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ALASKA STATE LEGISLATURE
HOUSE RESOURCES STANDING COMMITTEE
March 28, 2018
1:03 p.m.

MEMBERS PRESENT

Representative Andy Josephson, Co-Chair
Representative Geran Tarr, Co-Chair
Representative John Lincoln, Vice Chair
Representative Harriet Drummond
Representative Justin Parish
Representative Chris Birch
Representative DeLena Johnson
Representative David Talerico

MEMBERS ABSENT

Representative Mike Chenault (alternate)
Representative Chris Tuck (alternate)
Representative George Rauscher

COMMITTEE CALENDAR

HOUSE BILL NO. 399
"An Act disallowing a federal tax credit as a credit against the corporate net income tax; repealing a provision allowing the exclusion of certain royalties accrued or received from foreign corporations for purposes of the corporate net income tax; repealing the reduced rate for the alternative tax on capital gains for corporations; repealing an exemption from filing a return under the corporate net income tax for a corporation engaged in a contract under the Alaska Stranded Gas Development Act; and providing for an effective date."

- HEARD & HELD

HOUSE BILL NO. 173
"An Act establishing the Alaska Climate Change Response Commission; relating to the powers and duties of the Alaska Climate Change Response Commission; establishing the climate change response fund; and relating to the surcharge on oil produced in the state."

- HEARD & HELD

PREVIOUS COMMITTEE ACTION

BILL: HB 399
SHORT TITLE: CORP. TAX: REMOVE EXEMPTIONS/CREDITS
SPONSOR(s): FINANCE

02/23/18	(H)	READ THE FIRST TIME - REFERRALS
02/23/18	(H)	RES, FIN
03/28/18	(H)	RES AT 1:00 PM BARNES 124

BILL: HB 173
SHORT TITLE: CLIMATE CHANGE COMMISSION
SPONSOR(s): JOSEPHSON

03/10/17	(H)	READ THE FIRST TIME - REFERRALS
03/10/17	(H)	STA, RES, FIN
04/11/17	(H)	STA AT 5:30 PM BARNES 124
04/11/17	(H)	Heard & Held
04/11/17	(H)	MINUTE(STA)
05/04/17	(H)	STA AT 3:00 PM GRUENBERG 120
05/04/17	(H)	Heard & Held
05/04/17	(H)	MINUTE(STA)
05/09/17	(H)	STA AT 3:00 PM GRUENBERG 120
05/09/17	(H)	Moved CSHB 173(STA) Out of Committee
05/09/17	(H)	MINUTE(STA)
05/10/17	(H)	STA RPT CS(STA) NT 2DP 3DNP 2NR
05/10/17	(H)	DP: WOOL, KREISS-TOMKINS
05/10/17	(H)	DNP: BIRCH, KNOPP, JOHNSON
05/10/17	(H)	NR: TUCK, LEDOUX
05/15/17	(H)	RES AT 1:00 PM BARNES 124
05/15/17	(H)	-- MEETING CANCELED --
05/17/17	(H)	RES AT 1:00 PM BARNES 124
05/17/17	(H)	-- MEETING CANCELED --
05/31/17	(H)	RES AT 1:00 PM BARNES 124
05/31/17	(H)	-- MEETING CANCELED --
03/19/18	(H)	RES AT 1:00 PM BARNES 124
03/19/18	(H)	<Bill Hearing Canceled>
03/28/18	(H)	RES AT 1:00 PM BARNES 124

WITNESS REGISTER

BRODIE ANDERSON, Staff
Representative Neal Foster
Alaska State Legislature
Juneau, Alaska

POSITION STATEMENT: Introduced HB 399 on behalf of Representative Foster, co-chair of the House Finance Committee, sponsor.

BRANDON SPANOS, Deputy Director
Tax Division
Department of Revenue
Juneau, Alaska
POSITION STATEMENT: Answered questions relevant to HB 399.

MICHAEL WILLIAMS, Revenue Audit Supervisor
Tax Division
Department of Revenue
Anchorage, Alaska
POSITION STATEMENT: Answered a question relevant to HB 399.

JEREMY LITTELL, Research Ecologist
US Geological Survey (USGS)
Department of Interior Alaska Climate Science Center
Anchorage, Alaska
POSITION STATEMENT: During the hearing of HB 173, provided a PowerPoint presentation entitled, "Climate 101 for Alaska."

MICHAEL BLACK, Director
Department of Community Infrastructure Development
Division of Environmental Health and Engineering
Alaska Native Tribal Health Consortium (ANTHC)
Anchorage, Alaska
POSITION STATEMENT: During the hearing of HB 173, provided a PowerPoint presentation entitled, "Effects and Adaptation To Climate Changes in Alaska."

JOEL NEIMEYER, P.E., Federal Co-Chair
Denali Commission
Anchorage, Alaska
POSITION STATEMENT: During the hearing of HB 173, provided a PowerPoint presentation entitled, "Denali Commission."

JAY FARMWALD, Director of Programs
Denali Commission
Anchorage, Alaska
POSITION STATEMENT: Addressed a question during the hearing of HB 173.

CHRIS ROSE, Executive Director
Renewable Energy Alaska Project (REAP)
Member, Climate Action for Alaska Leadership Team

Anchorage, Alaska
POSITION STATEMENT: Testified during the hearing of HB 173.

DAVIN HOLEN, PhD, Coastal Community Resilience Specialist
Alaska Sea Grant Marine Advisory Program
Assistant Professor, College of Fisheries and Ocean Sciences
University of Alaska Fairbanks (UAF)
Fairbanks, Alaska
POSITION STATEMENT: During the hearing of HB 173, provided a PowerPoint presentation entitled, "Climate Impacts to Subsistence Economies & Community and Regional Adaptation Planning."

NIKOOSH CARLO, Senior Advisor
Climate and Arctic Policy
Office of the Governor
Juneau, Alaska
POSITION STATEMENT: Provided a PowerPoint presentation entitled, "Alaska Climate Change Strategy," during the hearing of HB 173.

ACTION NARRATIVE

1:03:23 PM

CO-CHAIR ANDY JOSEPHSON called the House Resources Standing Committee meeting to order at 1:03 p.m. Representatives Josephson, Tarr, Birch, Parish, Talerico, Johnson, and Lincoln were present at the call to order. Representative Drummond arrived as the meeting was in progress.

HB 399-CORP. TAX: REMOVE EXEMPTIONS/CREDITS

1:04:59 PM

CO-CHAIR JOSEPHSON announced that the first order of business would be HOUSE BILL NO. 399, "An Act disallowing a federal tax credit as a credit against the corporate net income tax; repealing a provision allowing the exclusion of certain royalties accrued or received from foreign corporations for purposes of the corporate net income tax; repealing the reduced rate for the alternative tax on capital gains for corporations; repealing an exemption from filing a return under the corporate net income tax for a corporation engaged in a contract under the Alaska Stranded Gas Development Act; and providing for an effective date."

1:05:02 PM

BRODIE ANDERSON, Staff, Representative Neal Foster, Alaska State Legislature, introduced HB 399 on behalf of Representative Foster, co-chair of the House Finance Committee, sponsor. He said HB 399 is the culmination of work to address foregone revenue and to provide the State of Alaska with the ability to potentially capture new revenue. To provide a brief history on how the bill came to be introduced, he noted that in 2014 legislation was passed that required both the Department of Revenue (DOR) and the Legislative Finance Division, Legislative Agencies and Offices, to create a report on indirect expenditures and the amount of foregone revenue not captured by the State of Alaska. The first indirect expenditure report was submitted in 2015 [entitled, "2015 Legislative Finance Indirect Expenditure Report"]. This report identified a list of indirect expenditures within the Department of Revenue that should be terminated. Last year during the fiscal year 2018 (FY18) budget process the House Finance Subcommittee for the Department of Revenue reviewed these indirect expenditures and recommended the House Finance Committee offer legislation that eliminates these indirect expenditures.

MR. ANDERSON explained HB 399 would repeal certain credits and exemptions that are recommended for termination in both the 2015 indirect expenditure report and last year's FY18 budget subcommittee. He said the indirect expenditures that would be repealed in [HB] 399 were selected for repeal for the following reasons: the indirect expenditures did not meet legislative intent, had limited or no usage, or their conforming purpose has changed. The following indirect expenditures would be repealed by HB 399: federal tax credits, foreign royalty exclusions, a reduced rate for capital gains, and credit associated with the Alaska Stranded Gas Development Act. According to the fiscal note before the committee, he continued, the combined total of the potential new revenue is up to an estimated $6.9 million.

1:07:43 PM

MR. ANDERSON provided a sectional analysis of HB 399. He said Section 1 would amend Alaska Statute (AS) 43.20.021(a) by amending the current section with conforming language that removes the list of federal credits as eligible items against Alaska corporate income tax liability.

MR. ANDERSON stated Sections 2 and 3 would amend AS 43.20.145(c) and (d), respectively, by amending those current sections with

conforming language in the Affiliated Groups section, removing the reference to the subsection on foreign royalty payments as eligible for Alaska corporate income tax liability.

MR. ANDERSON explained Section 4 is the repealer section of the bill. He said this section would repeal the following statutes: AS 43.20.021(c), which is the reduced rate in capital gains; AS 43.20.21(d), which is the eligibility of federal tax credits for Alaska corporate income tax liability; AS 43.20.036(a), which is the eligibility of federal foreign tax credit for Alaska corporate income tax liability; AS 43.20.036(b), which is the eligibility of federal investment credit for Alaska corporate income tax liability; AS 43.20.042, which is the eligibility of federal special industrial incentive investment credit for Alaska corporate income tax liability; AS.43.20.144(g), which is the exemption for Alaska corporate tax liability for entities participating in contracts related to the Alaska Stranded Gas Development Act; AS 43.20.145(g), which is the Stranded Gas Act exclusion; and AS 43.20.145(b)(3), which is the foreign royalty exclusion.

MR. ANDERSON said Section 5 is uncodified law, the applicability clauses. Sections 1, 2, 3, and portions of 4 would be subject to the effective date, which is Section 6, and which would add a new section making the effective date for this legislation as January 1, 2019.

1:11:46 PM

REPRESENTATIVE BIRCH offered his understanding that the genesis of HB 399 is the indirect expenditure report assessment. He asked what the net result is of this in addition to getting rid of some tax credits. He further asked why [these tax credits] were had in the first place - for example, whether they were incentives or inducements for certain behavior – and whether the State of Alaska will lose something by eliminating them.

MR. ANDERSON replied that many of the indirect expenditures were created at the time the tax code was created. Many of them were legislative intent to create a specific behavior. Since their creation they maybe haven't lived up to the expectation of inciting that behavior for corporations within Alaska.

1:12:49 PM

BRANDON SPANOS, Deputy Director, Tax Division, DOR, stated the 2015 indirect expenditure report tried to answer that specific

question on each individual expenditure. The report tried to detail whether the indirect expenditure was meeting what its intent was, if DOR knew what the intent was. He explained the federal tax credits were adopted by reference and they were given a specific rate that was similar to the tax rate prior to adopting [the state's] new structure in 1970. So, basically, corporations were already getting that and [DOR] continued to adopt it. He added he hasn't gone back and listened to those hearings and therefore doesn't know if there were any other specific reasons.

