

ALASKA LEGISLATURE COMMITTEE FILES 2007-2008 RES 12659



**Southwest Alaska Municipal Conference**

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Alaska  
Peninsula  
Aleutian Ch.  
Bristol Bay  
Kodiak Islan  
Pribilof  
Islands

**Resolution 07 - 07**

**A resolution of the Southwest Alaska Municipal Conference in support of the Establishment of a Renewable Energy Fund for Alaska.**

- WHEREAS,** an adequate, reliable, reasonably priced and safe supply of electrical energy is necessary for Alaska's basic infrastructure, and economic and technological development; and
- WHEREAS,** Alaska possesses vast amounts of renewable energy resources in the form of wind, geothermal, biomass, solar, tidal, wave and hydro power; and
- WHEREAS,** the Alaska Legislature established the Alaska Energy Policy Task Force in 2003 to review and analyze the state's current and long term energy needs; and
- WHEREAS,** the Task Force found that one of Alaska's long term energy needs is to "identify and evaluate long term fuel resources," and recommended that the state should "increase the proportion of renewable in long term fuel sources;" and
- WHEREAS,** the cost of fuels such as natural gas and diesel that Alaskans rely on in large part to generate electric power and heat is steadily rising; and
- WHEREAS,** residents in rural Alaska pay far more for electricity than residents who live on the Rail belt energy grid; and
- WHEREAS,** there is virtually no fuel cost associated with renewable energy resources; and
- WHEREAS,** other states and nations are working successfully to develop their renewable energy resources; and

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- WHEREAS,** the continued competitiveness and stability of the state's economy requires that the legislature consider national and international trends towards renewable energy development; and
- WHEREAS,** renewable energy technology development promotes both industry investment and job creation; and
- WHEREAS,** clean, renewable energy has many environmental and health benefits; and
- WHEREAS,** locally produced renewable energy has many security benefits; and
- WHEREAS,** modern, affordable, and efficient renewable energy technologies now exist; and
- WHEREAS,** It is in the public's interest for Alaska to develop its zero fuel cost renewable energy resources.

**NOW THEREFORE BE IT RESOLVED** that the Board of Directors of the Southwest Alaska Municipal Conference support a Renewable Energy Fund for Alaska to be established as a separate fund to finance new utility-scale renewable energy projects in Alaska with grants and loans; and


**BE IT FURTHER RESOLVED** that the Fund should be funded by general appropriations so that Alaska can leverage a portion of today's oil and gas wealth into a renewable energy industry that can and will provide perpetual benefits to Alaskans.

**PASSED AND ADOPTED** by a duly constituted quorum of the Southwest Alaska Municipal Conference membership this 26<sup>th</sup> day of January, 2007.

**Signed:**

  
\_\_\_\_\_  
Glen Gardner  
President

**Attest:**

  
\_\_\_\_\_  
Wanetta Ayers  
Executive Director

Reviewed by Board: January 24, 2007  
Referral(s): Energy Committee  
Report from Energy Committee: Do Pass  
Membership Meeting:  
Motion to Adopt: Linda Freed  
Second: Ernest Weiss  
Motion Passed  
Ratified by Board: January 27, 2007

# ALASKA MUNICIPAL LEAGUE

## Resolution No. 2007-14

### A RESOLUTION ESTABLISHING A RENEWABLE ENERGY FUND

**WHEREAS**, Alaska possesses vast amounts of renewable energy resources in the form of wind, geothermal, biomass, solar, tidal, wave and hydro power; and

**WHEREAS**, the Alaska Legislature established the Alaska Energy Policy Task Force in 2003 to review and analyze the state's current and long-term energy needs. The Task Force found that one of Alaska's long-term energy needs is to "identify and evaluate long-term fuel resources; and recommends that the state "increase the proportion of renewables in long-term fuel sources"; and

**WHEREAS**, there is virtually no fuel costs associated with renewable energy resources; and

**WHEREAS**, renewable energy technology development promotes both industry and job creation; and

**WHEREAS**, ISER's December 2005 Research Summary states, "Diesel is the main energy source in remote communities....and in 2004, diesel outside the rail belt cost about 5 times as much per unit of energy as natural gas." Community facilities such as electrical plants, water & sewer services and health clinics use diesel fuel; and

**WHEREAS**, there are numerous agencies dealing with energy assistance, both federal, state and international specialists. We urge the State to appoint a cabinet level position to coordinate and centralize resources to effectively solve the long-term energy crisis; and

**NOW, THEREFORE BE IT RESOLVED**, by the Alaska Municipal League, that we request our Alaska State Legislature and Alaska Congressional Delegation to address the energy needs by:

1. Creating a Renewable Energy Fund to finance new utility scale renewable energy projects in Alaska. The Fund shall be funded by general appropriations. The Fund shall be distinct from funds administered by the Alaska Energy Authority.
2. The Fund will conduct a program of energy research, development, demonstration and application.
3. Create a cabinet level position to coordinate efforts and centralize state and federal resources to solve the long-term energy crisis.
4. Creating a revolving loan and grant program to assist individuals, organizations, and businesses in purchasing and installing alternative and renewable energy products.

**PASSED AND APPROVED BY THE ALASKA MUNICIPAL LEAGUE** on the 17th day of November 2006.

Signed: \_\_\_\_\_

Tim Bourcy, President  
Alaska Municipal League

Attest.

