noted that the largest gap was in the Anchorage and MatSu area. He asked three questions: 1) whether the development on the Aleutians was associated with the fish processing plant, 2) whether mines were exploring geothermal as a potential power source, and 3) what the land ownership looks like and whether access to the resource would be difficult on federal land.

DR. LEPAIN responded that he knows that some of the sites in the central belt from the Seward Peninsula to the Canadian border are on federal land. He acknowledged that he didn't know how difficult it might be to develop those sites.

SENATOR DUNBAR asked for information about industrial users like mines and fish processors.

DR. LEPAIN said he understands that the project underway at Makushin Volcano will provide power to the City of Unalaska and the fish processor in the area. He mentioned the slow development of the Donlin Gold Mine and posited that one geothermal plant in that area could be a game changer.

[4:20:41 PM](#)

MR. CROWTHER thanked the committee and advised that DNR would give a detailed review of the bill at a future meeting.

CO-CHAIR BISHOP held SB 69 in committee.

[4:21:05 PM](#)

At ease

**PRESENTATION(S): ALASKA'S GEOTHERMAL RESOURCES**

[4:22:32 PM](#)

CO-CHAIR BISHOP reconvened the meeting and announced a presentation on Alaska's geothermal resources by Bernie Karl.

[4:22:38 PM](#)

BERNIE KARL, President, Chena Power, Fairbanks, Alaska stated that he was on a mission to make the world a better place to

live by harnessing geothermal resources to produce power instead of burning oil.

[4:25:13 PM](#)

MR. KARL played the following video that provides information about the opportunities for geothermal in Alaska: <https://www.alaskageothermal.info/video>.

MR. KARL stated that while there is a lot that isn't known about geothermal in Alaska, taking a water sample will show the geochemistry without drilling. He opined that it would be a good project for summer interns at the university to take samples of every untested hot spring in the state.

[4:32:04 PM](#)

MR. KARL skipped to slide 4, "Three Major Regions with Alaskan Geothermal Potential." He explained that the heat flow map was part of heat flow mapping for the entire US.

MR. KARL displayed slide 5, "Alaskan geothermal resources, How Much?" He answered the question saying there's enough geothermal in Alaska to run the world. He relayed that there are 60 volcanoes on the Ring of Fire and water samples should be collected from each one.

MR. KARL turned his attention to Chena Hot Springs and spoke to slides 6-8 that read as follows:

Chena Hot Spring's Low-Temperature, Electricity  
Generation Is the Perfect Solution for the Central  
Alaska Region.

Many low-temperature, but high flow rate hot springs, like CHS are spread out across central Alaska.

Low-temperature geothermal electricity generation was not thought possible at less than 194°F, CHS moved the temperature to less than 167°C and 'opened the door' for Central Alaska geothermal development.

Chena Hot Spring's binary, geothermal power plant, operating since 2006, at a nominal 350 MWe, has generated clean, carbon-free renewable energy for sustainable operations

[4:34:12 PM](#)

Slide 7

Chena Hot Springs Pioneered Geothermal, Low-Temperature, Electricity Generation and Changed the World

Geothermal Enables: fresh food greenhouses, recycling, Clean H<sub>2</sub>, and balneology.

[4:38:06 PM](#)

Slide 8

South-Eastern Alaska Region Will Also Benefit from Chena Hot Springs Low-Temperature Geothermal System

In addition to Chena Hot Spring's binary, geothermal power plant for electricity, geothermal waters are further employed to heat buildings, outdoor walkways and grow food year-round and, cool the icehouse. This is called direct use of geothermal energy.

Heat flow estimates in the SE region of Alaska (except Juneau) might be able to generate electricity, but certainly SE cities would benefit from direct usage.

[4:37:36 PM](#)

MR. KARL advanced to slide 9, "Aleutian Islands Have an Enormous Untapped Geothermal Potential," and spoke to the joint venture between Ounalashka Corporation and Chena Power (OCCP):

Alaska's Aleutian Islands are the largest island arc volcanic center in the World. Total Aleutian volcanic energy was estimated as 1022 joules. How to tap into this enormous source of energy for Alaska's benefit?

