ALASKA STATE LEGISLATURE
SENATE RESOURCES STANDING COMMITTEE
March 17, 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. 72
"An Act relating to designation of state water as outstanding national resource water; and providing for an effective date."

- HEARD & HELD

PRESENTATION(S): HEAVY OIL RECOVERY

- HEARD

PREVIOUS COMMITTEE ACTION

BILL: SB 72
SHORT TITLE: NATL. RES. WATER NOMINATION/DESIGNATION
SPONSOR(s): SENATOR(s) GIESSEL

02/17/23	(S)	READ THE FIRST TIME - REFERRALS
02/17/23	(S)	RES
03/17/23	(S)	RES AT 3:30 PM BUTROVICH 205

WITNESS REGISTER

JULIA O'CONNOR, Staff
Senator Cathy Giessel
Alaska State Legislature

Juneau, Alaska
POSITION STATEMENT: Presented the sectional analysis for SB 72 on behalf of the sponsor.

RANDY BATES, Director
Division of Water
Department of Environmental Conservation
Juneau, Alaska
POSITION STATEMENT: Stated support for SB 72 on behalf of the department.

LEILA KIMBRELL, Executive Director
Resource Development Council for Alaska, Inc.
Anchorage, Alaska
POSITION STATEMENT: Provided invited testimony on SB 72.

DR. ABHIJIT DANDEKAR, Professor and Chair
Department of Petroleum Engineering
UAF College of Engineering and Mines (CEM)
University of Alaska Fairbanks
Fairbanks, Alaska
POSITION STATEMENT: Delivered a presentation titled, "Heavy Oil Recovery Research at the University of Alaska Fairbanks."

ACTION NARRATIVE

3:30:58 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, Kawasaki, Co-Chair Giessel, and Co-Chair Bishop. Senators Claman and Wielechowski arrived thereafter.

SB 72-NATL. RES. WATER NOMINATION/DESIGNATION

3:31:20 PM
CO-CHAIR BISHOP announced the consideration of SENATE BILL NO. 72 "An Act relating to designation of state water as outstanding national resource water; and providing for an effective date."

3:31:32 PM
SENATOR CATHY GIESSEL, District E, sponsor of SB 72, explained that the bill proposes a formal process for designating waterbodies as Outstanding National Resource Waters (ONRW). These are commonly known as Tier III waters, which are part of the Clean Water Act that was enacted in 1972. This federal law

mandated that states implement water quality standards by 1983. These standards had to include designated use classifications, numerical or narrative water quality criteria, and an anti-degradation policy. At a minimum, the anti-degradation policy had to establish minimums for management of water quality in a tier system.

3:32:51 PM
SENATOR CLAMAN joined the committee.

3:33:43 PM
SENATOR GIESSEL spoke to the document in the bill packet titled, "Water Quality Tier 3 Water Nomination and Designation Process in Alaska." Page 4 describes the three tiers of water quality. Tier I refers to the existing quality of the water, also known as "the floor." Tier I waters do not meet one or more of the water quality standards due to things like docks, agricultural runoff, and boat traffic. Tier II waters are high quality. They comprise the majority of waters in Alaska and are safe for fishing and swimming. Tier III waters are Outstanding National Resource Waters (ONRW); they deserve special protections. They receive the highest protection under the anti-degradation policy of the Clean Water Act.

3:35:46 PM
SENATOR GIESSEL read 40 Code of Federal Regulations 131.12(A)(3):

> "WHERE HIGH QUALITY WATERS CONSTITUTE AN OUTSTANDING NATIONAL RESOURCE, SUCH AS WATERS OF THE NATIONAL AND STATE PARKS AND WILDLIFE REFUGES AND WATERS OF EXCEPTIONAL RECREATIONAL OR ECOLOGICAL SIGNIFICANCE, THAT WATER QUALITY SHALL BE MAINTAINED AND PROTECTED."

She said Tier III waters have no development along side, no pollution, and no degradation is allowed.

3:36:38 PM
SENATOR GIESSEL spoke to the Department of Environmental Conservation (DEC) policy and procedure document that provides guidance relating to the nomination and designation of Tier III waters. Nominations are submitted to DEC and the policy states that the nominations will go to the legislature. Implementing this policy is at the discretion of the DEC commissioner, which means the policy could change. The bill addresses this issue by codifying that the designation of Tier III waters is in the hands of the legislature.