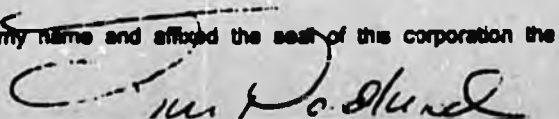
**Resolution in Support of a Renewable Energy Fund**

WHEREAS, the Chugach Electric Association Board of Directors recognizes that renewable energy will play an important role in Alaska's future energy supply:

BE IT RESOLVED that the Chugach Electric Association Board of Directors supports the establishment of a renewable energy fund where the funding comes from the Alaska State Legislature in the form of appropriations, general funds, or through an endowment.

I, Jim Nordlund, do hereby certify that I am that I am Secretary of Chugach Electric Association, Inc., an electric non-profit cooperative membership corporation organized and existing under the laws of the State of Alaska; that the foregoing is a complete and correct copy of a resolution adopted at a meeting of the Board of Directors of this corporation, duly and properly called and held on the 21st day of February, 2007; that a quorum was present at the meeting; that the resolution is set forth in the minutes of the meeting and has not been rescinded or modified.


IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed the seal of this corporation the 21st day of February, 2007.

  
Secretary



Golden Valley Electric Association

PO Box 71249, Fairbanks, AK 99707-1249 • (907) 452-1151 • www.gvea.com

Your Touchstone Energy Cooperative 

**RESOLUTION NO. 102-07  
GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.  
SUPPORTING THE CONCEPT OF A RENEWABLE ENERGY FUND**

**WHEREAS**, the GVEA Board recognizes that renewable energy will play an important role in Alaska's future energy supply;

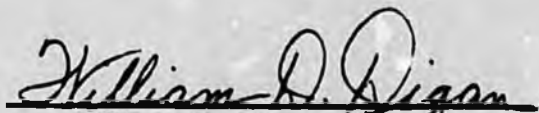
**BE IT FURTHER RESOLVED** that the Golden Valley Electric Association Board of Directors supports the concept of a renewable energy fund where the funding comes from an appropriation, general funds or through an endowment.

**CERTIFICATION**

I, William D. Digan, do hereby certify that I am the Secretary of Golden Valley Electric Association, Inc., an electric not-for-profit cooperative membership corporation organized and existing under the laws of the State of Alaska; that the foregoing is a complete and correct copy of a resolution adopted at a regular meeting of the Board of Directors of this corporation, duly and properly called and held on the 29th day of January 2007; that a quorum was present at the meeting; that the resolution is set forth in the minutes of the meeting and has not been rescinded or modified.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed the seal of the corporation this 29th day of January, 2007.



  
William D. Digan, Secretary

**Alaska State Chamber of Commerce**  
**2007 Position**  
**Create a Renewable Energy Fund for Alaska**

The Alaska State Chamber of Commerce supports the establishment of a Renewable Energy Fund by the legislature, financed with general fund appropriations, to finance the construction of zero fuel cost renewable energy projects across Alaska.

**ALASKA FEDERATION OF NATIVES INC.**

**2006 ANNUAL CONVENTION**

**RESOLUTION 06-34**

- TITLE**        **CALLING FOR THE ESTABLISHMENT OF A RENEWABLE ENERGY FUND**
- WHEREAS:** Alaska possesses vast amounts of renewable energy resources in the form of wind, geothermal, biomass, solar, tidal, wave and hydro power; and
- WHEREAS:** The Alaska Legislature established the Alaska Energy Policy Task force in 2003 to review and analyze the state's current and long term energy needs; and
- WHEREAS:** The Task Force found that one of Alaska's long term energy needs is to "identify and evaluate long term fuel resources" and recommends that the state "increase the proportion of renewable energy in long term fuel sources"; and
- WHEREAS:** There is virtually no fuel costs associated with renewable energy resources; and
- WHEREAS:** Renewable energy technology development promotes both industry and job creation; and
- WHEREAS:** The Institute of Social and Economic Research's December 2005 research summary states "Diesel is the main energy source in remote communities--and in 2004 diesel outside the rail belt cost about 5 times as much per unit of energy as natural gas;"and
- WHEREAS:** Community facilities such as electrical plants, water & sewer services and health clinics use diesel fuel; and
- WHEREAS:** Rural Alaskan residents are dependent on diesel fuel to generate heat for homes and the high cost of energy seriously impacts economic conditions in rural Alaska. The average price of diesel fuel in the Bering Straits Region is \$4.39 a gallon; and
- WHEREAS:** There are numerous agencies dealing with energy assistance, both federal state and international specialists. We urge the State to appoint a cabinet level position to coordinate and centralize resources to provide leadership and begin to develop a solution to the long term energy crisis; and

**NOW THEREFORE BE IT RESOLVED** by the Delegates to the 2006 Annual Convention of the Alaska Federation of Natives that President Bush is urged to include in his budget for FY 2008, more funding for alternative fuel projects; and

**BE IT FURTHER RESOLVED**, that the Alaska Congressional Delegation and the State Administration is urged to address the energy needs of rural Alaska families by:

1. Creating a Renewable Energy Fund to finance new utility scale renewable energy projects in Alaska funded by general appropriations. The fund shall be distinct from funds administered by Alaska Energy Authority and will conduct programs of energy research, development, demonstration and application; and
2. Creating a cabinet level position to coordinate efforts and centralize state and federal resources to solve the long term energy crisis; and
3. Creating a revolving loan fund to allow individuals and businesses to purchase and install alternative energy products.