In 2016, Makushin scored first on a DOE-EERE-GTO funded report assessing island arc geothermal-potential, favorability? list of over 59 Aleutian volcanoes near population centers.

Makushin volcano is estimated at  $3 \times 10^{19}$  joules is the key.

MR. KARL highlighted the signed power purchase agreement between OCCP and the City of Unalaska to purchase 30 megawatts of power at 16.3 cents. Today that power costs 45 cents. He expressed optimism that the price would eventually be as low as 8 cents. He noted that this site has 7000 acres of patented ground and

the employees own the resource. He described Unalaska as a perfect location for geothermal. The project geophysicist told him that 450 megawatts of power could be generated from the 7000 acres.

[4:41:17 PM](#)

MR. KARL advanced to slide 10, "Unalaska is Strategically Located in the Aleutian Chain." He described the location as perfect. He highlighted that Unalaska is the largest deep water fishing port in the US and Alaska's only international port. He said the fishing industry is a heavy energy consumer and geothermal can meet this need.

MR. KARL displayed slide 11, "What is the Makushin Geothermal Project?" The picture on the lower left is of the Makushin Valley looking west and the topography map on lower right shows that the power plant site is about 14 miles from the City of Unalaska. He continued to describe the project speaking to the following:

Makushin Geothermal Project (MGP) is a 100% renewable energy 30MWe geothermal power system:

- Powerplant utility corridor and three production/injection wells,
- Modular geothermal plant with multiple, cascading OEC units,
- Power transmission/communications lines on land and underwater connection to City of Unalaska's power grid, and
- Automated controls and integration scheme with power grid.

[4:45:29 PM](#)

MR. KARL continued to slide 12, "OCCP Aleutian Vision Summary," and spoke of the following:

- Starts on Unalaska Island and Makushin Volcano's thermal energy.
- Next, the larger Makushin Geothermal Resource (MGR) and then the complete Volcano itself.
- Next, a move to Adak island to replace diesels.
- Finally, Aleutian volcanoes, more than any other place on Earth, are tapped for large-scale, industrial businesses such as green H2 production and green ore smelting.

Eventually, eleven commercial business ventures are visioned with numerous OCCP-1 (30MWe) size power plants or much larger for heavy-use offtakers for a total of over 1 GW of capacity and attracting almost \$13B in power plant and facilities investment capital.

[4:51:22 PM](#)

SENATOR KAUFMAN asked what mechanism is used at Chena to convert heat into electricity.

MR. KARL replied that they use an organic Rankine cycle, which is the opposite of a refrigeration cycle. The air will provide the cooling and the water will be reinjected at temperatures above 180 degrees. He highlighted that Ormat was chosen as the engineering, procurement, construction (EPC) contractor for the project.

[4:57:01 PM](#)

SENATOR DUNBAR asked him to discuss the permitting and how long it's taken.

MR. KARL answered that it took 7 months to get the permits from the Army Corps of Engineers and a year to get the permit from the Alaska Department of Fish and Game (ADF&G).

SENATOR DUNBAR asked about EPA and DEC.

MR. KARL said DEC permitted the camp for drinking water and there were no problems. He anticipated some difficulty with EPA because geothermal drilling is now linked to oil and gas. He said there is no oil and gas potential, but they still have to go through the process.

[4:59:45 PM](#)

CO-CHAIR GIESSEL recalled that Ormat tried and abandoned geothermal drilling in other locations.

MR. KARL said that's right; Ormat tried and abandoned drilling at Mount Spur. He shared his belief that Mount Spur still had a lot of potential.

CO-CHAIR BISHOP asked if he'd thought about hydrogen production.

MR. KARL said yes; OCCP applied to become a hydrogen hub and they're still working on that.

CO-CHAIR BISHOP thanked Mr. Karl for the presentation.

5:03:07 PM

There being no further business to come before the committee, Co-Chair Bishop adjourned the Senate Resources Standing Committee meeting at 5:03 p.m.