REPRESENTATIVE BIRCH inquired whether there has been any consultation with those who would be impacted by this and whether the feedback has been adverse.

MR. ANDERSON answered that at this time the only true outreach would be the creation of the 2015 Legislative Finance Indirect Expenditure Report and discussions throughout policy committees and committees to discuss whether indirect expenditures should be removed. Regarding who is impacted, he said DOR did submit a letter. Particularly in 2016, he continued, 273 beneficiaries for a total of $1.4 million participated in claiming federal tax credits against their Alaska corporate income tax liability.

1:15:17 PM

REPRESENTATIVE PARISH observed the change in revenue anticipated for the Alaska Stranded Gas Development Act is $0. He requested this be spoken to.

MR. SPANOS responded the credits were sunset through statute. He said 1994 was the last date that [companies] could have an expenditure that would create a credit and [companies] could carry it forward no later than 1999. This is really just cleanup language, he continued, in that it would remove credits that no longer exist.

REPRESENTATIVE PARISH surmised this part of the bill is what falls under the House Resources Standing Committee's purview. Since this part is just conforming language, he said, he would just as soon pass the bill on to the House Finance Committee.

MR. ANDERSON replied that because of the Alaska Stranded Gas Development Act component in HB 399 he was not surprised the bill received a House Resources Standing Committee referral to answer that portion of the question.

REPRESENTATIVE PARISH noted the intended purpose of [the foreign royalty exclusion] was to encourage foreign investment in Alaska. However, he said, this exclusion has had the unintended consequence of corporations transferring certain assets like patents to overseas subsidiaries, paying royalties for their use, and then excluding 80 percent of those expenses from income. He asked how much of the total fiscal impact of this portion would be captured by closing this troubling loophole.

MR. ANDERSON drew attention to the fiscal note, page 2, change in revenue estimates, item 2 on foreign royalties, and said DOR states it could be a potential of $1.7 million.

1:18:35 PM

REPRESENTATIVE PARISH inquired whether it is accurate to say that that suggests the vast majority of these monies are foregone by the state essentially to incentivize domestic companies sending assets overseas or giving them to overseas holding companies and then paying fees for their use.

MR. SPANOS responded they could be legitimate royalties and not necessarily a transfer of U.S. assets to gain that benefit; it could be some other asset that was already overseas. It's a multi-national corporation, he said, the corporation pays royalties to a foreign subsidiary or a foreign parent and would receive a benefit of an exclusion of 80 percent of those royalties. It's unusual for a state to take that position, he added.

REPRESENTATIVE PARISH asked whether it would be correct to say that it does create a positive incentive for sending such assets overseas.

MR. SPANOS answered yes DOR has seen that happen.

REPRESENTATIVE BIRCH thanked Mr. Spanos and said he found the information that Mr. Spanos referenced.

1:20:14 PM

CO-CHAIR JOSEPHSON opened public testimony on HB 399.

1:20:25 PM

MICHAEL WILLIAMS, Revenue Audit Supervisor, Tax Division, Department of Revenue (DOR), at the request of Co-Chair

Josephson described his position at DOR. He said he specializes in corporate income tax, so he is the principle party for enforcement of these statutes as they currently exist and would be the principle party for enforcement of these statutes should they change.

1:21:27 PM

CO-CHAIR JOSEPHSON closed public testimony after ascertaining no one wished to testify.

CO-CHAIR JOSEPHSON held over HB 399.

HB 173-CLIMATE CHANGE COMMISSION

1:22:10 PM

CO-CHAIR JOSEPHSON announced that the next order of business would be CS FOR HOUSE BILL NO. 173(STA), "An Act establishing the Alaska Climate Change Response Commission; and relating to the powers and duties of the Alaska Climate Change Response Commission."

1:22:19 PM

The committee took a brief at-ease.

1:23:00 PM

CO-CHAIR JOSEPHSON, speaking as the prime sponsor, explained it is not his intent to advance HB 173, but he wants to talk to the committee about the legislation. The bill before the committee is a version from the House State Affairs Standing Committee although he has prepared a [proposed] committee substitute (CS), Version M. The reason he is disinclined to advance the bill is that in October 2017, Governor Walker created a climate change panel and he doesn't want to compete with that panel or distract from that panel's good work. In reviewing HB 173, including Version M, there are some things he would like to talk to the administration about that are somewhat different. They are different on the margins. The administration had several hundred thousand dollars to operate its climate action team.

CO-CHAIR JOSEPHSON explained Version M, would add a 1 cent conservation surcharge to the existing surcharge in the prevention account, increasing that account to a full 5 cents. There is an additional 1 cent [surcharge] in the response

account. The thinking behind the legislation was that a climate change commission needed some source of funding to have an office, and to establish itself, and to use seed money effectively to then try to obtain other grants and other additional funding.

CO-CHAIR JOSEPHSON stated that in addition to the financing difference the other principle difference with the governor's team is the makeup. Version M of HB 173 would include a number of the governor's cabinet and that can be true under the governor's plan as well. So, there are stylistic differences. He said he wants to use Version M merely as a talking point on the margins to talk about how this legislation is somewhat different than what the governor has conceived. He would like to adopt Version M as the working document to use it as a talking point but not to move it forward.

1:26:15 PM

CO-CHAIR TARR moved to adopt the proposed committee substitute (CS), Version 30-LS0163\M, Radford, 3/16/18, as the working document.

1:26:34 PM

REPRESENTATIVE BIRCH objected.

CO-CHAIR JOSEPHSON noted the State Affairs version would create a commission without any funding source. Version M would add a funding source. Another significant difference is that at the end of Version M, pages 8-9, there is transition language which references the wish of the bill that in the event that the governor's team was dissolved, primarily, for example, he didn't wish it to continue or he was no longer governor, this bill would come into effect. So, it is designed to keep a climate change panel moving forward in the absence of a governor's climate change strategy or [Climate Action for Alaska Leadership Team].

1:27:44 PM

CO-CHAIR JOSEPHSON opened invited testimony related to HB 173.

REPRESENTATIVE BIRCH stated this is wrongheaded. He said the billion-dollar issue on oil tax credits keeps being kicked down the road. This climate change bill would add another penny per barrel of oil, which is basically another tax, and the co-chair

has said he doesn't intend to act on this. Given the committee's time is finite, he urged the committee focus on something it intends to act on.

CO-CHAIR JOSEPHSON responded that the bill Representative Birch wishes to hear is going to be heard in 48 hours. While he doesn't intend to advance his bill, he continued, the committee is about to hear experts testify on climate change and many Alaskans do intend to act on the climate change problem.

REPRESENTATIVE JOHNSON inquired whether the committee is going to vote on the objection.

1:29:55 PM

The committee took a brief at-ease.

REPRESENTATIVE DRUMMOND reminded committee members that the village of Newtok just received $1 million from the federal government to move the village. The federal government has accepted that climate change is real and is impacting Alaskan communities, she said. It is important to adopt the [proposed] CS and get on with it.

1:30:51 PM

A roll call vote was taken. Representatives Drummond, Parish, Lincoln, Tarr, and Josephson voted in favor of adopting the proposed committee substitute for HB 173, Version 30-LS0163\M, Radford, 3/16/18, as the working document. Representatives Birch, Johnson, and Talerico voted against it. Therefore, Version M was before the committee by a vote of 5-3.

1:31:53 PM

CO-CHAIR JOSEPHSON said committee members would use Version M to the extent that members wish as a talking point with testifiers.

REPRESENTATIVE JOHNSON noted she is on the House State Affairs Standing Committee which heard the bill's previous version. She asked whether the funding provision of Version M is the only difference between the two versions.

CO-CHAIR JOSEPHSON confirmed that is one difference and said the other is the transitional language in Version M on pages 8-9.

REPRESENTATIVE TALERICO offered his understanding that what the governor put together was done via administrative order (AO) in October [2017].

CO-CHAIR JOSEPHSON answered correct. It is AO 289 signed on October 31, 2017. He began the invited testimony.

1:33:15 PM

JEREMY LITTELL, Research Ecologist, US Geological Survey (USGS), Department of Interior Alaska Climate Science Center, provided a PowerPoint presentation entitled, "Climate 101 for Alaska." It is the role of USGS to provide scientific information underpinning climate change and make climate information more available to those who might use it. He said he was asked to provide the committee with a brief overview of current climate change and expected changes in the 21st Century.

MR. LITTELL moved to slide 2 and said there are three main messages to take away. First, weather observations/data over the past 40-plus years show that Alaska has already warmed about two and a half times faster than the average for the whole planet – roughly 7.5 degrees Fahrenheit (F) per century over the last 45 years in contrast to about 3 degrees F for the planet as a whole. So, the rate of warming in the high latitudes and in the far north is greater than that in the rest of the U.S. and the rest of the planet. Second, by the late 2080s the annual average temperature in the state is projected to increase by 7 degrees F in Southeast Alaska and by 14 degrees F on the North Slope. Third, precipitation is likely to increase over the entire state and in all seasons, but those increases won't be sufficient to offset the temperature increases, resulting in much increased permafrost thaw, shorter snow season, and longer fire seasons.

1:35:41 PM

MR. LITTELL, responding to Co-Chair Josephson, provided his background. He said his background and training is in climate science and the way that climate impacts terrestrial ecosystems like forests and other vegetation. He has spent the last 15 years working on problems of climate impacts, usually those that are relevant to some set of stakeholders, for example climate effects on forests and working with the U.S. Forest Service (USFS) to better understand what that might look like or species of concern to the U.S. Fish and Wildlife Service (USFWS). He

deals with a lot of climate data and spends lots of time working with climate projections and how to make them more robust.

MR. LITTELL addressed slide 3 depicting a temperature graph by Rick Thoman of the National Weather Service. He said the graph includes the station data over the entire state of Alaska. The graph shows the changes in temperature from 1925-2016, the most recent completed year for which the data has been verified. Each black dot on the graph, he explained, represents a year's average annual temperature for the state as a whole. From 1925 to the mid-1970s there is a considerable amount of variability year to year, which is also the case going forward from there. The red line on the graph, he further explained, indicates the trend that is statistically detectable during that period. From 1925-1976 there is no statistically significant trend, but after the mid-1970s the trend becomes increasingly evident and is statistically significant for any period of time for which the data justify that analysis. The rate of change is roughly seven-tenths of a degree F per decade since the mid-1970s, which is twice the global average. He noted the graph depicts observations, not modeled data. It is an aggregate or an average over all of the stations in the state for which the quality control procedures have justified the work.

1:38:57 PM

REPRESENTATIVE TALERICO pointed out that today's technology is different than that of 1925. He therefore asked whether all of the measurements are taken from consistent points over the time frame of 1925-2016.

MR. LITTELL replied the number of stations increased in the late 1940s to early 1950s and there were decreases later as older stations were decommissioned. But, for the most part, over this period of record, this analysis relies on the subset of stations that have the best record. There are more of them in the latter period and there are differences in the instrumentation that has been used over time, so the technology used to measure these has changed. The U.S. historic climate network from which a lot of these stations are taken goes through quite a controlled process. For example, sometimes stations in the past would get moved and that is only detected if someone wrote down that the station was moved or increasingly now it is detected more by looking at comparisons to other stations. Most of this information is consistent to the time period, but more stations did come on line in the middle of the century.