**SUBMITTED BY:** KAWERAK, INC.; NAPAKIAK CORPORATION

**COMMITTEE ACTION:** DO PASS

**CONVENTION ACTION:** AMENDED AND PASSED



**TAB 6**



## Berkeley Lab and the Clean Energy States Alliance

# CASE STUDIES OF STATE SUPPORT FOR RENEWABLE ENERGY



## The Impact of State Clean Energy Fund Support for Utility-Scale Renewable Energy Projects

Mark Bolinger and Ryan Wiser  
Lawrence Berkeley National Laboratory

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May 2006

The database from which the information in this report has been compiled can be found at [http://eetd.lbl.gov/ea/ems/cases/Large\\_Renewables\\_Database.xls](http://eetd.lbl.gov/ea/ems/cases/Large_Renewables_Database.xls)

Download other clean energy fund case studies from:  
<http://eetd.lbl.gov/ea/EMS/cases/>  
or  
[www.cleanenergystates.org](http://www.cleanenergystates.org)

### Introduction

At least fourteen states across the U.S. have established funds to promote the development and commercialization of renewable energy technologies. Most often financed by a small surcharge on retail electricity rates, these funds currently collect more than \$500 million per year in aggregate in support of renewables. At this funding level, state clean energy funds are positioned to be a major driver of renewable energy development.

Though state clean energy funds have pursued a variety of approaches in the use of their funds, support for the deployment of utility-scale renewable energy projects – such as commercial wind, biomass, and geothermal projects – has been a principal target of most funds. This case study, and the database it describes, summarizes the support that clean energy funds have provided to utility-scale renewable energy projects in recent years, detailing – among other things – the amount of funds

obligated and the number, capacity, and resource type of projects supported.

This case study focuses on projects supported by funds that are members of the Clean Energy States Alliance (CESA). CESA is a non-profit, membership-based, multi-state coalition consisting of most of the clean energy funds throughout the United States.<sup>1</sup> CESA provides information and technical assistance to its member funds, and works with them to develop and promote clean energy technologies and to create and expand the markets for these technologies.

The database on which this summary is based will be updated periodically to provide a running summary of state activity and influence. The Excel database contains information on all non-photovoltaic, utility-scale (defined here as 1 MW or larger in nameplate capacity), new renewable energy projects (whether currently on line

<sup>1</sup> Specifically, CESA consists of 18 funds in 14 states. More information is available at [www.cleanenergystates.org](http://www.cleanenergystates.org).

or not) that have received (or been obligated) construction- or production-related financial support from CESA-member clean energy funds. The database does *not* include projects that have received only pre-development support; nor does it cover R&D or other non-deployment activities. In addition, several clean energy funds, including those in California and New York, now provide direct financial assistance to projects participating in each state's renewables portfolio standard (RPS) – the database *does not* include such RPS-related support.

The database includes both project and incentive information, to the extent readily available. Project information includes: project location, resource type (e.g., wind, geothermal, etc.), nameplate capacity, project participants (e.g., developer/owner), project status (i.e., online, pending, or canceled), online date (if applicable), and power purchase agreement (PPA) counterparty (if applicable). Incentive information includes: supporting clean energy fund, incentive type (e.g., grant vs. production incentive vs. loan), original and revised incentive amount, date of incentive award, solicitation name (if any), and treatment of the project's tradable renewable certificates (TRCs – i.e., whether the fund places any restrictions on the sale of TRCs from the project). Finally, in addition to reporting the incentive as it is actually structured, we also normalize all incentives to their equivalent 5-year production incentive value in order to facilitate broad comparisons across projects, technologies, and clean energy funds.

The remainder of this report provides summary information compiled from the database as of March 2006. For more detailed information on individual states or projects, see the actual database itself, which can be accessed at [http://eetd.lbl.gov/ea/ems/cases/Large Renewables Database.xls](http://eetd.lbl.gov/ea/ems/cases/Large_Renewables_Database.xls).

### Key Findings

#### 1. State clean energy fund support for utility-scale renewable energy projects is significant.

Of the fourteen states with CESA-member clean energy funds, eight have provided construction or operational support to utility-scale renewable energy projects. As shown in Figure 1 and Table 1, since 1998, clean energy funds in these eight states have set aside or obligated more than \$475 million in construction or operational support for 250 renewable energy projects totaling 2,642 MW. After accounting for cancellations – 16 projects totaling 393 MW have had their incentives canceled to date<sup>2</sup> – and penalties due to missed milestones, the total amount of funding currently obligated stands at nearly \$400 million. So far, 178 projects totaling 1,116 MW have been built, while 56 projects totaling 1,133 MW are still in the development pipeline.