SENATOR GIESSEL displayed a state map that identifies the locations of five waterbodies that have been nominated as Tier III and submitted to DEC. She noted that copies of the five letters requesting Tier III designation were in the bill packets. She restated that the bill proposes that these nominating letters be submitted to the legislature to review and determine whether the designation is appropriate.

3:39:26 PM
SENATOR GIESSEL cited the Constitution of the State of Alaska that clarifies that appropriation of resources, as assets of the state, is the purview of the legislature. She read:

> "THE LEGISLATURE SHALL PROVIDE FOR THE UTILIZATION, DEVELOPMENT, AND CONSERVATION OF ALL-NATURAL RESOURCES BELONGING TO THE STATE, INCLUDING LAND AND WATERS, FOR THE MAXIMUM BENEFIT OF ITS PEOPLE."
>
> ALASKA CONSTITUTION, ARTICLE 8, SECTION 2
>
> "ALL SURFACE AND SUBSURFACE WATERS RESERVED TO THE PEOPLE FOR COMMON USE, EXCEPT MINERAL AND MEDICINAL WATERS, ARE SUBJECT TO APPROPRIATION. PRIORITY OF APPROPRIATION SHALL GIVE PRIOR RIGHT. EXCEPT FOR PUBLIC WATER SUPPLY, AN APPROPRIATION OF WATER SHALL BE LIMITED TO STATED PURPOSES AND SUBJECT TO PREFERENCES AMONG BENEFICIAL USES, CONCURRENT OR OTHERWISE, AS PRESCRIBED BY LAW, AND TO THE GENERAL RESERVATION OF FISH AND WILDLIFE."
>
> ALASKA CONSTITUTION, ARTICLE 8, SECTION 13

SENATOR GIESSEL stated that the Alaska Supreme Court underscored this authority in Mallott v. Stand for Salmon. The question was whether an initiative could be used to designate a state water as Tier III. The court ruled that an initiative designating a Tier III water would override the legislature's power to make decisions about the allocation of state assets. The court went on to say that the legislature has the ultimate decision-making authority to use specific public assets for specific purposes.

3:40:54 PM
SENATOR WIELECHOWSKI joined the committee.

3:41:25 PM

SENATOR GIESSEL spoke to the following summary of what SB 72 seeks to do:

SUMMARY

CODIFIES ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION'S CURRENT TIER III POLICY.

COULD EXPEDITE THE CURRENTLY NOMINATED WATERBODIES.

3:42:20 PM
JULIA O'CONNOR, Staff, Senator Cathy Giessel, Alaska State Legislature, Juneau, Alaska, presented the sectional analysis for SB 72 on behalf of the sponsor:

Section 1: Amends AS 46.03 by adding a new section that: Establishes AS 46.03.085(a). Through statute, the legislature may designate water of the state as an outstanding national resource water. Establishes AS 46.03.085(b). Unless the body of water has been designated as an outstanding national resource water can it be managed like so.

Section 2: Applies for an immediate effective date.

3:43:26 PM
RANDY BATES, Director, Division of Water, Department of Environmental Conservation, Juneau, Alaska, stated support for SB 72 on behalf of the department. He spoke to the following points:

[Original punctuation provided.]

Outstanding Natural Resource Waters, ONRWs or Tier 3 waters, are defined as waters of "of exceptional recreational or ecological significance" which shall be "maintained and protected" from degradation in perpetuity.

A Tier 3 designation of a waterbody bestows the highest level of water quality protection under the federal Clean Water Act and restricts a wide range of activities on these waters as well as on adjacent lands.

Since 1983, the Clean Water Act has required that each state establish an ONRW or Tier 3 designation process.

Alaska has a process in place, formalized in November 2018 in the form of a Department Policy and Procedure that essentially reads the same as the bill – "The current process for nominating Tier 3 waters involves proposing the introduction of legislation to make the designation. Any such request may go to a legislative representative or committee for consideration for introduction as a legislative bill. Typically, a request to an individual legislator would go to a legislator whose district contains the proposed Tier 3 water."