1:40:47 PM

MR. LITTELL turned to slide 4 and stated there are other lines of evidence in Alaska, we don't have to rely just on temperature to understand that things are changing around us. It is evident that glacier area and volume are decreasing, particularly in Southeast and Southcentral Alaska, but also in the far north. Sea ice extent seasonally is decreasing, with this year being an example of that in Western Alaska in the Bering Sea. Permafrost is thawing, and the seasonal active layer is deeper. Fire area burned is also increasing. All of these have robust science underpinning them and have been concluded repeatedly in the published literature. He further stated that the global and regional historical 20th Century temperature record cannot be explained without considering both human drivers, (primarily increases in greenhouse gasses in the atmosphere) and natural variability. These impacts can therefore be expected to continue as greenhouse gas concentration continues to increase in the atmosphere.

MR. LITTELL brought attention to slide 5, a map of Alaska showing the rate of temperature change for each of the state's climate divisions from 1970-1999 relative to the global average. For example, the North Slope rate of change is 2.6, which means this area is warming at 2.6 times the global average for the period 1970-2016. In Southeast, Southcentral, and the Aleutians the rates of change are slower. The Interior rate of change is in between. But averaged over the state it is over 2 degrees F change relative to the global average. The rate of change is much faster in Northwestern and Northern Alaska than it is in Southcentral and Southeast.

1:43:19 PM

REPRESENTATIVE LINCOLN asked why the Arctic is warming faster than the rest of the globe.

MR. LITTELL replied there are two main reasons and many little reasons, but to answer the question he will address only the two main reasons. The first main reason is that going northward, the length of the snow cover season is longer. As snow cover is decreased the rate of heat transfer to the ground is increased. Snow reflects light in the visible spectrum so there is less surface warming. Without snow it is darker so there is more absorption of heat and it warms faster than would otherwise be expected. The second main reason is that with the mechanisms of climate change and how they influence the planet and the

atmosphere as a whole, there is a greater rate of heat transfer from the equator to the poles. Energy is basically moved more efficiently from the equator to the poles, which results in a faster rate of change at the high latitudes than at low or mid latitudes.

1:44:52 PM

MR. LITTELL displayed slide 6, a map of Alaska showing the expected change in annual average temperature in F for each of the state's climate divisions for the years 2070-2099 as compared to the years 1970-1999. These numbers are lower in the lower latitudes and higher in the higher latitudes. An increase of 14 degrees F [in Northern Alaska] is expected by the late 21st Century. This is from five different global climate models that have been shown to perform well over the Arctic and Alaska. This is work on projections has been done in conjunction with partners at the University of Alaska Fairbanks (UAF). The changes for all of Alaska's climate divisions are quite large relative to the historical averages.

MR. LITTELL moved to slide 7 and discussed the percent increase in precipitation that is expected for the years 2070-2099. He noted that the darker the blue on the map, the larger the expected percent increase in precipitation. He pointed out that there is a larger percent increase in precipitation is expected in Northern and Interior Alaska than in Southcentral, the Aleutians, or Southeast. With a warming climate in Alaska the precipitation increases are projected in all seasons on average. The increase in summer is not enough to offset the increased evaporation that is driven by the temperature increases. So, for example, despite the increase in precipitation the fuels available to fires will likely not be any less available than they are now, and evidence indicates they will likely be more available.

MR. LITTELL displayed slide 8, a map of Alaska depicting the [expected] changes in April 1 snowpack for the years 2070-2099. He explained the colors on the map represent decreases (reds) or increases (blues) in the April 1 snowpack as a function of the temperature and precipitation that occur between October and March. A pronounced decrease in the snow cover season [is expected], he noted, even as snow cover in the middle of spring is increasing. In some of the highest parts of the Arctic, [the expectation is for] a longer snow-free season and more snow due to the increased precipitation. However, he continued, [the expectation for] Southeast, Southcentral, and Western Alaska is

for substantial decreases [in the snowpack] – from as small as 10-20 percent to as great as 60-80 percent in Southeast and Southcentral coastal areas.

1:47:55 PM

REPRESENTATIVE DRUMMOND inquired about the meaning of "PAS" above the color key on slide 8.

MR. LITTELL responded "PAS" stands for "precipitation as snow," which is a percentage of the fraction of water that comes out of the sky as snow. This depicts [the change] in PAS as a percent, he explained. A 100 percent decline in PAS means it all becomes rain; a 60 percent increase in PAS is assumed to be available in snowpack in April. No accounting is made for melting, he noted, it is just the maximum potential snowpack.

REPRESENTATIVE PARISH drew attention to slide 3 depicting the increase in Alaska temperature and asked what the probability value (p-value) is that this trend is chance.

MR. LITTELL answered there are two different probabilities - one for the flat red line and the other for the rising red line that starts in 1976. He said the flat line indicates a very small probability that it is anything other than a flat line; a statistically significant trend cannot be fit through that, so it is flat. For the rising red line, he stated, the probability is less than 5 percent that it is not a positive trend.

REPRESENTATIVE PARISH noted villages in Alaska are falling into the ocean and Alaska is losing a great deal of coastline every year. He inquired what the likelihood is that will increase and whether the trend will move north.

MR. LITTELL replied that the rate of thaw on the coastal margins of Alaska, and particularly Western Alaska and Northwestern Alaska, would very likely continue under these projected scenarios. As coastal areas that previously had very little thaw experience increased temperatures and increased seasons during which they can thaw, that can be expected to increase as well so it would move up the coast.

1:51:29 PM

REPRESENTATIVE PARISH asked how far north Mr. Littell thinks that that will extend by 2070.

MR. LITTELL responded he is not an expert in permafrost and coastal erosion and would have to get back to the committee with an answer.

REPRESENTATIVE PARISH [said that wasn't necessary.]

1:52:58 PM

MICHAEL BLACK, Director, Department of Community Infrastructure Development, Division of Environmental Health and Engineering, Alaska Native Tribal Health Consortium (ANTHC), said ANTHC has been looking at climate change as it relates to communities, community health, and community infrastructure, and in this presentation, he will discuss the highlights of that involvement.

MR. BLACK turned to slide 4 and said ANTHC is first trying to increase its ability to observe the changes that are going on and the consortium has seen those that have been mentioned. The consortium is attempting to respond to those changes because its interest is the health of rural residents, in particular, and of Alaska Natives, and the changing of the environment is impacting them. He said the consortium is also concerned because it has built infrastructure to support communities, such as health clinics, water and sewer principally, and other types of infrastructure to improve the public health, and those are being impacted as well. The consortium hopes to adapt some of its designs and construction techniques to improve the resiliency of that infrastructure.

MR. BLACK moved to slide 5 and stated ANTHC is aware things are changing in Alaska. As seen by [the pictures] on the slide, he continued, these changes include increased numbers of fires in the Interior; permafrost melt, which is impacting lots of different infrastructure and increasing erosion rates along the western coast; flooding; and a general change in vegetation and in the nature of the natural world.

MR. BLACK displayed slide 6 and said ANTHC's first action was taken in 2009 when it established the Center for Climate and Health. The center's purpose is to observe the connections between climate changes, food security, disease, behavioral health, injuries, and water security in rural Alaska, all of which impact public health.

MR. BLACK addressed slide 7, noting that over just a few years the Center for Climate and Health has identified a number of

changes and impacts on individual Alaskans and households as the climate warms, especially in certain regions of the state. He said the changes greatly involve the subsistence foods that most individual households within communities depend on. Changes and impacts also include contagious diseases, respiratory health issues, food safety, infrastructure, and allergies.

1:58:05 PM

MR. BLACK turned to slide 8 and related that ANTHC has created a local environmental observer (LEO) network to better observe those changes. A computer network allows individuals at various locations around the state to report observations of what they believe to be anomalies, something out of the usual. These observations are put together to try to take a comprehensive look at how Alaska is changing.

MR. BLACK moved to slide 9 and stated that the photograph is of a massive thermokarst along the Selawik River in Northwest Alaska and is an example of what is being seen. He said this thermokarst resulted when the ice failed to bind the soil together and when it warmed to a critical point a mass of soil was released that ended up in the river. Thermokarsts are being seen all across Northwestern Alaska, he added, not just along the Selawik River. This impacts health in large part because people depend upon surface waters for a source of drinking water as well as for navigation, he explained. It is becoming increasingly difficult to get barges up rivers and consequently trade costs are increasing because of having to rely on more air transport of freight material and food items.

MR. BLACK displayed slide 10 and pointed out that changes are also being seen within the environment of houses. To save money homeowners have tightened up their houses [which keeps] airborne particulates and other pollutants in the house, which is exacerbated by bad stoves. He allowed this cannot be tied to climate change because a warming environment would suggest that not as much heat is needed. However, he said, all these houses are being impacted by melting of the permafrost. Houses are starting to tilt, cock, and in some cases lose their integrity. Showing slide 11, he noted that a typical connection for a water and sewer system is through an arctic box that is attached to the home. Because of differential settling from the permafrost, the pipes are pulling away from the buildings themselves, ripping open the insulation and allowing the pipes to freeze.

MR. BLACK turned to slide 12 and described the impacts to structural health, such as the tilting of water tanks. In some cases, he said, thermosiphons have been installed in an attempt to keep the ground frozen, one example being the Trans-Alaska Pipeline System (TAPS). However, the thermosiphons are not performing as well as they were originally designed to perform, and failures are being seen in foundations, he continued. Displaying slide 13, he stated that the broken [foundation] slab is at the Noorvik water plant and that the pipes themselves are being stressed because of the tilting of the foundation. Moving to slide 14, he said the destruction is in Kotlik where an October storm washed partially formed sea ice into the community, which devastated the water and sewer systems. Normally the sea ice would have been [fully] formed.

2:01:30 PM

REPRESENTATIVE DRUMMOND inquired whether the picture on slide 14 of damage in Kotlik includes a broken utilidor, which has the utility lines running through it.

MR. BLACK confirmed the [broken] metal box in the picture is a utilidor that carries water and sewer lines. He explained that when the ice intercepted the utilidor it bulldozed it into the community and tore apart all the piping.

MR. BLACK resumed his presentation. He moved to slide 15 and said infrastructure must be adapted to the changing environment or it will need to be replaced more frequently, so adaptation is ANTHC's main concern. Extending the life of water and sewer infrastructure will save billions of dollars, he continued. He displayed slide 16 and explained the drawing depicts an adaptation engineered and developed by ANTHC - a flexible pipe that attaches to the home. Turning to slide 17, he said the picture shows this flexible pipe as it attaches to a home in Savoonga. The blue portion of the pipe is flexible, allowing the pipe to move, within limits, independently of the house. This is one way to avoid the damage seen in the Kotlik arctic box picture, he added. This is being done increasingly in areas where it is known that permafrost is going to be an issue - Yukon-Kuskokwim (YK) Delta, Norton Sound, and Northwest Alaska.

2:03:24 PM

CO-CHAIR JOSEPHSON asked where this flexible pipe was found.