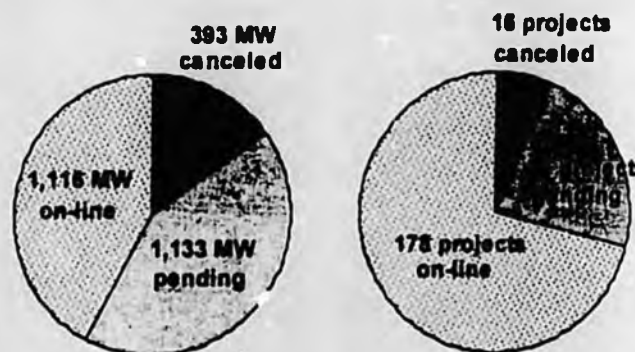


Figure 1. Status of Projects and Capacity Supported

<sup>2</sup> Four wind projects in New York account for 267 MW of the 393 MW that have had incentives canceled to date. These four projects agreed to forfeit their incentives, as required, in order to participate in New York's RPS. One of these four projects has since received support from NYSERDA under the state's RPS (in the form of a 10-year TRC purchase). As noted earlier, though, our database does not include this RPS-related support.

**Table 1. Summary of State Support for Utility-Scale Renewable Projects (as of March 2006)**

Project Location	# of Projects	Obligated Funding (\$)		Capacity (MW)			
		Original	Current	Original	Canceled	Pending	Online
CA	80	\$243,573,376	\$189,970,791	1,291.5	64.5	748.5	478.5
IL	5	\$8,425,000	\$8,425,000	112.5	0.0	6.0	106.5
MA*	5	\$32,756,736	\$32,756,736	52.3	0.0	49.0	3.3
ME*	1	\$5,600,000	\$5,600,000	19.0	0.0	19.0	0.0
MN	147	\$107,679,545	\$107,679,545	253.3	1.7	35.3	216.3
NH*	1	\$2,720,000	\$2,720,000	50.0	0.0	50.0	0.0
NJ	6	\$17,782,028	\$14,682,028	38.9	21.0	6.9	11.0
NY	11	\$25,560,000	\$10,460,000	316.1	266.5	8.0	41.6
OR	4	\$3,800,000	\$3,800,000	122.0	0.0	6.0	116.0
PA	10	\$27,292,000	\$21,442,000	386.6	39.6	204.5	142.5
<b>Total</b>	<b>260</b>	<b>\$475,188,683</b>	<b>\$397,636,097</b>	<b>2,642.2</b>	<b>393.3</b>	<b>1,133.2</b>	<b>1,116.8</b>

\*Maine and New Hampshire do not currently have clean energy funds. The projects located in these two states have received support from Massachusetts' clean energy fund. Similarly, one wind project located in Massachusetts has received financial support from Rhode Island's renewable energy fund.

**2. California has been the biggest player historically, but other states have been more active recently.**

Among the states listed in Table 1, California clearly dominates, accounting for roughly half of total dollars obligated, as well as capacity obligated and online. This not only reflects the sheer size of California's renewable energy program, but also its early initiative: California's first auction of production incentives to utility-scale renewable energy projects occurred in June 1998, roughly two years prior to similar activity in other states. By the same token, however, California has not encumbered new funding for such projects since 2001,<sup>3</sup> and has also experienced difficulty in bringing funded projects online – 66% of all pending capacity is in California. Meanwhile, much of the activity in other states has been more recent.

<sup>3</sup> This lapse is due in large part to the creation of the California RPS, under which the role of California's program that formerly targeted new utility-scale projects has changed to providing supplemental energy payments (SEPs) intended to cover the above-market cost of RPS contracts. Though no RPS contracts approved to date have required SEPs, such support would not be included in our database regardless, since it is RPS-related.

**3. The amount of renewable generating capacity supported by state funds continues to increase, though the growth rate has slowed markedly.**

As shown in Figure 2, with the exception of 1999 and 2004, the amount of renewable generating capacity being supported by these eight states has risen each year. Likewise, the amount of obligated capacity that has come online has also risen, with proportionally larger increases in 2001, 2003, and 2005 – all years in which the federal production tax credit (PTC) for wind power was scheduled to expire, thereby encouraging completion of wind projects prior to year's end (see Figure 3 for a clearer, wind-specific view of this phenomenon). Even so, the rapid growth in new obligated capacity in the early years has slowed markedly since 2003, perhaps partly in response to the slower-than-expected pace of development among projects already obligated funding. The transition of California and New York towards supporting such projects through RPS policies has no doubt also played a role in slowing the growth of new obligated capacity.