Because the designation of a Tier 3 water carries with it the requirement to maintain and protect the water quality from degradation, the designation restricts a wide range of activities on the waters and adjacent areas, to include

- road and building construction
- recreational activities
- seafood processing
- municipal wastewater discharge and septic systems
- storm water discharge
- landfills
- gravel quarries
- large-scale resource development projects
- and or any other activity that might affect the designated water

Designation as a Tier 3 waterbody requires that the water quality on the designated body be maintained and protected for the reasons designated and for the water quality at the time of designation.

What that practically means is that no new or increased discharges to the river or its tributaries would be permitted if the discharges would result in lowering or degrading the water quality.

That has potential long-term if not permanent adjacent and upstream land-use consequences – no new discharge contributions that lower or degrade water

quality, whether those new discharges meet water quality standards or not.

That would potentially eliminate road improvements in the area, increased or changed discharges from municipal wastewater treatment facilities, increased recreational opportunities, seafood processing, or anything else that might affect the water quality.

Such widespread impacts effectively make a Tier 3 designation a de facto land and water use decision, one that may be based on designation criteria and use restriction well outside the Department's expertise and authority.

The Department is supportive of this bill that formalizes that the designation of Tier 3 waters by the legislature through statute for three very important reasons:

1. The legislative process provides a full and public process engaging all the interested and affected parties, including those communities, residents, users, developers, and conservationists, and also those agencies with oversight responsibilities for the area lands and waters;

2. The legislative process allows for a full discussion on the consequences, restrictions, or impact to other activities and potential activities by the designation, including future and foreseeable activities; and

3. This legislative body and process is the proper forum to establish land and water use designations, and we are pleased to return that power to this body in this instance.

Providing for the designation of a Tier 3 water as structured in the bill will bring certainty to the process and would codify in statute a consistent practice for how lands and waters across the state would be designated for conservation by legislative approval rather than by division, department, or judicial discretion.

3:48:52 PM
SENATOR DUNBAR asked whether any other states use a regulatory process.

MR. BATES said yes; it's done by regulation, by statute, by commission, or by a commissioner. He noted that Idaho has a legislative process that's similar to what SB 72 proposes.

SENATOR DUNBAR referred to the slide that shows the locations of the five waters that have been nominated as Tier III waters. One of the nominations is the Chilkat River near Haines. He asked whether the legislature could act on its own to designate the Chilkat River as a Tier III water.

MR. BATES said yes; DEC's current policy directs proponents to the legislature. If the legislature were to make that designation, DEC would manage that waterbody accordingly.

SENATOR DUNBAR clarified the question. He asked, if DEC did not have the current policy in regulation, would the Environmental Protection Agency (EPA) recognize the legislature's inherent power to designate a waterbody as Tier III.

MR. BATES said he would follow up in writing after he'd conferred with the Department of Law, but his belief was that the answer is yes.

SENATOR DUNBAR articulated his conclusion that SB 72 does not give the legislature new power to designate Tier III waters; the bill restricts the department in the future from changing the regulations and eliminating the legislature from the process. He opined that this probably would reduce the likelihood of Tier III designations in the future.

MR. BATES said it would only reduce the likelihood of Tier III designations in the future if it were the will of the legislature to do so.

SENATOR DUNBAR clarified that SB 72 ensures that the designations would be solely up to the legislature.

MR. BATES agreed.

3:52:41 PM
CO-CHAIR BISHOP asked whether the onus to prove that a waterbody should be designated as Tier III was on the individual or entity

that submitted the nomination to DEC. But if SB 72 were to pass, the onus of proof would reside with the legislature.

MR. BATES replied that the onus of proof is always on the proponent. His expectation is that anybody who nominates a waterbody as Tier III would be asked to provide proof.

3:53:41 PM
SENATOR CLAMAN offered his understanding that the five waterbodies depicted on the map the sponsor presented were nominations that were submitted to DEC.

MR. BATES agreed. He explained that when each application was submitted, the department reached out to the proponent to articulate the process going forward.

SENATOR CLAMAN noted that one of the applications was submitted in 2009. He asked whether any of the nominations had been approved.

MR. BATES answered no, but each proponent received instructions on the process to pursue the designation of a Tier III waterbody. The instructions were based on DEC's policy and procedure document relating to the nomination and designation of Tier III waters.