MR. BLACK answered that ANTHC itself engineered this by using a plastic form of pipe as opposed to rigid metal. It allows for a limited amount of flexibility and has performed much better than ductile iron pipe, also known as arctic pipe, which has no flex. The plastic pipe also allows the house to be approached in a different way as opposed to perpendicular into the wall. As seen [on slide 17], he continued, the pipe runs parallel to the house, which increases its ability to move with the house.

MR. BLACK returned to his presentation. He drew attention to slide 18 depicting another adaptation that ANTHC is currently engineering. He said solar energy, the enemy of permafrost, would be used as an electric source to run a chiller to keep the ground below a water plant frozen. This has never been done before but ANTHC is hoping to build this within the next couple years. If this can be done, it would save many buildings that will fail because of permafrost warming to the point where foundations are lost.

2:05:08 PM

REPRESENTATIVE LINCOLN inquired whether current structures could be modified with this or whether the structures would have to be constructed new.

MR. BLACK replied it is designed to use existing thermopiles and modify them simply by using the refrigeration from the chiller to cool glycol lines that are wrapped around those thermopiles. Adding more cold into the glycol going below the building allows for refreezing of the ground as opposed to letting it warm up. This modification, he noted, will be much cheaper than complete re-building.

REPRESENTATIVE DRUMMOND surmised the thermopiles are labeled as thermosiphons on slide 18.

MR. BLACK responded yes.

REPRESENTATIVE DRUMMOND further surmised they already exist.

MR. BLACK answered correct.

REPRESENTATIVE DRUMMOND offered her understanding that Mr. Black is saying they would be powered by the solar energy that is available in a community.

MR. BLACK replied yes. By using active chilling and by wrapping the thermosiphons with a refrigerant tube, he explained, more cold can be induced into the ground.

REPRESENTATIVE DRUMMOND returned to slide 17 and asked what utilities are running inside that pipe.

MR. BLACK responded it is a water line only. He explained the pipe size looks big, but that this is because of the insulation and it is called an arctic pipe.

REPRESENTATIVE DRUMMOND observed that in addition to flexing the blue section of the pipe looks like it can expand. She asked whether it can also lengthen.

MR. BLACK confirmed the blue section can expand as well as flex. As to whether it can lengthen, he said it will naturally [change length] with warming and cooling and is designed to do that.

REPRESENTATIVE DRUMMOND surmised the inside pipe is much smaller than the outside pipe so there is space for it to flex, stretch, and shrink as well.

MR. BLACK answered correct.

CO-CHAIR JOSEPHSON inquired whether this is being done by Mr. Black or by a team of engineers.

MR. BLACK replied ANTHC has a team of engineers. The chief of engineering is responsible for research and development so that ANTHC is innovating its engineering techniques instead of remaining with how things have been done for the last 30 or 40 years. He said ANTHC realizes that under this changing environment it has to rethink, redesign, and use different materials in order to keep these systems functioning.

2:08:19 PM

CO-CHAIR JOSEPHSON asked whether there are patent opportunities for ANTHC.

MR. BLACK responded yes.

CO-CHAIR JOSEPHSON further asked whether ANTHC is pursuing these patent opportunities.

MR. BLACK answered yes, in various cases, with this case being one case in which ANTHC is pursuing patents on that technology.

CO-CHAIR JOSEPHSON surmised that is an industry of sorts.

MR. BLACK replied ANTHC has used patents in the past, mainly with the innovations in the health field, while this is innovations in the built infrastructure field.

REPRESENTATIVE PARISH brought attention to the third bullet on slide 15 regarding adapting infrastructure to climate change, which states: "Compounding this shortened life over decades adds Billions of dollars to preserving the sanitation utility. Estimated to add $3-6 B (rebuilding) by 2030 for Alaskan villages." He inquired whether this statement is in public savings.

MR. BLACK responded correct. He noted the aforementioned numbers come from a 2007 report by the Institute of Social and Economic Research (ISER) for the University of Alaska.

REPRESENTATIVE PARISH presumed that if these same innovations were to be used for private structures the overall savings realized could be considerably higher.

MR. BLACK answered correct.

REPRESENTATIVE PARISH asked what the capital costs would be to realize the $3-6 billion in savings.

MR. BLACK replied he cannot answer the question although he can answer it on individual projects. He said he doesn't know that there is a clear assessment of how much infrastructure is at risk. While some examples are in his presentation, there hasn't been a comprehensive look at the nature of infrastructure in Alaska and how much of it is in a threatened situation. He said he believes the estimates provided by [ISER] at that time were of the total built water and sewer infrastructure in villages and communities around the state.

2:11:17 PM

REPRESENTATIVE DRUMMOND pointed out that the $3-6 billion on slide 15 is not a savings but is the cost of rebuilding these utilities.

MR. BLACK responded correct.

REPRESENTATIVE DRUMMOND further pointed out that Anchorage has a sewage treatment plant that may be in danger of needing to be moved and will cost Anchorage upwards of $1 billion. She urged people to keep in mind the cost of utilities in Alaska because they aren't cheap, and they aren't free.

MR. BLACK returned to his presentation. Addressing slide 19, he said modular water treatment plants are another adaptation that ANTHC thinks has merit. The water treatment plant is built off-site, he explained, and then taken to the community where it remains moveable. Unlike traditional ways of building water treatment plants where concrete is poured, and anchors put in, these modular plants could be moved and, as such, would avoid erosion and flooding issues that might otherwise jeopardize a static asset. It also reduces the cost of producing these types of plants, he added.

MR. BLACK turned to slide 20 depicting a portable alternative sanitation system (PASS) being used in Kivalina. He stated ANTHC has been pioneering this system and believes it has merit for very small communities and communities threated by imminent flooding and erosion. He said ANTHC is attempting to develop this system as a way of providing a much-needed improvement for un-served homes, those homes that are relying on honey buckets. This would allow treated water to be brought to the home and sanitation taken care of in a much healthier and easier way than a honey bucket represents. Also, from the standpoint of climate change, it allows for moving the system and doesn't require attaching pipes to the home. He related that ANTHC believes this system can be used in coastal communities threatened by erosion and flooding. He further noted that last winter ANTHC put in a few of these systems in the Interior. This system is still being studied, he added, but it looks promising.

MR. BLACK moved to slide 21 and concluded his presentation by noting that ANTHC is working with the Denali Commission on helping the community of Newtok with some of its issues on how to move to its new site.

2:14:51 PM

CO-CHAIR JOSEPHSON inquired where ANTHC gets its resources.

MR. BLACK answered ANTHC gets its funding resources primarily from the Indian Health Service (IHS), the Environmental Protection Agency (EPA), and the U.S. Department of Agriculture

(USDA). Those are the three primary funding federal agencies in putting water, sewer, and other health facilities in to Alaska.

REPRESENTATIVE BIRCH thanked Mr. Black for his presentation and said there is a lot to be proud of. He offered his agreement with the principles of flexible, light, and moveable when possible. The innovations are tremendous, he added.

REPRESENTATIVE LINCOLN brought attention to slide 18 regarding thermosiphons pulling heat. He said it sounds like a heat pump, which can function down to sub-freezing temperatures. He asked whether there is any opportunity to capture some of that heat out of the ground and pump it into the building.

MR. BLACK replied ANTHC uses heat pumps in some cases, but in this situation not enough heat would be derived to justify it. The beauty of this system is to pump as much cold as possible, he continued, and he is unsure how much heat could be recovered. In Southeast Alaska, ANTHC is using heat recovery from the ocean. Further, ANTHC uses heat recovery quite a bit from the power plants. Capturing heat from the power plant itself and putting it into the water system, saves the local residents lots of money in their water and sewer bills because 30-40 percent of the cost of water and sewer has to do with heat, especially in very cold regions like Representative Lincoln's.

REPRESENTATIVE PARISH asked how useful HB 173 would be to the Alaska Native Tribal Health Consortium.

MR. BLACK responded that a dedicated revenue source that allows these types of innovations would be quite useful because to pay for this ANTHC must seek grants or use ANTHC revenue. There is no specific place that can be gone to that says, "let's innovate," so ANTHC must apply for each project independently. For example, ANTHC is attempting to get community block grant funding for the soil chilling innovation seen on slide 18. Most times it is unknown whether ANTHC will be successful in getting that money, he noted.

2:19:22 PM

JOEL NEIMEYER, P.E., Federal Co-Chair, Denali Commission, noted he worked for the Indian Health Service (IHS) for 25 years, mostly in rural Alaska, and for the last 8 years he has worked as a civil servant with the Denali Commission. He applauded the committee for taking up HB 173, and said not included in [a letter from the Denali Commission to Representative Josephson,

dated 3/26/18, and signed by Mr. Neimeyer as Federal Co-Chair], or the PowerPoint presentation, is that the U.S. Government Accountability Office (GAO), a part of the legislative arm of Congress and a federal agency he thinks is outstanding, released a report on nation states that are addressing climate change. In this report the GAO found that those nation states doing the best and most good in responding to climate change were those that had alignment between the executive branch and the legislative branch. So, he said, he sees HB 173 in partnership with the governor's office as a critical first step for the State of Alaska to respond to climate change.

MR. NEIMEYER began his PowerPoint presentation entitled, "Denali Commission." Turning to slide 2, he said the mission of the Denali Commission is to identify gaps where other agencies are not operating and try to fill them, and the commission tries to complement, but not duplicate, the work of other agencies. For example, he pointed out, Mr. Black talked about how IHS, EPA, and USDA fund sanitation; therefore, the Denali Commission does not work there. However, the commission found that other agencies aren't working on sanitation energy efficiency and so the commission stepped in and has been funding that. He related that the late U.S. Senator Ted Stevens envisioned the Denali Commission as being nimble and able to respond to issues of the day. The commission has six commissioners who are non-federal employees and Alaskans and they define where the commission's investments will go. To date the Denali Commission has over $1.2 billion in investments in rural Alaska matched by another $900 million from other agencies and over 1,500 projects. Virtually every community in rural Alaska has been touched in one way or another by the Denali Commission.

MR. NEIMEYER moved to slide 3 and related that on 9/2/15 former President Obama assigned the commission as lead coordinating federal agency for village relocations and protect in place solutions. "Coordinating" is a very important distinction, he noted. The commission wasn't given any extra money, other federal agencies were meant to implement. The commission has invested several million dollars of its own funds to coordinate activities such as plans and designs, pre-construction activities that take time but don't cost much money. The assignment was specific to the built infrastructure in rural Alaska, he continued, how to address erosion, flooding, and permafrost degradation that is occurring. The assignment also was that the commission was supposed to follow under the Arctic Executive Steering Committee, which was made up of many cabinet

level agencies and that was supposed to provide a whole of government approach.

MR. NEIMEYER displayed slide 4 and provided a summary of environmental threats. Regarding [coastal] flooding and wave run-up, he stated that according to scientists the change is not an increase in the magnitude of storms but that shore bound ice is no longer occurring in the fall. Shore bound ice prevents wave run-up and doesn't now occur until much later, and in some communities not until January. Regarding river flooding, which has been historic in rural Alaska, he said the difference is permafrost degradation in some places and communities are settling, so [during ice breakup] the threat of damming the river is more imminent. Regarding erosion driven by permafrost melting, he related that the Denali Commission sees this as probably the largest risk in the western part of the state. There are longer periods of time in which no freezing is occurring and that accelerates the erosion.