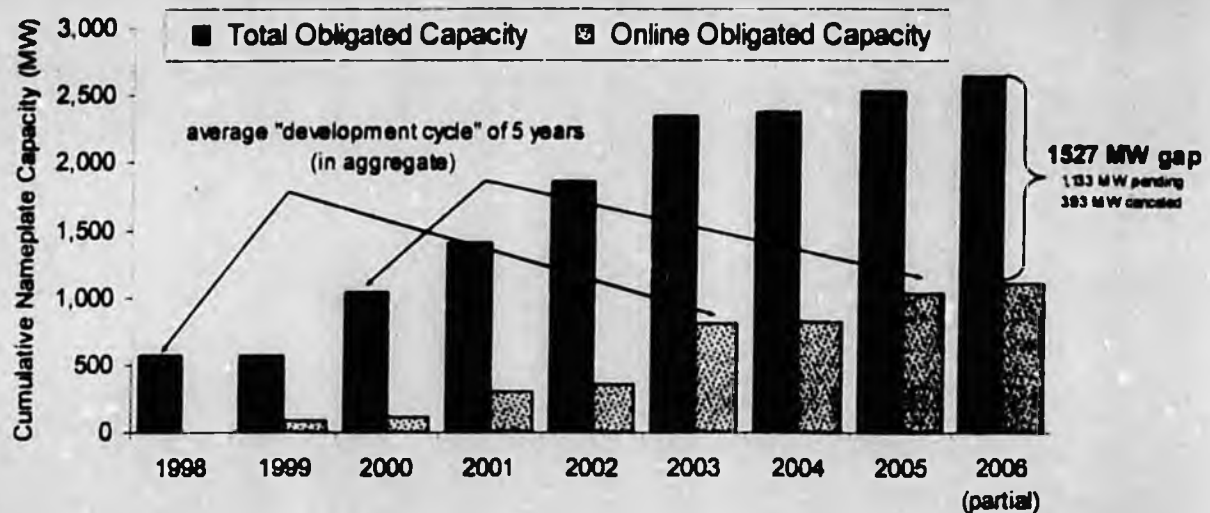


Figure 2. Cumulative Renewable Capacity Obligated and Online Over Time

4. Development difficulties have been encountered.

It is apparent from Figure 2 that the amount of obligated capacity coming online has not kept pace with the amount of new capacity being obligated: the gap between the two currently stands at 1,527 MW, a level that has remained more or less constant since 2002 (again, as shown in Table 1, 393 MW of this amount has been canceled or withdrawn, leaving 1,133 MW still pending). This is partly a reflection of unforeseen difficulties in the development process, such as permitting challenges, difficulty securing a power purchase agreement,<sup>4</sup> and the failure of Congress to extend the PTC in a timely manner (in 2004). On an aggregate basis, the length of the "development cycle" (i.e., the amount of time before a given amount of obligated capacity actually comes online) has, to date, been about 5 years on average – no doubt longer than most would have anticipated back in 1998.

<sup>4</sup> The lack of power purchase agreements is a key reason why both California and New York have moved towards an RPS structure that relies upon state renewable energy funds.

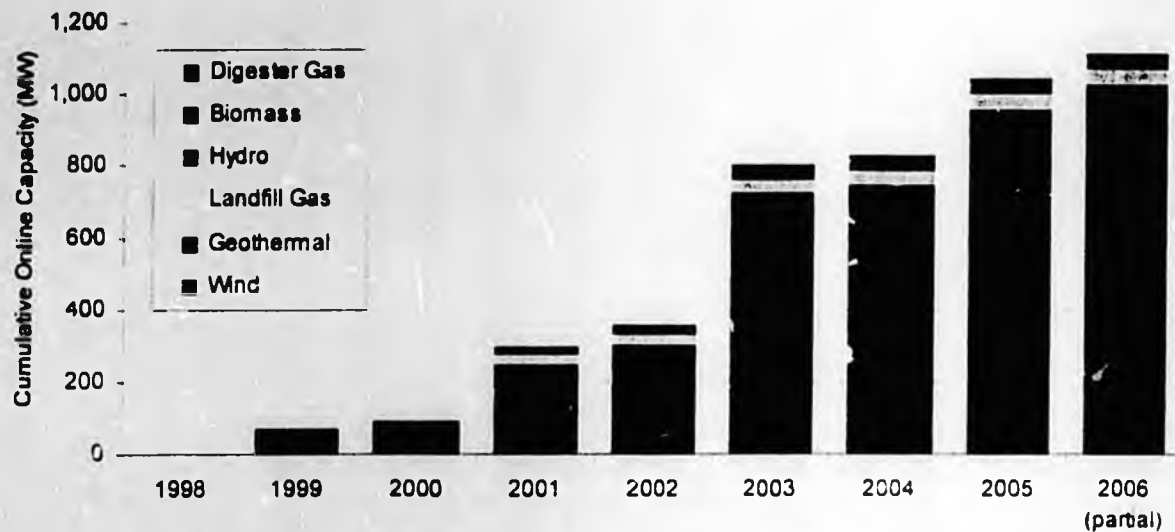
5. Wind energy is a major recipient of financial support.

Having captured more than 60% of total funding to utility-scale renewable projects, wind power accounts for more than 80% of all obligated, online, and pending capacity. As shown in Table 2, 970 MW of obligated wind capacity is now online, and more than 900 MW are still pending (of the 330 MW of wind projects that have had their incentives canceled, 267 MW are in New York – see footnote 2 for an explanation). This high concentration reflects the cost-effectiveness and widespread availability of wind power. The next largest resource (in terms of funding and capacity) is geothermal, which has been supported by a single state – California. Landfill gas projects have also been somewhat successful at securing state incentives, though a relatively high number of such projects have since been canceled.

Figure 3 shows the cumulative amount of obligated capacity that has come online over time, by resource type.