SENATOR CLAMAN asked whether the policy became effective in 2018.

MR. BATES confirmed the effective date was November 21, 2018.

SENATOR CLAMAN summarized that the applications are submitted to DEC but the department's policy and procedure is to notify the applicant that they must go to the legislature to designate the waterbody.

MR. BATES confirmed that the department would direct the proponent to the legislature and suggest they seek help from their legislator in the House and Senate.

3:55:15 PM
SENATOR CLAMAN observed that DEC's policy is to serve as a pass through.

MR. BATES confirmed that the department would direct the proponent to the legislature to evaluate the nomination.

CO-CHAIR BISHOP observed that the hurdle for proponents was the cost to do the science necessary to prove to the legislature that the nomination was valid.

MR. BATES said he would provide a copy of the letter he submitted to the legislature last year about the cost to propose a waterbody be designated as Tier III. He said the notion is that the proponent should identify the reasons that the department should be managing that waterbody as a Tier III so it can ensure there is no degradation to the water quality.

The point is if there is a special waterbody that needs increased coverage, there should be effort put in to identify what the existing water quality criteria are so that the state agency vested with the protection of human health and the environment, and the implementation of water quality standards knows exactly how and why it is managing that waterbody as Tier III.

3:57:10 PM
SENATOR WIELECHOWSKI offered his understanding that the legislature delegated to DEC the authority to develop clean water quality standards, and that anti-degradation is part of that authority.

MR. BATES agreed; as part of the delegated authority of primacy under the Clean Water Act, DEC identified designated uses, established water quality standards, and developed and implemented an anti-degradation policy. That anti-degradation policy includes a process for Tier I waters, Tier II waters, and Tier III waters.

SENATOR WIELECHOWSKI observed that the philosophical question is whether waterbody designations should be based on an agency review of the science and what it shows to be best for the waterbody or a political decision. He further observed that the department seems to be advocating for waterbody designations that rely on political decisions.

MR. BATES posited that science would prevail when the legislature is presented with the facts.

CO-CHAIR BISHOP turned to invited testimony.

3:59:58 PM

LEILA KIMBRELL, Executive Director, Resource Development Council for Alaska, Inc., Anchorage, Alaska, provided invited testimony on SB 72, paraphrasing the following prepared testimony:

[Original punctuation provided.]

Briefly, for 47 years, RDC has advocated for a strong, diversified private sector in Alaska and to expand the state's economic base through the responsible development of our natural resources. We are a statewide trade association comprised of individuals and companies from Alaska's fishing, tourism, forestry, mining, and oil and gas industries. This includes private companies, labor organizations, Alaska Native corporations, as well as local governments and non-profit organizations. RDC collaborates with our partners and policy makers to ensure Alaska continues to have a strong and diverse economy by growing Alaska through the responsible development of our natural resources.

Thank you for the opportunity to provide invited testimony on SB 72, an act relating to the designation of state water as outstanding national resource water, also commonly referred to as "Tier 3" waters. RDC speaks in support of SB 72, which provides a clean solution to complying with EPA requirements to codify State agency policy related to Tier 3 waters for the following reasons.

EPA, under our nation's Clean Water Act, requires all states to have a policy against the degradation of waters and to maintain associated procedures that prohibit the lowering of water quality under three categories of water protection, the most stringent of which is Tier 3.

Tier 3 designation is for an Outstanding National Resource Water, which is described as having exceptional recreational or ecological significance. Tier 3 waters are required to be maintained to their baseline conditions, and effectively cannot have any new or expanded activities that have the potential to change the water quality in any way. **This would apply even in situations where the activity meets the water standards and fully protects fish and other water**

uses, especially the highly regulated industries I represent**.**

(note/citation: See 18 AAC 70.016(d)).