2:26:05 PM

MR. NEIMEYER addressed slide 5 depicting a map of Alaska with 31 environmentally threatened communities. He noted the map comes from two sources – an erosion analysis of threatened communities completed in 2008 by the U.S. Army Corps of Engineers (USACE) followed by a GAO analysis that identified these 31 as having the largest threat. Of those 31, four communities are facing relocation: Shishmaref, Shaktoolik, Kivalina, and Newtok. Of importance, he pointed out, is the way the Denali Commission carries out its business. The commissioners from the beginning gave the assignment to staff to work on the highest need projects. If administrative capacity issues were preventing a community from moving forward, staff's job was to figure out how to remove those administrative capacity issues and address highest need, not just issue funding to those who had the best grant writer. In September 2015 the commissioners gave staff very clear instruction – to focus attention and resources on flooding, erosion, and permafrost degradation in these 31 communities. Having said that, Mr. Neimeyer continued, the commission is interested beyond that and has provided funding to the University of Alaska Fairbanks (UAF) and USACE to do further analysis on flooding and permafrost degradation; that work should be done in summer 2018. He stated the commission sees it as complementary to the erosion work done by the USACE and the commission anticipates that after those three threats are incorporated the number of communities will increase beyond 31.

MR. NEIMEYER turned to slide 6, depicting photographs of winter storms with no shoreline ice in the villages of Kivalina and Shishmaref. No shoreline ice is an issue because flooding can occur, he reiterated. The commission is looking at studying Kivalina and Shishmaref similar to a study done in Shaktoolik in 2008 or 2009 by the USACE, he said. In that study [slide 7], the USACE analyzed a 100-year storm event and found that virtually every building would be inundated by 2-3 feet of water. Imagine if a storm washed in during the night at high tide in November - virtually every one of the community's 200 people would be immersed in cold water. It is a very dangerous situation, he continued, and this is what the signs are telling will happen one day in Shaktoolik. Perhaps one day it will also happen in Shishmaref and Kivalina, but unknown right now is what the magnitude of run-up will be in those two communities.

2:29:31 PM

R. NEIMEYER moved to slide 8 which portrayed photographs of river flooding and ice jams in Galena in May 2013. He then displayed slide 9 with photographs of permafrost degradation. He noted the movement of power poles, roads, and boardwalks in the pictures caused by discontinuous permafrost or discontinuous permafrost melting. He also reminded members of the structure movement discussed by Mr. Black.

MR. NEIMEYER addressed an earlier question from a committee member about what the savings would be if disaster mitigation were done in advance. He said many studies done in the Lower 48 show a savings ratio of about 1:4 or 1:6. So, he continued, if mitigation were done in advance instead of allowing the disaster to occur, there would be about a 1:4 savings ratio.

MR. NEIMEYER discussed the table on slide 10 showing the Denali Commission's investments to date. He stated that in 2016 and 2017 the commissioners put $7 million and $5 million, respectively, into the Village Infrastructure Protection (VIP) Program, for a total of $12 million in the two years prior to this fiscal year. The Denali Commission was given no extra funds by the previous administration to carry forward the VIP Program, he pointed out, these funds were taken from the commission's other programs, such as the energy, transportation, and clinic programs. In 2018 the Alaska Delegation successfully increased the commission's budget from $15 million to $30 million, he related, with the additional $15 million specific for implementing solutions in the highest-need communities. In his discussions with commissioners at a 1/29/18 meeting, he

continued, there was agreement that that meant Newtok and the development of Mertarvik. Between 9/2/15 and 3/22/18 the Denali Commission was acting as a lead coordinating agency, but as of now the commission is an implementing agency with the community of Newtok in the development of Mertarvik. The commission remains a coordinating agency with all the other villages. In 2018, he added, a total of $21.34 million of federal investment will be made into this issue.

2:32:37 PM

MR. NEIMEYER turned to slide 11 and provided specific comments about HB 173. He said the slide depicts a flowchart in essence [from climate change science to applied science to engineered solutions and prioritized projects to funding and implementation]. Regarding climate change science in Alaska, he stated that the three threats of interest to the Denali Commission are erosion, flooding, and permafrost degradation. He reminded committee members of his earlier statements that the USACE has worked on erosion and that the Denali Commission has been working on flooding and has UAF working on permafrost degradation, all of which provide important information about trends and what is happening in the local community. That information is then applied to the local community through two or more opportunities, he explained. One opportunity is the Hazard Mitigation Plan, which is a Federal Emergency Management Agency (FEMA) document that the [Alaska Department of Military and Veterans' Affairs (DMVA)] uses in working with communities to identify risks to each community, including the built environment. Another opportunity is vulnerability assessments. These are more specific, such as assessment of a specific infrastructure or community asset, which then enables the identification of relative risks to that built environment. From there it goes into prioritized projects based upon what is more risky than others and then engineered solutions. For example, he continued, if in a community it is unknown what is going to happen with wave run-up, an analysis of wave run-up will be done to figure out whether the lift station is more at risk than the airport and more at risk than the school. Through that analysis the highest need can be identified and then resources assigned to that highest need. From there things move into funding and implementation. As talked about by Mr. Black, he added, adaptation is the key here and adaptations start at the engineered solutions and prioritized projects.

2:35:07 PM

EPRESENTATIVE DRUMMOND inquired whether she is correct in understanding that Hazard Mitigation Plans are a FEMA document that is used by the Alaska Department of Military and Veterans' Affairs (DMVA).

MR. NEIMEYER replied correct, part of the DMVA is the Division of Homeland Security and Emergency Management (DHSEM). The staffs at FEMA and DHSEM are dedicated professionals who excel at disaster response after the disaster comes in. However, he said, the two agencies are not given many funds or authorities on disaster mitigation, which is the up-front issue. The Denali Commission sees that lots of effort should be placed on that up-front disaster mitigation and strongly urges that consideration be given to formally including the DHSEM in the [Alaska Climate Change Response Commission (ACCRC) proposed in HB 173].

2:40:06 PM

MR. NEIMEYER returned to his presentation. He drew attention to slide 12 and discussed the six comments about HB 173. Regarding the first comment to enhance the federal to state relationship, he said the federal government is late to this issue. He applauded Governor Palin for standing up a climate sub-cabinet. Many good things were accomplished by the state and there was partnership with many federal agencies on that work. From his observations, however, local federal employees stationed in Alaska who understood the issues in play here did much of the federal work. Perhaps there was some engagement with the federal employees at the regional level, he continued, but from his conversations with folks who work on those matters, the policy makers and funders in Washington DC were not included in the discussions. Therefore, when he says enhance the federal to state relationship, he is saying there needs to be a clear policy statement from the State of Alaska that says the state wants a clear and intentional relationship with all branches of the federal government in Alaska as well as regional offices and headquarter offices in Washington, DC.

MR. NEIMEYER addressed the second comment on slide 12 to articulate a village relocation policy. He said nowhere on the state or federal level is there an express policy that moving villages in rural Alaska is the policy. Many times, in conversations in Washington, DC, [the Denali Commission] has found the lack of this express policy to be a problem because agencies that have existing authority to do work oftentimes expect to be working in established communities that already have [infrastructure], for example, a water and sewer

department. When moving an entire village, all these different agencies are trying to work together at one time and the authorities often do not match well. It is key in both Juneau and Washington, DC, to articulate that it is important to relocate the villages and if done timely, it can be done efficiently, effectively, and at reduced cost.

MR. NEIMEYER moved to the third comment on slide 12, which asks why FEMA and DHSEM are not engaged. He stated that in his opinion climate change response is centered about disaster mitigation, disaster response, and disaster recovery. Not much funding and authority is extended to FEMA and therefore provided downstream to the State of Alaska through the DHSEM on disaster mitigation. He urged that strong consideration be given to including the DHSEM in the [Alaska Climate Change Response Commission (ACCRC) proposed in HB 173].

MR. NEIMEYER discussed the fourth comment on slide 12 to focus on responding to climate change, not stopping climate change. Often seen, he noted, are well-intentioned efforts to address greenhouse gas emissions in rural Alaska. The Arctic is warming at four times the rate as other locations, but the greenhouse gas causing this warming is generated from high population areas, not the Arctic. Stopping climate change is not something Alaska can have an impact on, he said. It's a federal issue that must be taken care of in Washington, DC. He advised that including renewable energy or greenhouse gases in HB 173 would be a distraction for the staff working on this. It invites folks who are interested in those sectors to come in and make an appeal for both time and resources when the real issue here is disaster mitigation - how to respond in advance of a disaster.

MR. NEIMEYER spoke to the fifth comment on slide 12 that the Denali Commission stands ready to collaborate on complementary work with the [Alaska Climate Change Response Commission (ACCRC) proposed in HB 173]. He urged consideration be given to that and to specifically naming that in the bill. Prior to this federal administration, he noted, senators and congressmen identified the Denali Commission to be zeroed out and to go away, but the Alaska Delegation has thwarted those proposals and kept the Denali Commission in place. He said the reason given by this administration for shutting down the Denali Commission for 2018 and 2019 is any state that can give its citizens a permanent fund dividend (PFD) doesn't need additional federal resources. He offered his belief that the Denali Commission is needed for complementing the work of the other federal agencies in communicating back to the Climate Change Commission on what

the federal agencies can and cannot do. Therefore, he continued, he encourages consideration of naming the Denali Commission as part of the [ACCRC proposed in HB 173][sixth comment on slide 12]. The commission doesn't have to be named as a voting member, he added, it could be an advisory member. The point is that the State of Alaska recognizes the Denali Commission's work and wants to hear one-on-one what the commission is doing and how the commission can coordinate the federal government to State of Alaska activities. Mr. Neimeyer concluded his presentation by directing committee members to the aforementioned 3/26/18 letter, which provides additional information.

2:44:18 PM

CO-CHAIR JOSEPHSON asked whether Mr. Neimeyer is in communication with the new Climate Action for Alaska Leadership Team and other groups such as ANTHC. He further asked whether these groups are speaking to each other so that the work is complementary.

MR. NEIMEYER replied a copy of his 3/26/18 letter was sent to Nikoosh Carlo, [Office of the Governor]. The Denali Commission has been collaborating with that group when invited. He said he sees this as an opportunity for an intentional relationship between the federal and state government. The Denali Commission is very much coordinating with ANTHC. The work being done in Newtok by ANTHC has been fully funded by the Denali Commission. There are other efforts that ANTHC is working on as agent of the Denali Commission and more will be forthcoming. The Denali Commission anticipates that they will have a larger responsibility with respect to the $15 million on implementing solutions in Mertarvik community development. The Denali Commission is aware of many of the folks and is collaborating as best it can.

REPRESENTATIVE BIRCH recalled an effort 35-40 years to move the larger part of Nulato up the hillside to higher ground above the Yukon River and inquired whether that was successful. In regard to how much energy, effort, and investment is put into areas that are frequently subject to flooding, he further inquired whether the Denali Commission has a policy for not investing in areas that are subject to flooding and how the Denali Commission looks at that from an investment standpoint.