**Table 2. Support for Utility-Scale Renewable Projects, by Resource Type (as of March 2006)**

Resource Type	# of Projects	Obligated Funding (\$)		Capacity (MW)			
		Original	Current	Original	Canceled	Pending	Online
Biomass	9	\$20,347,840	\$16,407,902	98.7	9.5	77.9	11.3
Digester Gas	3	\$4,108,210	\$4,108,210	6.0	0.0	6.0	0.0
Geothermal	4	\$80,331,618	\$80,331,618	156.9	0.0	97.9	59.0
Hydro	8	\$14,946,409	\$13,757,139	50.8	0.0	18.5	32.3
Landfill Gas	30	\$41,974,893	\$33,689,649	91.7	23.7	24.6	43.4
Waste Tire	1	\$7,232,413	\$0	30.0	30.0	0.0	0.0
Wind	195	\$303,247,300	\$249,241,580	2,208.2	330.1	908.4	969.7
<b>Total</b>	<b>250</b>	<b>\$475,188,683</b>	<b>\$397,536,097</b>	<b>2,642.2</b>	<b>393.3</b>	<b>1,133.2</b>	<b>1,115.6</b>

**Figure 3. Cumulative Online Capacity Supported by CESA-Members, by Renewable Resource**

#### 6. States are increasingly using new and innovative incentive structures to support projects.

The structure of state clean energy fund support for utility-scale renewable energy projects has evolved somewhat over time. In the late 1990s, production incentives and grants were the predominant form of support. While both are still regularly employed,<sup>5</sup> a number of states

<sup>5</sup> States are becoming increasingly innovative in their use of grants and production incentives. For example, some states have provided up-front, lump-sum, production incentives that are earned over time and secured by a letter of credit. Such an incentive provides similar value to the project as an up-front

have begun to expand their offerings to include debt financing, negotiated purchases of a project's tradable renewable certificates (TRCs), and "insurance" products that mitigate the project's price risk in the absence of a long-term power purchase agreement.

Figure 4 shows the prevalence of each type of incentive employed, based on percentage of total dollars obligated. As shown, real-time production incentives – utilized in California, Minnesota, New Jersey, New York, and Pennsylvania – account for 78% of all dollars obligated. Another 4% involves a variation on

grant, without negatively impacting the project's ability to capture the federal production tax credit.

real-time production incentives, where instead of metering out funding over time, funding is provided up-front in a lump sum, but *earned* over time through electricity production or delivery of TRCs.<sup>5</sup> Pennsylvania, Oregon, and Illinois have each employed this type of incentive. Massachusetts and Rhode Island have offered various forms of TRC purchase and price insurance products, accounting for 8% of all dollars obligated. Meanwhile, Pennsylvania and New Jersey have provided debt financing equal to about 3% of all dollars obligated. Finally, grants in Illinois, Minnesota, New Jersey, New York, and Pennsylvania make up the remaining 7% of dollars obligated.

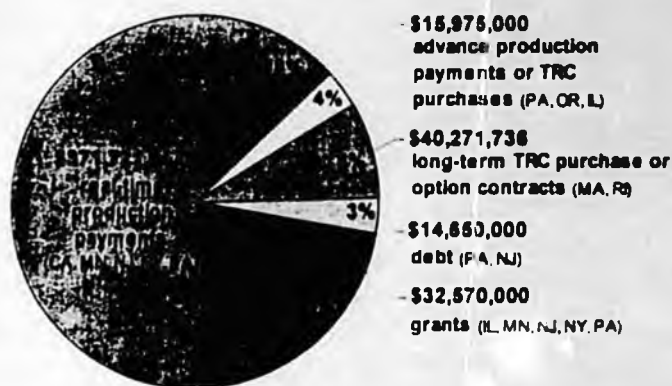


Figure 4. Percentage of Obligated Dollars Awarded Through Various Incentive Types

#### 7. Support is predominantly production-based, rewarding electricity generation rather than project construction.

In aggregate, incentives that are based on actual production make up 90% of all dollars obligated (i.e., 78% real-time production payments plus 4% advance production payments or TRC purchases plus 8% TRC price insurance or ongoing TRC purchase commitments). More so than grants, such production-based incentives align the interests of project developers, state

funds, and society in building or supporting projects that efficiently produce the maximum amount of clean, renewable energy. Just as importantly, unlike grants, production-based incentives are unlikely to trigger the anti-double-dipping provisions of the federal production tax credit (PTC) for renewable energy contained in Section 45 of the US tax code. How different incentive types interact with the PTC is an important consideration, given the PTC's potential value to a project.

#### 8. Normalized incentive levels vary based on a number of factors.

Figure 5 shows the normalized (to 5-year production incentive equivalent) range of state clean energy fund support for each renewable resource. Incentive levels have ranged widely, particularly for wind, hydro, and biomass projects. In each of those cases, however, the capacity-weighted average normalized incentive falls close to the low end of the range, implying that there is not much capacity at the high end of the range. Typically, the high end of the range represents very small projects that have been able to secure generous incentives, perhaps justified by the disproportional impact of transaction costs and diseconomies of scale that small projects must sometimes overcome.

Although sample size (in terms of both number of projects and capacity involved) varies widely across resources, the ranking of resources based on capacity-weighted average normalized incentive level is not too surprising. Specifically, biomass and wind projects have required some of the lowest incentives on average, while digester gas projects have typically required more support (though the range of average incentives among resources is fairly tight overall, from \$7-21/MWh on a 5-year equivalent basis).