To be clear: the Clean Water Act, combined with other federal and state policy extensively regulates how waters are managed and impacted by all user groups. Stringent water quality standards are established, baseline study is done, extensive monitoring takes place, and action is taken to further protect waters when needed. This management already exists in Alaska.
A Tier 3 designation goes much further than our already exemplary water quality protections, without any added benefit to the environment but with added threats to economic and community activity. Specifically, any activity that has the potential to degrade a designated Tier 2 water and its tributaries could be prohibited. A designation would impact the users such as motorized vessels of any kind, residential and commercial septic systems, stormwater permits associated with road building, seafood processors, timber harvesting, and much more.
Tier 3 water designations have the potential to become a tool for anti-development interests to block or delay resource development projects. That is evident in the five nominations before DEC currently, which specify mining, oil and gas, federal land planning, and Alaska Native Corporation lands selections as threats to waterbodies.

Further problematic, a Tier 3 water designation applies "to a Tier 3 water or tributary to a Tier 3 water." This expansive designation means that it would prohibit development in entire watersheds of Alaska – essentially comparable to establishing de-facto Wilderness, akin to a national park or other expansive conservation area. For this reason, we believe the authority to designate a Tier 3 water should therefore lie solely with representatives of Alaskans - the Alaska Legislature, similar to Congress having the authority to designative federal areas as national parks or Wilderness.

Because of the watershed-wide land and water impacts of a Tier 3 designation, it is no different than the

impacts of the 12 million acres of legislatively-designated State refuges, sanctuaries, critical habitat areas, ranges, special management areas, forests, parks, recreation areas, marine sanctuaries etc. –All of these designations are made by the Legislature. Just as the Legislature made those designation, so too should the Legislature make Tier 3 designations and not the EPA.

To do so, the State needs a policy and statutory authority in place. The Alaska Department of Environmental Conservation existing policy agrees that Tier 3 designations should be made by the Legislature. Former DEC Commissioner Larry Hartig, in the Walker/Mallott Administration, submitted a letter to the Senate in November 2018:

"DEC recently updated its internal guidance to advise DEC employees who might receive a nomination of a water for Tier 3 designation on how to deal with that nomination. This guidance provides that the current process for nominating Tier 3 waters involves proposing the introduction of legislation to make the designation. Any such requests would need to go to a member or committee of the Legislature to be considered for introduction. DEC has reviewed this guidance with EPA and they confirmed what we have put in place satisfies Clean Water Act requirements for antidegradation implementation."

In short, SB 72 is a housekeeping measure to implement and codify existing DEC policy. Enactment would meet EPA's Tier 3 designation process requirement and provide process certainty to the public.

We believe that, given the significant, adverse, watershed-wide land and water use impacts and socio-economic impacts of Tier 3 designation, a Tier 3 water should be designated ONLY by a vote of the Legislature. This is consistent with the Alaska Constitution, the existing process for setting aside areas of State land and water from development, and existing DEC policy. For these reasons, we urge you to move this bill from committee and support it to statute.

Thank you for the opportunity to testify today in support of SB 72.

4:04:52 PM
CO-CHAIR BISHOP asked her to send her testimony to his office and he would distribute it to the members.

MS. KIMBRELL indicated she would do so.

CO-CHAIR BISHOP held SB 72 in committee.

4:05:09 PM
At ease

PRESENTATION(S): HEAVY OIL RECOVERY

4:05:44 PM
CO-CHAIR GIESSEL reconvened the meeting and announced a presentation by Abhijit Dandekar, Ph.D. titled, "Heavy Oil Recovery Research at the University of Alaska Fairbanks."

4:06:17 PM
DR. ABHIJIT DANDEKAR, Professor and Chair, Department of Petroleum Engineering, UAF College of Engineering and Mines (CEM), University of Alaska Fairbanks, Fairbanks, Alaska, stated his intention to provide an update on the $5 million appropriation for FY23 and FY24 for research on heavy oil recovery.

DR. DANDEKAR displayed the outline for the presentation and stated that he would begin by discussing the vast heavy oil resources in Alaska and the difficulties associated with producing that oil. This was the reason for the research. He reported that research over the last five years has provided sufficient proof that polymer enhanced oil recovery (EOR) in the Alaskan Arctic works for viscous oils. These oils are water floodable meaning that they can be recovered by injecting water. He said this was the primary motivation for ambitiously targeting Ugnu.

4:08:11 PM
DR. DANDEKAR turned to slide 3, Alaska's abundant heavy oil resources, and spoke to the following points:

(1) The left most picture on this slide shows the three main units on ANS with Viscous and Heavy

oils resources sandwiched between the Kuparuk and the Permafrost.