MR. NEIMEYER responded that the cases of Nulato and Koyukuk are similar in that it is known that during spring break-up and the

formation of ice dams, flooding will occur in the community. In Nulato's case, he said, the Denali Commission was aware of that issue when it funded a new clinic about 11-12 years ago - that clinic had to be built up on the hillside. As the risk profile is understood in communities, funders like Denali Commission and others start making investments out of that floodplain and up higher. That is where the local Hazard Mitigation Plans and the vulnerability assessments are very important, he continued, and it is also important to use that applied science. In the case of Nulato, the Denali Commission has not worked on moving any of the housing structures up the hillside. He recommended that if, in time, the Denali Commission and the federal agencies along with the State of Alaska decide there is a need to start moving existing homes out of the floodplain, it be done by need. Those communities with the greatest need/risk would be assigned resources first, he explained, and from there resources would be assigned sequentially to other communities by level of need/risk. The Denali Commission hasn't gotten there yet in its programming, he added, because most of the commission's work has been focused on the relocation villages.

2:49:21 PM

CO-CHAIR JOSEPHSON recalled that when he lived in Kalskag for three years during the early 1990s spring breakup would typically flood parts of the village and would sometimes flood into the dump. He noted that climate change wasn't talked about as much back then and asked how to distinguish between spring breakups that are not aggravated by climate change and are just how things happen and have happened in the past.

MR. NEIMEYER answered that whenever the issue of flooding is posed in Washington, DC, it just goes by everyone; they don't catch the nuance of what Co-Chair Josephson just asked about. He explained that the Denali Commission views this issue of erosion, flooding, and permafrost degradation as more the question of disaster mitigation. So, even though the spring breakup and ice damming has been historical and will continue, and even though it is not really driven by climate change, it is a climate event. And when looking at climate events, he continued, the Denali Commission believes that that should be part of the portfolio of work that it does.

REPRESENTATIVE DRUMMOND noted that Mr. Neimeyer's 3/26/18 letter is not in her committee packet or on BASIS and requested that it be provided to members.

CO-CHAIR JOSEPHSON agreed to do so.

CO-CHAIR JOSEPHSON addressed Mr. Neimeyer's comment about mitigation versus reduction relative to the carbon footprint in Alaska. He agreed the comment is true given there are only 730,000 Alaska residents, but stated what strikes him as sad about it is that there are Alaskans who want to reduce their carbon footprint. He said he takes Mr. Neimeyer's point that the 7 billion people outside of Alaska are more impactful by far. He asked whether Mr. Neimeyer would like to add anything about Alaskans' own behavior outside of the mitigation issue.

MR. NEIMEYER replied he stands by his comment that the impact on climate change by Alaskans is miniscule. He said he encourages Alaskans choosing to try to reduce their use of fossil fuels and other drivers of climate change. But, he continued, that is an individual commitment and while the state should encourage it, it is not necessarily something that the State of Alaska should assign resources and time to when it is a miniscule thing. If that door is opened to the Alaska Climate Change Response Commission, there will be a lot of time and effort and perhaps even resources assigned to something that doesn't impact the increasing temperatures in Alaska.

2:53:57 PM

JAY FARMWALD, Director of Programs, Denali Commission, stated his belief that decreasing the carbon footprint in rural Alaska in particular is certainly related to the cost of energy and that is the key for rural Alaska. However, he said, that is a different subject than climate change in his view. Other state and federal agencies are working on trying to reduce the cost of energy and hence improve the quality of life in rural Alaska. These include the Alaska Energy Authority, Alaska Industrial Development and Export Authority (AIDEA), and U.S. Department of Energy. He offered his belief that Mr. Neimeyer is saying that the issue of carbon footprint, also known as cost of energy, should be addressed in a different forum versus the Alaska Climate Change Response Commission at the risk of diluting the true primary goals, mitigation primarily, of the new commission.

2:55:28 PM

CO-CHAIR JOSEPHSON recessed the House Resources Standing Committee meeting to 5:55 p.m.

5:57:16 PM

CO-CHAIR JOSEPHSON called the House Resources Standing Committee meeting back to order at 5:57 p.m. Representatives Josephson, Tarr, Talerico, Johnson, and Lincoln were present at the call back to order. Representatives Birch and Rauscher arrived as the meeting was in progress.

CO-CHAIR JOSEPHSON resumed invited testimony related to HB 173.

5:58:05 PM

CHRIS ROSE, Executive Director, Renewable Energy Alaska Project (REAP), Member, Climate Action for Alaska Leadership Team, noted he is testifying on behalf of REAP, a statewide nonprofit education and advocacy group for renewable energy and energy efficiency, as well as on behalf of the governor's Climate Action for Alaska Leadership Team. He stated climate change is an issue that will be around for centuries and it is just the beginning. Adaptation to what is changing, mitigation, and research are all going to be a part of that.

MR. ROSE said REAP's role has been on the mitigation side. He related that in 2007 REAP asked the legislature to consider financing renewable energy projects in 2008 and a unanimous vote created the Renewable Energy Fund. That fund has since used about $259 million of state money to leverage more than $250 million of private and federal money to build more than 70 projects around the state, mostly in rural Alaska. The Alaska Energy Authority estimates these projects are saving about 30 million gallons of diesel every year, he further related.

MR. ROSE stated REAP also worked hard in 2010 for passage of House Bill 306 and Senate Bill 220. House Bill 306 set a goal of getting 50 percent of the state's electricity by 2025 from renewable resources. House Bill 306 also set a goal of decreasing the per capita energy use in the state by 15 percent by 2020. He said Senate Bill 220 included a provision to create the Emerging Energy Technology Fund, which REAP help put together with many different players, including the Denali Commission, Alaska Energy Authority, the university, and others. He said U.S. Senator Lisa Murkowski calls Alaska's remote communities a natural laboratory for energy innovation. The technology and adaptations to climate change being developed in rural Alaska could be important to the billion people on the planet with no electricity and 500 million who are on diesel.

MR. ROSE emphasized there is no more financing; the grant money is over. While the governor has some money in his budget for the Renewable Energy Fund, he said, in general the forward movement of projects has to be financed. It has already been seen that energy efficiency can be privately financed. In 2008 REAP asked the legislature to consider putting more money into energy efficiency. That resulted in the legislature appropriating over $600 million over the course of several years to the Alaska Housing Finance Corporation (AHFC) to support weatherization and rebate programs. More than 45,000 households in the state took advantage of those programs, he reported. The average savings for those 45,000 households, mostly on thermal, has been 30 percent, a tremendous payback for the state, except the state used grant money to do that.

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MR. ROSE stated REAP has been investigating the financing idea for some time. Over the last year and a half REAP has been particularly interested in the green bank concept that is now being used by other states and nations to finance clean energy, which is essentially energy efficiency and renewable energy. In the green bank concept, he explained, a little bit of state money is used to leverage as much private money into investments as possible.

MR. ROSE outlined why the green bank concept is important. For example, he said, if someone went to Wells Fargo today asking to borrow $10,000 to do weatherization, like what was done by those 45,000 households, Wells Fargo would say it doesn't understand how those work. And, if Wells Fargo did give a loan, it would probably say 10 percent interest to be repaid in 5 years. But that doesn't work, he advised. Green banks would educate those other bankers in the private sector that if they would just flip these terms and allow people to pay back a 5 percent loan over 10 years the bank would still make money and would have a super secure loan because people are going to be saving more money every month.

MR. ROSE pointed out that other states have developed programs to allow for unsecured loans for energy efficiency that are through programs the green bank has developed. Most of the money is coming from private banks, he said, because the private banks now have been educated about how to do this. And, if the private banker feels there is any risk, the state would de-risk the project for the banker by putting a little bit of state

money into a loan loss reserve fund or by guaranteeing a portion of the loan.

MR. ROSE specified that Connecticut has been very successful in doing this. Connecticut's average leverage ratio in the first six years has been 8:1, he reported, meaning that for every $1 Connecticut loaned, $8 was loaned from the private sector. Within those first six years there was over a billion dollar's worth of clean energy financing, mostly in energy efficiency. He said REAP is hoping to develop this model and has flown the vice president of the Connecticut green bank to Alaska a couple times to testify before committees and meet with the mayor of Anchorage and the governor. Mr. Rose added that he travelled to Washington, DC, a couple weeks ago to meet with the Connecticut green bank's vice president and that he is also working with the New York green bank and the Coalition for Green Capital, both of which are interested in these kinds of things and ensuring that more green banks are developed.

MR. ROSE stated he agrees that the financing part must be done. While a climate action team can talk about this and make recommendations to the governor by September, this is an ongoing problem, he stressed. Establishing the [Alaska Climate Change Response Commission] makes sense because there must be a body that takes this on and actually handles these issues. Recommendations can be made, but there must be follow through with action. Ten years ago, he said, he was on Governor Palin's team and the team spent two years coming up with great recommendations that got put on the shelf. Now 10 years later the state is still in the position of having to act, so the [Alaska Climate Change Response Commission] is really important for that.

MR. ROSE related that REAP has over 80 organizational members, including utilities, Native associations, Native corporations, independent power producers, and businesses. He explained that before this wide array of folks takes a stand to support a bill it typically goes through a policy committee process and a board vote. But, he continued, REAP hasn't done that on the element of HB 173 that he thinks many of the committee members are concerned with, which is the [proposed] per barrel surcharge. He said REAP would have to discuss this provision of the bill as an organization before saying it supports the provision. However, he continued, the state needs to put money in this from somewhere because the cost of adaptation is going to be far greater than the cost of mitigation.

MR. ROSE said REAP sees a huge opportunity in renewable energy. For perspective, he noted that in 1990 the average cost of wind power in the U.S. was $.65 per kilowatt-hour, while in 2017 the average cost of unsubsidized wind power is $.05. The cost of solar is also about $.05 per kilowatt-hour, he continued, which means both wind and solar in the Lower 48 are now competitive, without subsidy, with coal and natural gas. The price of wind power and solar keeps going down, he added, and is going to keep going down [with] technology that is already happening. For instance, electric vehicles are something to be aware of and talking about. Right now, a Chevy Volt or Tesla Model 3 can be purchased for about $35,000 before the $7,500 federal tax credit, making them about the same price as any other car. This is because the price of lithium ion batteries that fuel these cars has come down fast, he explained, and the price is going to keep coming down, so the price of those cars is going to keep going down, which is a big deal.

6:08:13 PM

MR. ROSE advised the aforementioned is significant for Alaska because there are nations and companies, such as Volvo, saying that after 2018 they are no longer going to produce cars with an internal combustion engine only; after 2018 they are going to be making only hybrids and electric vehicles (EVs). Nations are phasing out internal combustion engines and so are investors. The reason is economics, he stated. When the same car can be purchased for $35,000 in electric versus gas, it's a no-brainer because even with high electric prices in the Railbelt the gas car costs twice as much to operate. Mr. Rose outlined the math: To go 200 miles, the range of an electric car, takes about 60 kilowatt-hours; at $.20 per kilowatt-hour the cost is $12.00. For a gas car at 25 miles per gallon at $3.00 per gallon the cost to go 200 miles is $24.00 or twice the cost. Many people, he related, are expecting a real transformation in the transportation sector very, very quickly. That will decrease the demand for oil on the planet by about 30 percent, as oil will still be used for ships and airplanes. A collapse in the market for gasoline-powered cars could be seen within 5-10 years, he said. That will impact the State of Alaska and is something to think about.