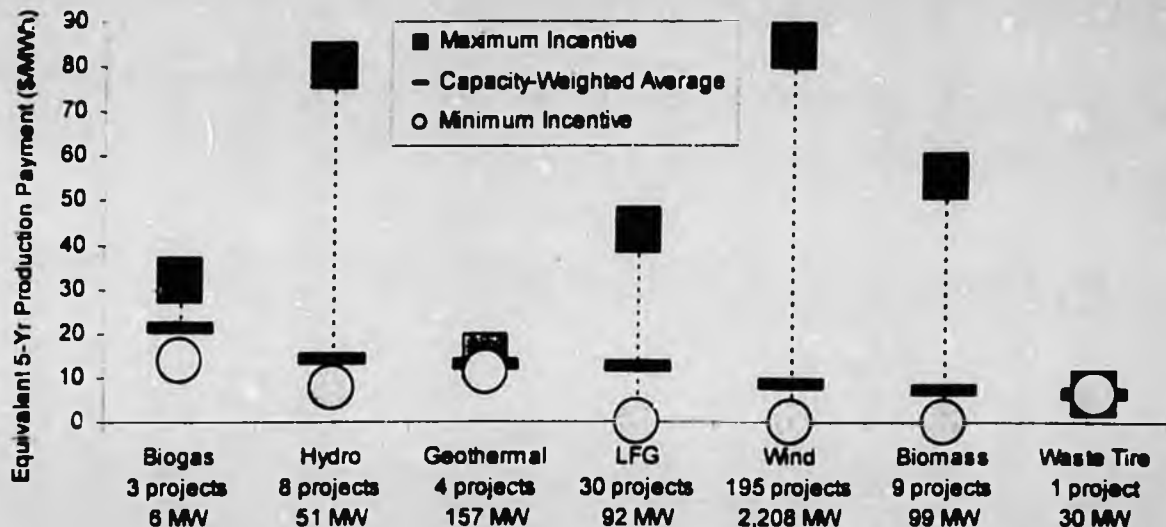


Figure 5. Equivalent 5-Year Production Incentives by Resource Type

### Conclusions

To date, CESA-member state clean energy funds have committed a substantial amount of funding in support of utility-scale (> 1 MW) renewable energy projects. This funding, currently about \$400 million, is already supporting 1,116 MW of new renewable capacity, and could eventually support up to 2,249 MW (i.e., 1,133 MW of obligated capacity still remains in the development pipeline). California has by far provided the most support of any fund (though not since 2001), while wind has by far received the most support of any renewable resource. Other state funds, however, are also supporting such projects (in some cases at similarly aggressive levels as California relative to the total size of endowment), and other renewable resources are also garnering attention and funding. Progress in obligating funds for new projects, and in bringing previously obligated projects online, has been fairly steady over time, though undoubtedly slower than originally envisioned with respect to development and construction. State funds are experimenting with increasingly innovative financial incentives, ranging from production incentives provided in an up-front lump sum and then earned over time, to various forms of debt financing, to options and other forms of price insurance on a project's TRCs. Finally, while

the amount of financial support provided to individual projects has varied widely, on average the level of incentive provided to projects to date does not appear to be unreasonable.

The database from which this information has been compiled is publicly available at [http://eetd.lbl.gov/ea/ems/cases/Large\\_Renewables\\_Database.xls](http://eetd.lbl.gov/ea/ems/cases/Large_Renewables_Database.xls), and will be updated periodically as new funding is obligated and new projects come online.

**INFORMATION SOURCES**

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Database of Utility-Scale Renewable Energy Projects Supported by CESA Members:  
[http://eetd.lbl.gov/ea/ems/cases/Large\\_Renewables\\_Database.xls](http://eetd.lbl.gov/ea/ems/cases/Large_Renewables_Database.xls)

### ABOUT THIS CASE STUDY SERIES

A number of U.S. states have established clean energy funds to support renewable and clean forms of electricity production. This represents a new trend towards aggressive state support for clean energy, but few efforts have been made to report and share the early experiences of these funds.

This paper is part of a series of clean energy fund case studies prepared by Lawrence Berkeley National Laboratory and the Clean Energy States Alliance. The primary purpose of this case study series is to report on the innovative programs and administrative practices of state (and some international) clean energy funds, to highlight additional sources of information, and to identify contacts. Our hope is that these case studies will be useful for clean energy funds and other stakeholders that are interested in learning about the pioneering renewable energy efforts of newly established clean energy funds. To access or download all the case studies, see: <http://eetd.lbl.gov/ea/ems/cases/> or <http://www.cleanenergystates.org/>

### ABOUT THE CLEAN ENERGY STATES ALLIANCE

The Clean Energy States Alliance (CESA) is a non-profit initiative funded by members and foundations to support the state clean energy funds. CESA collects and disseminates information and analysis, conducts original research, and helps to coordinate activities of the state funds. The main purpose of CESA is to help states increase the quality and quantity of clean energy investments and to expand the clean energy market. The Clean Energy Group manages CESA, while Berkeley Lab provides CESA with analytic support.

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**TAB 7**

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## **Bipartisan effort could bring alternative energy to Bush**

by Bill McAllister  
Thursday, March 8, 2007

JUNEAU, Alaska -- Business at the Capitol has been slow this week as several legislators attend an energy conference in Washington, D.C., focusing on an Alaska gas pipeline.

A couple of lawmakers who stayed behind, though, are touting their efforts to move forward on renewable energy.

The effort is based on the fact that even as the state enjoys the benefits of its energy wealth, residents of rural Alaska are paying highly disproportionate electrical bills. So some legislators are pushing for a renewable energy fund to bring cleaner and cheaper fuel to the Bush.

In their effort to establish a renewable energy fund aimed mostly at rural Alaska, House Speaker John Harris and Sen. Johnny Ellis are reaching not only across the aisle, but across the capitol.