(2) The depth vs. oil viscosity plot on the right most side gives us an idea of the increasing viscosity with decreasing depth and three development phases.

(3) Rather than lumping everything in one heavy oil category we use a home-grown term to differentiate between viscous oils (water floodable) and heavy oil with viscosities upward of 2000 cP.

(4) Viscous and heavy oil represent about a third of known North Slope OOIP.

(5) Cumulative production of heavy and viscous oil is about 1% of OOIP slope wide and currently, there's hardly any production from Ugnu.

4:11:38 PM

DR. DANDEKAR spoke to the following points to explain why research on the recovery of heavy oil is important:

- Strategic importance to the State of Alaska and the Nation
- Technology development "in Alaska for Alaska"
- Resource too large to ignore, and within established and permitted infrastructure
- Prudhoe Bay type diluent crude is still available for heavy oil transport through TAPS. Willow has fairly light oil that may be used for this purpose in the future.

DR. DANDEKAR directed attention to the samples of viscous and heavy oil pictured on the next slide. The Schrader Bluff viscus oil moves when the test tubes are tilted but the Ugnu heavy oil shows a very slow or sluggish movement. Reasons for high viscosity are close proximity to the permafrost, fairly low reservoir pressures and the lack of lighter hydrocarbon components. He noted that in Canada and the area near Bakersfield, California, it's common to see steam injected to produce heavy oil, but in Alaska the presence of permafrost precludes this typical thermal method of recovery.

4:15:03 PM

CO-CHAIR BISHOP asked if the permafrost was about one-quarter mile or 2,500 feet deep.

DR. DANDEKAR replied that it varies depending on the area but it's from about 2,000 to 2,500 feet deep. He added that the depth for the resources he's discussing is 3,000 feet plus so there's some spacing. Another point of reference is the reservoir temperature, which for both viscous oil and heavy oil is about 75 degrees Fahrenheit.

4:16:17 PM
DR. DANDEKAR advanced to the illustration on slide 6 that illustrates sweep efficiency or mobility ratio. The concept is that water or gas injected into immobile heavy oil will cause movement. The example in the top figure shows that water injected in the oil will "finger" through the thick oil without much recovery. If water soluble polymer powder is mixed with water, the thicker polymer solution is 20-40 times the viscosity of 1 cP of water. He said it's important to know the optimum concentration of the polymer so there are no injectivity issues, but enough research has been done to show that this does work.

4:19:33 PM
DR. DANDEKAR turned to slide 7 to discuss other concerns associated with the recovery of heavy oil. The first is known as polymer retention. He said this is a significant parameter that may impact the effectiveness of a polymer flood; that portion of the polymer is retained by the rock, so it doesn't play a role in the displacement efficiency. This is shown in the first picture. A second concern is that the use of any type of solvent may precipitate asphaltenes in the reservoir and blocks the pores, thus impeding the flow of oil. This is called formation damage. He said there are also concerns related to the breakthrough polymer. When the polymer breaks through and shows up in the production stream, it will influence emulsions that have to be broken down. The picture on the lower left shows heavy oil and water emulsions and fouled heater tubes that influence heat transference. Finally, conformance control must be considered to ensure even distribution of the polymer solution or injectant in nearly mile-long horizontal wells. Injection control devices that are similar to nozzles are used for this purpose. He said the research team also investigated recovering the breakthrough polymer. The viscosity of the breakthrough polymer is reduced but can still be used in the "makeup" solution.

4:25:05 PM
DR. DANDEKAR advanced to slide 8 to discuss the success of the Schrader Bluff pilot project. He pointed to the image on the top left that shows the polymer injection unit that's located at the

J-Pad of the Milne Point unit. The idea is to prepare a thick polymer solution that is diluted to a specified concentration for use in the injection unit. The polymer that's used is called Hydrolyzed Poly Acrylamide or HPAM. It looks like sugar and is stored in the solo that's pictured.

4:26:36 PM
DR. DANDEKAR advanced to slide 9 to discuss the enhanced oil recovery (EOR) benefit that was realized from the J-Pad pilot project. The chart shows the actual oil production rate for the polymer flood compared to the best-case history matched model. To do the forecast, actual production data is used to calibrate the assimilation models. This chart looks at the incremental recovery of about 700 barrels/oil/day (bopd) compared to recovery with water flooding, which isn't very efficient.