MR. ROSE spoke to mitigation, noting that he will be testifying tomorrow before the House Special Committee on Energy on HB 382. He said HB 382 is another attempt for the Railbelt utilities to start working together on a consistent basis. There are six independent utilities, which made sense when they were formed.

But now, with transmission lines and the Internet, there are six utilities that are not planning together on a regional basis. This is important for the whole state to consider, he counseled, because overbuilding generation impacts everyone in the state. Many experts believe overbuilding has been done in the Railbelt due to the lack of planning. It means consumers in the Railbelt are paying more for unnecessary generation and a lack of transmission, he said. It also means that everyone who is on power cost equalization (PCE) is going to get less support because the idea of PCE is to equalize what it costs people in the regions outside of the Railbelt for electricity with the people who live in Juneau, Anchorage, and Fairbanks. Mr. Rose stated HB 382 would create a system of regional planning, which is commonsense for generation and transmission, [and would create] region-wide reliability standards and interconnection standards. That will go a long way to mitigating on the electric side some of the greenhouse gas emissions in the state, he continued, and, more importantly, it would save the State of Alaska money.

MR. ROSE concluded by saying he is glad the committee is bringing forth the idea of a commission that can act into the future on all these things that are before the state.

6:12:05 PM

REPRESENTATIVE RAUSCHER asked where the number of 45,000 homes comes from.

MR. ROSE replied it comes from the Alaska Housing Finance Corporation (AHFC), which runs both the weatherization and the rebate programs.

REPRESENTATIVE RAUSCHER asked if AHFC has published this number.

MR. Rose responded yes, it is in AHFC's reports on those combined programs.

REPRESENTATIVE RAUSCHER inquired where Mr. Rose obtained the figures for his statement that there will be a collapse in the gas vehicle market in 5-10 years.

MR. ROSE responded it is an analysis many experts are looking at and he would refer members to a PowerPoint presentation by analyst Tony Seba. In this presentation, he related, Mr. Seba points out that the cost curve of lithium ion batteries is coming down so fast that it is driving along with it the price

of electric cars. Once [the price of] an electric car is on par with an internal combustion engine car, and the cost to operate the electric car is half or less than half that of a gas car, consumers will go that direction. It will be an economic decision to buy electric cars because it is cheaper. Additionally, Mr. Rose noted, there are 2,000 moving parts in an internal combustion engine car compared to 20 moving parts in an electric car, which means electric cars are going to last a lot longer and be easier and cheaper to maintain. Being said by Mr. Seba and others, including the car companies that have announced they are going to stop building combustion vehicles, is that everything is pointing in this direction. If the business model disruption of ridesharing like Uber and Lift is added on, it is a perfect confluence because these cars with only 20 moving parts are going to last 500,000 to 1,000,000 miles and so will be used on a constant basis, unlike gas cars that are parked an average of 95 percent of the time. With electric cars that will be constantly used it will move toward a total transformation of the transportation infrastructure, he continued, and it will be so transformative that it will collapse the market.

6:15:01 PM

REPRESENTATIVE RAUSCHER asked why Mr. Rose used Connecticut.

MR. ROSE answered Connecticut is universally seen as the most successful green bank due to its program uptake. For instance, it is one thing to set up a green bank and set up these esoteric programs and it is another to have lots and lots of people take advantage of them and then pay the loans back. So [REAP] has been very interested in how Connecticut has done that. They are very interested in helping us. Bert Hunter, who is vice president of the Connecticut green bank and who was in Alaska last year, is willing to come back in another month at which time conversations will be continued with folks in Alaska about how something like that might be set up.

REPRESENTATIVE RAUSCHER inquired about the prediction for a 30 percent decline in oil demand in 5-10 years and whether this is figurative or a guesstimate.

MR. ROSE replied they are international energy figures that are based on what percentage of the oil market is used for small cars and individual transportation, which is 30 percent. So, if 30 percent of the oil market goes to electric vehicles, that is what would happen.

6:16:50 PM

REPRESENTATIVE BIRCH asked how long the batteries last.

MR. ROSE said that is a good question because it determines the economics. He provided some anecdotes. He related that Kodiak Electric Association (KEA) is 100 percent renewable electricity, 80 percent hydro and 20 percent wind. Darron Scott, [KEA's [President/CEO], recently chose to replace the wind farm's acid batteries with lithium ion batteries. In a conversation, Mr. Scott said he now looks at batteries like he looks at oil filters - they filter the electricity and are a cost of doing business and when they wear out, he recycles them. Mr. Scott said he saves so much on the backend by not burning diesel with the wind farm that it makes total [economic] sense. Mr. Rose further related that the lithium ion battery in his personal car, a 2002 Prius, was warranted for 100,000 miles at the time of purchase and that battery is now at 250,000 miles. For the new Chevrolet Volts and Tesla Model 3s coming out this year, he continued, the life of the battery is not yet known. A lot of smart people are betting on the technology lasting long enough for it to be worth it. In a car where the drive train and everything else lasts for 1 million miles, he added, it might be worth replacing the battery one or two times if needed, just like batteries are replaced in flashlights.

6:18:58 PM

CO-CHAIR TARR noted the issue of emissions from idling cars. She shared her experience of attending a conference where the participants were able to test drive electric cars that had no emissions. She remarked about the big impact of no emissions on climate issues.

MR. ROSE agreed and noted his Prius shuts down when stopped at a red light. He related that Mr. Sepa talks in his presentation about how much economically viable space is taken up in cities by parking lots. For example, the amount of parking space taken up in Los Angeles is the equivalent of three San Francisco's, space that could be taken up with economic activity from businesses that could be located in that space. Mr. Sepa states in his presentation that this parking space won't be needed with the ride sharing and constant moving of cars that will take place with electric cars.

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CO-CHAIR JOSEPHSON inquired about other legislation that Mr. Rose is tracking.

MR. ROSE replied [HB 347] for on-bill financing would be another financing tool that would allow people to borrow money through their utility to do [energy improvements] and then pay back through their utility bill. Another way for financing energy efficiency, but still in the implementing phase, is [HB 80, Municipal Property Assessed Clean Energy Act (PACE), signed into law 10/6/17]. He said SB 190 and SB 191, both energy efficiency bills, would keep the momentum going particularly with the state owning 5,000 buildings, because the state should be leading here. In 2012, AHFC estimated the state's annual utility bill to be $642 million, which was during high oil prices. Assuming the state's annual utility bill for heating and electricity is now $500 million, he continued, that is a significant portion of the operating budget. The state taking the lead by making all its buildings as energy efficient as possible would do several things, he advised. It would create a ton of jobs and would attract people to places that might not otherwise be attractive [due to high energy costs]. It is very difficult to consider doing any kind of business enterprise in rural Alaska when it costs $.40 cents per kilowatt-hour after PCE and heating oil costs $8.00 a gallon. He related that a question he likes to ask people rhetorically to hear what they will say is, "Why wouldn't the State of Alaska have as its goal to be the most energy efficient place on the planet?"

6:23:37 PM

DAVIN HOLEN, PhD, Coastal Community Resilience Specialist, Alaska Sea Grant Marine Advisory Program, Assistant Professor, College of Fisheries and Ocean Sciences, University of Alaska Fairbanks (UAF), began with slide 1 of his PowerPoint presentation entitled, "Climate Impacts to Subsistence Economies & Community and Regional Adaptation Planning." He noted he is an anthropologist by training and has researched subsistence economies in Alaska for over 20 years. In addition to working for the College of Fisheries and Ocean Sciences, he said he works with the Alaska Center for Climate Assessment and Policy at the International Arctic Research Center, both of which are collaborations between UAF and the National Oceanic and Atmospheric Administration (NOAA). Dr. Holen explained he is testifying via teleconference because he is in Nome attending the UAF-sponsored Western Alaska Interdisciplinary Science Conference where scientists and local residents are talking

about the same pressing issues that the committee is now discussing.

DR. HOLEN turned to slide 2 and stated that wild resources are important to all Alaskans, especially those living in rural communities. He related that he came to the Alaska Sea Grant Marine Advisory Program from the Alaska Department of Fish and Game (ADF&G) where he was a research and regional manager in the Division of Subsistence. He has worked with communities from the Arctic to Southeast Alaska over his career and has found there are many subsistence economies in Alaska, not just one. Salmon are important statewide, he continued, as well as other marine and riverine fish. The large land mammals and marine mammals are also very important and in some areas of the state, especially Western Alaska and the Arctic, marine mammals constitute a high portion of the subsistence economy and come in big packages. Small packages include birds and wild plants, especially berries which residents spend considerable time and effort harvesting.

DR. HOLEN moved to slide 3 and said that for his dissertation work on the importance of fisheries to rural communities, culture, and economies, he asked residents why they remained in their communities. This simple question had complex answers, he noted. Reasons to remain included family being important because it is home as well as having access to subsistence foods and the subsistence way of life. He pointed out that the slide shows a subset of three of the thirteen communities in which he asked the questions, but the overall the responses in all communities were similar.

DR. HOLEN stated there are significant challenges to rural lifestyles. Addressing slide 4, he explained that to understand some of these challenges related especially to climate change is part of a larger effort over the course of 18 months or so. A collaboration of federal, state, university, and nonprofits held coastal resilience workshops in communities in Western Alaska and he did a similar workshop in Southeast Alaska. In Western Alaska the latest climate science for the region was provided to representatives of area tribes and communities, he said. The conversation was turned around to get feedback on the greatest issues impacting communities in the region.

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DR. HOLEN displayed slide 5 and outlined the key issues that were identified by both scientists and residents: ocean

acidification, changes in seasonality, changes in hydrology, permafrost thaw, and reduction of sea ice. Ocean acidification is a looming threat, he said. Alaskan waters are cold and old and make great carbon sinks affecting ocean chemistry. In Alaska all the potential impacts of ocean acidification on individual fish species are not understood. Residents face challenges of seasonality for hunting large animals as well as the shift in fisheries he pointed out. Weather impacts fish drying times and if fish are harvested during prolonged periods of rain the fish may spoil on the racks. Hydrology, or the change of the water in terms of abundance, timing, and temperature is a major issue and can be coupled with permafrost thaw in the region. Permafrost thaw means that pan lakes found throughout Western Alaska and the Interior are drying out and steams are also lower in some areas. Residents worry about streams for salmon migration and subsistence, he related. They worry about waterfowl habitat from loss of marshlands. They worry that freezing rain is creating ice cover over the lichen-rich tundra that caribou may be unable to break through in the winter. Travel on the landscape is difficult, he continued, too little snow for snow machines and too much for all terrain vehicles (ATVs). Further, he noted, lack of sea ice is a major factor because it means lack of a buffer for late fall and winter storms with wave action inundating communities, making it unsafe for travel, and the loss of ice to hunt seals and walrus.