He said another measure of success is the polymer utilization factor. This is the amount of polymer needed to produce the incremental barrel of oil. In this case, it was 1.7 pounds of polymer per incremental barrel, which is among the lowest in the reported field cases worldwide. He noted that the cost for the polymer was $2-3 per pound so the cost was not high to produce the incremental barrel.

4:27:56 PM
DR. DANDEKAR directed attention to the charts on slide 10 that show the forecast and economic analysis that was done. He said this shows that water flood alone, which is the blue curve, is not very efficient compared to polymer floods. The red curve is the best model, but even the most conservative polymer model, which is the gray curve, produces from 1.6 to 1.7 times more than the water flood recovery.

The bar chart shows the economic analysis for the history matched models. A higher net present value indicates a greater project value while a higher profit-to-investment ratio and low development cost indicates a more efficient investment. All three models were robustly profitable through 2050.

Slide 11 speaks to workforce development. The picture shows Cody Keith, the Alaskan student who ran all the simulations for the test project. He won the Society of Petroleum Engineers Western Regional Student Paper Contest and the master's division international student paper contest. He currently is working for ConocoPhillips as a reservoir surveillance engineer in the Kuparuk area.

4:31:03 PM
DR. DANDEKAR advanced to slide 12, Targeting Ugnu – Polymer Alternating Solvent. He said the big question is whether polymer alone will work for the heavy oil in Ugnu, given its comparatively high viscosity. The proposed solution is to use a solvent to reduce the viscosity of Ugnu oil and then use polymer.

Advancing to slide 13, he summarized the following points regarding project management:

(1) We have basically retained the structure from our last project with involvement of other non-UAF experts.
(2) We have a strong commitment from industry in terms of the needed samples and technical advisory.
(3) The entire team meets for 2 hours every other Friday to review the progress and internally we meet with the students every alternate Friday.
(4) Senator Bishop visited us back in early January and you're most welcome again any time and I extend that invitation to the entire committee.
(5) I'll share some results in the next few slides, which are basically indicators that we're steadily making progress.

4:32:45 PM
DR. DANDEKAR spoke to the following points on slide 14 to discuss the phased approach for the polymer alternating solvent project:

(1) The approach in this project somewhat differs from the Schrader Bluff pilot in that it was designed as a "Field Laboratory" right from day one because there was sufficient experimental and simulation evidence that warranted the field testing. Note though that the lab work and simulation continued in parallel as new data emerged from the pilot.
(2) However, polymer alternating solvent is a new territory and that means we need to first demonstrate the efficacy of appropriate polymer-solvent combo in the lab and run simulation models. After that we will test the proposed methodology in a heavy oil reservoir – this phased approach is shown here.

4:34:23 PM
DR. DANDEKAR stated that the next few slides show the latest results from the project. The first picture looks at the swelling effect that carbon dioxide, as a solvent, has on Ugnu oil. The test samples and graph show the significant reduction in viscosity when carbon dioxide comes in contact with and is dissolved into the heavy Ugnu oil. The plan is to also test with other miscible solvents such as natural gas. He noted that the discussions about carbon capture, utilization, and storage also align with the project.

DR. DANDEKAR displayed slide 16, Ugnu oil recovery – low salinity water and polymer. He said the team has run commercial sand pack core flooding experiments using both water and polymers. These experiments show that some heavy Ugnu oil can be recovered when it's flooded with low salinity water. But if a polymer solution is injected after the water, even more heavy oil is produced. The caveat is that these commercial sand packs have high porosity and permeability, so the real test will be when water followed by a polymer solution is injected into actual reservoir sands.

4:37:22 PM
DR. DANDEKAR displayed slide 17, CO^2 solvent -> Low Salinity Water and/or CO^2 solvent -> Polymer injection Alternating Cycles.

- Two different modes of CO_2 "soaking" followed by low salinity water
- Evaluate oil viscosity reduction/swelling
- Monitor gas, oil and water production
- Evaluate CO_2 "stored" while enhancing heavy oil recovery

He explained that these experiments inject CO_2 alternated with water injection. At this stage, it is not polymer alternating solvent, it is water alternating solvent. The schematic shows what's called huff and puff, which means the solvent is injected and left to soak into the oil. This is followed by low salinity water and also polymer in sand pack floods. He said the amount of CO_2 that's injected is just enough to see the effect. He acknowledged that this will be a long iterative process to figure out what combination works best.

4:39:04 PM
DR. DANDEKAR stated that the schematic on slide 18 illustrates the soaking modes that have been tested in the alternating

cycles. On the left it shows a certain amount of CO_2 is injected while oil is produced. Then the system is closed for 24 hours so the CO_2 can soak. This is followed with low salinity water injection to see how much the viscosity has reduced, and then the heavy oil is recovered.

The second image illustrates full soak. This means CO_2 is injected until a certain pressure is achieved, and then the system is closed. This is followed with water injection. He explained that the idea is to determine the ideal combination of water and CO_2.

4:40:00 PM
DR. DANDEKAR displayed slide 19, Ugnu oil recovery: CO_2 – low salinity water alternating cycles, which shows results from last week. The test vials on the left show the cumulative oil and water production. CO_2 is also produced but it can only be seen on a gas meter. He said the motivation was to determine just how much CO_2 can actually be stored in heavy oil; it ties into CCUS.

The bar chart on the right shows that about 11 percent of the oil can be produced when just CO_2 is injected as a solvent. But when water was injected into that less viscous oil, as much as 43 percent of the oil was produced. Then there was a second full soak followed by more injected water, which produced another 4.9 percent of the oil.

4:41:51 PM
DR. DANDEKAR concluded the presentation by reviewing the upcoming plans.

- Continue working on all Phase I tasks so that enough data is generated for initial reservoir simulation – decision point
- A two-day forum/conference of academics (US and Canada), industry and SNF (polymer manufacturer) on heavy oil EOR at UAF after the SPE Western Regional Meeting to:
  - —Discuss our currently ongoing projects and raise ideas on how to extend our current work
  - —Visit our labs to know our capacity and capability
  - —Discuss future potential collaborations in heavy oil EOR

DR. DANDEKAR extended his thanks to everyone who contributed to the research efforts.

4:44:40 PM
SENATOR KAWASAKI asked if the polymer was designed in Alaska or just tested here.

DR. DANDEKAR replied that polymer is not new technology, but this was the first polymer pilot project in Alaska. S&F manufactures the polymer in Georgia. Conceptually, polymer could be manufactured in Alaska because the primary raw material is natural gas, but other elements aren't readily available here, so the logistics would be complicated.

SENATOR KAWASAKI asked if the polymer is inert, and what happens to it after it's used for flooding.

DR. DANDEKAR referenced the slide that shows the polymer breaking through into the produced stream, but not in amounts that cause concern. For example, the polymer concentration on the J-Pad ranged from 300-700 parts per million. The polymer stays in the water and is processed; the separated water is disposed of, and some may be used for reinjection. The team is looking at recycling the polymer so it's more of a closed system.

4:49:14 PM
SENATOR CLAMAN summarized that the concept is to inject CO_2 into the heavy oil to reduce the viscosity and make it easier to produce. He asked what happens to the CO_2 after it comes out of the ground.

DR. DANDEKAR said part of the research is to determine how much of the CO_2 stays in the reservoir, but the gas that's produced could be used again. Some of the recycling could be done on the pad using a "knock out drum." This process is already used to recycle water containing polymer. He acknowledged that once a lot of CO_2 shows up, something else will have to be done.

SENATOR CLAMAN asked if he was saying that not all the CO_2 that was injected would stay in solution with the heavy oil.

DR. DANDEKAR said that's correct; it's similar to the gas injection that's been done at Prudhoe Bay for years.

4:52:34 PM
SENATOR KAUFMAN wondered how the dissolved solvent would affect the blend of the oil. He specifically mentioned sulfur content.

DR. DANDEKAR said he didn't believe there was any concern about sulfur, especially with heavy oil.

CO-CHAIR GIESSEL thanked him for the presentation and his work at the university.

4:54:42 PM
There being no further business to come before the committee, Co-Chair Giessel adjourned the Senate Resources Standing Committee meeting at 4:54 p.m.