DR. HOLEN moved to slide 6 and stated that the International Arctic Research Center in collaboration with the Arctic Research Consortium of the U.S., and the National Weather Service have been working on a project to observe sea ice changes using satellites and local observations. He said the image on the right of the slide shows wave action along the shore at Shishmaref in February 2018 and pointed out that it should be sea ice. The graph in the center, he noted, shows the ice-over date of the Chukchi Sea, an area important for hunting walrus.

DR. HOLEN addressed the poster depicted on slide 7 and noted the poster is a product of the Coastal Resilience Workshops in the Bering Sea region to which 200 authors contributed. He explained walrus are an important food source for the region and residents are greatly concerned about accessing walrus. [One] walrus equals around 800 meals, providing nutritious protein, not to mention the benefits of passing on a cultural knowledge that occurs during a walrus hunt. The poster also shows other factors affecting food security in Western Alaska, such as changes in habitat for large land mammals. This poster and two others can be downloaded at adaptalaska.org, he pointed out.

DR. HOLEN displayed slide 8 and said Southeast Alaska issues include warming air temperatures, snowfall variation, ocean acidification, warming ocean temperatures, harmful algae blooms, and changes in the forest environment. He noted these issues are not as visible as they are in Western Alaska. Warming air temperatures mean more rain and less snow in the winter. Projections at the University of Alaska Southeast (UAS) show an increase in precipitation in the winter in the future and this impacts the forest environment. Already large areas of yellow cedar are dying off, a species that is important for cultural elaboration. Less snowpack also means less cold water available in the spring and summer for salmon, he explained. Southeast Alaska has rich shellfish resources, providing residents with both subsistence and commercial fishing opportunities for crab and other marine invertebrates. Warming water leads to harmful algae blooms that spurt toxins that shellfish like clams absorb and then humans absorb them.

6:31:08 PM

DR. HOLEN discussed slide 9. He said in September 2016 the Central Council Tlingit and Haida Indian Tribes of Alaska in cooperation with six tribes and Alaska Sea Grant held a workshop in Ketchikan to discuss the latest science, mainly focusing on the key cultural resources of salmon, shellfish, berries, and yellow cedar. In this two-day workshop partnerships were formed between state and federal agencies, nonprofits, and university to initiate monitoring activities. He said Central Council is now working on a region-wide adaptation plan that can act as a template for communities in Southeast to devise their own plan based on locally identified needs.

DR. HOLEN showed slide 10 and related that workshops like the aforementioned have been taking place statewide leading to vulnerability studies and adaptation planning efforts. He noted that a recent report details the efforts that have occurred statewide identifying climate data needs and barriers communities face to facilitate their efforts and the map on the slide depicts where some of these activities are occurring.

DR. HOLEN turned to slide 11 and reviewed efforts to address some of the most pressing issues. He said a recent Alaska Sea Grant funded project is covering some of the needs identified in the Southeast workshop. The project will take existing stream monitoring data collected by ADF&G and others, establish new data collection sites in collaboration with tribes, and create a

model of potential climate impacts to salmon lifecycles in Southeast Alaska streams. Two networks are building collaborations to monitor and better understand harmful algae blooms and ocean acidification, he added.

DR. HOLEN moved to slide 12 and said the coastal resilience workshops in Western Alaska and the adaptation planning efforts in Southeast Alaska led to Adapt Alaska collaborations. This is headlined by a website launched in November [2017], which articulates major challenges occurring in coastal Alaska, he continued. It pairs these issues with innovative adaptation solutions and provides links to resources specific to Alaska, such as databases and tools. All the materials from the workshops are housed here and efforts continue with planning additional workshops in the Yukon-Kuskokwim (YK) Delta as well as Kodiak. Most importantly, he stated, the website provides a location for Alaskans to tell their stories of innovative adaptation solutions and allowing Alaskans working on similar issues to learn from each other. This component is under development right now, he noted, and should be out shortly.

DR. HOLEN discussed the recommendations outlined on slide 13. He related that from his experience working at ADF&G and the university, one of the key challenges researchers have is obtaining funding for their projects to match federal funding. Such funding could lead to more research and collaborative projects that involve communities and researchers working together to tackle the challenges related to subsistence economies and other climate topics. More tools are needed for community specific climate data, he advised. Efforts are ongoing at the university through the Scenarios Network for Alaska + Arctic Planning (SNAP) at the International Arctic Research Center, but this only covers a few communities as a test case. Having spent many years involved in the regulatory process, he continued, he knows the challenges many resource managers face in amending hunting and fishing opportunities to allow for residents to participate in subsistence activities when the climate and weather are not cooperating with the scheduled regulatory seasons. Perhaps there are some innovative regulatory tools that could be developed, he suggested. The Sitka Tribe and Alutiiq Pride Hatchery in Seward are working on monitoring ocean acidification in the near-shore environment in Southeast Alaska, lower Cook Inlet, and Prince William Sound. The programs need long-term funding to understand trends and should be expanded to areas such as Kodiak and the Arctic, he stated. For salmon, more research and resources are needed, especially in understanding stress on Chinook and other salmon

resources in the marine environment, something that local residents often bring up in workshops. Finally, Dr. Holen said, communities are taking great strides to increase their resiliency and build food security for an uncertain future. Everyone knows the cost of bringing food into rural communities. Promoting local production, whether it is through greenhouses and farms or habitat amelioration for wild resources will provide for food security in communities across Alaska.

DR. HOLEN turned to slide 14 and concluded his presentation. He said the Tyonek community garden project is a real model in that it produces fresh produce through the summer for elder meals. Produce is for sale in the community at much lower cost than shipping it in and it produces jobs for students, he continued. It involves the school and makes the kids proud of their work. So much is produced that it is sent out of the community for sale in Anchorage to help support the program, he added, and more can be learned by going to the adaptalaska.org website.

6:36:56 PM

CO-CHAIR TARR requested Dr. Nolen to talk further about general funds for state agencies and university faculty to match federal funds. She offered her understanding that due to budget cuts at the University of Alaska Anchorage (UAA), folks are no longer seeking some of these grant opportunities, faculty has left, and climate change research is being done by universities in North Carolina, Iowa, and other states.

DR. HOLEN replied it is a real challenge because the university has lost a significant amount of faculty. For example, his program, the Alaska Sea Grant Marine Advisory Program, has lost half its faculty in the last five years. This is continuing and is causing a brain drain in which these researchers are moving to other institutions. But, he noted, they still want to work in Alaska and in many cases, they continue to work in Alaska from other locations. To fill some of these gaps the university has hired research faculty that almost entirely work on grant funding. They are provided one or two months of funding from the university and then they must seek additional funding. It is quite the challenge to find that match, he added, it is often 50 percent of what the researcher is asking for. Dr. Holen noted that he and his colleagues have passed over grants because of this. Alaska is a big state, but also a very small state, he continued, and many of the people working on these issues know each other well and have created unique collaborations. He said he has learned that in many places if an agency or university

couldn't get a grant, they would just pass it up. Often done in Alaska to address these issues, he advised, is to put together collaborations of very large teams to apply even for small amounts of funding and everybody throws in a little bit.

6:40:46 PM

NIKOOSH CARLO, Senior Advisor, Climate and Arctic Policy, Office of the Governor, informed the committee her role as a senior advisor in the governor's office is to lead the development of a climate policy that incorporates the expertise of state departments and agencies, and to serve as a liaison to the Climate Action for Alaska Leadership Team. Slide 1 pictured climate change impacts such as increased wildfires, erosion, melting glaciers, and ocean acidification, which she said collectively threaten the social and cultural fabric of Alaska's communities and the health, safety, and economic future of its residents. In October [2017] Governor Walker signed Administrative Order 289 which established Alaska's Climate Change Strategy and the Climate Action for Alaska Leadership Team. The leadership team has 21 appointed members who first met December [2017], and who are tasked to develop recommendations that are due to the governor by September 2018. Dr. Carlo said the team has formed two working groups to review the topics of mitigation and adaptation (slide 2). The topic of mitigation includes the use of renewable energy, energy efficiency, and other actions to decrease the carbon footprint of the state and other entities (slide 3). The topic of adaptation will be studied to determine how Alaska communities respond to climate impacts and how to increase social, environmental, and economic resilience (slide 4). Further, the leadership team will form panels, one on science and research, and one to evaluate oil and gas technical data and the effect of industry on climate (slide 5).

6:45:18 PM

DR. CARLO continued to explain another category the team will study is response to the present threats facing 31 communities in Alaska by gathering data, planning, adaptation measures, diversification, and obtaining funding (slides 6 and 7). Slide 8 listed visions that would address threats facing Alaska in the future such as a stable fiscal plan and improved food security.

6:48:19 PM

CO-CHAIR JOSEPHSON inquired as to Dr. Carlo's previous experience in Arctic policy.

DR. CARLO said she is from Fairbanks and Tanana and worked for the U.S. Department of State on Arctic policy during the U.S. chairmanship of the Arctic Council; prior to that she served as executive director of the Alaska Arctic Policy Commission.

CO-CHAIR JOSEPHSON asked whether Dr. Carlo agreed that the Climate Action for Alaska Leadership Team should involve federal agencies such as FEMA and DHSEM.

DR. CARLO said she has been in contact with federal agencies that are working on climate change in order to ensure federal agencies are aware that Alaskans are threatened by climate change now and will be in the future. In further response to Co-Chair Josephson, she said she also communicates closely with the Denali Commission.

CO-CHAIR JOSEPHSON asked for assurance that all of the related organizations collaborate.

DR. CARLO gave an example of the leadership team cohosting a workshop during which information was exchanged between state and federal agencies.

6:52:00 PM

CO-CHAIR TARR encouraged the leadership team to include complete cost estimates with its recommendations to the governor. For example, in addition to the costs of moving a community, there are additional costs to oil and gas development projects in the northern region due to thawing permafrost and shorter building seasons; also, ocean acidification will be costly to the fishing industry.

DR. CARLO agreed.

6:54:28 PM

CO-CHAIR JOSEPHSON read from an article found in the [Alaska/Anchorage Daily News] noting the cost of climate change on Alaska's public infrastructure is estimated to be $5.5 billion in 2099 [document not provided]. He pointed out costs are difficult to determine and urged the leadership team to produce a credible document that reflects the reality of the

cost of climate change. Co-Chair Josephson then questioned whether the leadership team needs funding at this time.

DR. CARLO said the team has the funding needed to complete its mandate within the administrative order; however, long-term funding would be helpful. She added, "Conceptually, I like the idea of having a commission that is there for the long term and is something that ... we can work on to develop and ... see the recommendations that come through the leadership team into reality."

CO-CHAIR JOSEPHSON asked about the team's meeting schedule.

DR. CARLO advised the team holds monthly meetings by teleconference and on April 12, [2018], will meet for one day in Fairbanks. She described her other responsibilities in the governor's office.

6:59:24 PM

CO-CHAIR JOSEPHSON opened public testimony on HB 173. After ascertaining no one wished to testify, public testimony was closed.

HB 173 was held over.

7:00:24 PM

ADJOURNMENT

There being no further business before the committee, the House Resources Standing Committee meeting was adjourned at 7:00 p.m.