"It's something that can bring the House and Senate together. It's non-partisan, it's non-ideological," said Ellis, D-Anchorage. "People realize that there's money to be made. Not just money to be saved, but money to be made on these cutting-edge technologies."

"So it's responsible for us, both in a bipartisan way and between the House and Senate, to look at something we can come together on and say how we can generate our efforts, literally, to find better ways of getting less expensive, more reliable, cleaner power to many of these areas," said Harris, R-Valdez.

There are some wind farms contributing to electrical generation in western Alaska, but Harris and Ellis say the state can go much further with wind, and with solar, geothermal, biomass and hydro power.

They want to establish a fund under control of the Alaska Energy Authority to provide grants and loans for projects to provide cheaper, cleaner power.

They haven't decided on how to capitalize the fund, although one idea is to use earnings of the Alaska Permanent Fund.

"We'd need to talk that through. But we're willing to discuss all the options. Nobody's throwing up any roadblocks at this stage," said Ellis.

"I think sooner or later -- and I'm a big advocate of the Permanent Fund Dividend for people -- but sooner or later the permanent fund earnings also have to be looked at for what's good for the rest of Alaska, too, not just the recipients that get a check," Harris said.

But if those earnings go into a renewable energy fund, Alaska's oil wealth would go toward moving some communities away from expensive oil consumption.

Sen. Ellis says eventually, the renewable energy fund will require hundreds of millions of dollars, but he says they might start off small.

Meanwhile, the fallout continues from Exxon CEO Rex Tillerson's remarks yesterday on a future gas line for the state.

Wall Street Access, a daily online newsletter for energy investors, concludes that there probably is not an Alaska gas line in Exxon's future, and that the company will rely on Rocky Mountain gas and imports of liquefied natural gas to serve the North American market.

Today, Sen. Con Bunde shot back: "It may be that Exxon defines stability in the way they define expediency in paying their debts to Alaska fishermen."



# ALASKA CENTER *for the* ENVIRONMENT

807 G Street, Suite 100 • Anchorage, Alaska 99501

907-274-3621 phone • 907-274-8733 fax • ace@akcenter.org • www.akcenter.org

Dear Senator Huggins,

JAN 25 2007

1/2007

In Alaska, the negative effects of global warming are threatening our very way of life: salmon streams are warming, forests are succumbing to increased infestation and fire, and our favorite winter recreation activities are threatened by increasingly unpredictable winters. Infrastructure is crumbling as soils destabilize, and even oil and gas seasons are shortening due to shorter winters in the Arctic.

If we don't take action today to stop global warming in its tracks, the Alaska we know and love will be forever changed – for the worse.

I have enclosed "Global Warming In Alaska: The Scientific, Economic, and Social Impacts of Global Warming in Alaska", a special report produced by Alaska Center for the Environment. I hope you can use this publication as a resource to address the issue of climate change as you start this legislative session. Of special interest might be the article written by Peter Larsen and Fran Ulmer at the Institute of Social and Economic Research titled "Implications of a Changing Climate for Our Social, Economic, and Political Systems".

Alaska Center for the Environment is Alaska's largest citizen's group working for the sensible stewardship of Alaska's natural environment. With 7,000 dues-paying members from around the state, Alaska Center for the Environment is a voice for public lands conservation, clean air, clean water, and livable places. We are also a voice for responsible action on climate change in the state of Alaska.

As you start this legislative session, I'd like to note three positive policy steps you can take to help address this growing problem:

- **Create a Renewable Energy Fund.**
- **Ensure that the Climate Change Commission is successful.**
- **Support legislation throughout the session that addresses Global Warming.**

Thank you, and please don't hesitate to contact us at Alaska Center for the Environment for more information.

Sincerely,

Randy Virgin

Executive Director, Alaska Center for the Environment  
(907) 274-3656 • randy@akcenter.org

GLOBAL WARMING IN ALASKA

# GROUND ZERO



**The Scientific, Economic, and Social  
Impacts of Global Warming in Alaska.**

An



## **ALASKA: GROUND ZERO FOR GLOBAL WARMING, GROUND ZERO FOR SOLUTIONS**

In Alaska, the negative effects of global warming are threatening our very way of life: salmon streams are warming, forests are succumbing to increased infestation and fire, and our favorite winter recreation activities are threatened by increasingly unpredictable winters. Infrastructure is crumbling as soils destabilize, and even oil and gas seasons are shortening due to shorter winters in the Arctic.

If we don't take action today to stop global warming in its tracks, the Alaska we know and love will be forever changed - for the worse.

The good news is that we have the tools to save our state. Energy efficiency in homes and businesses, increased efficiency in transportation, and renewable energies like wind power are just a few of the new technologies available in Alaska. Alaskans also have a powerful congressional delegation that can tell our story to the nation and help move national climate security policies. Alaska may be ground zero for global warming, but we can also be a leader for reversing the harmful causes of climate change. By taking the lead, Alaska can help the rest of the country cut greenhouse emissions, stay competitive in world markets and create high-tech jobs here at home.

That's why ACE has created a comprehensive campaign to confront global warming at personal, local, and national levels: At home - Reduce your own energy consumption by carpooling, using compact florescent light bulbs, and purchasing energy efficient vehicles and appliances; In your community - Local assemblies and mayors can sign onto the Mayors' Climate Protection Agreement to reduce global warming emissions by 7 percent below 1990 levels; Across the state and nation - Alaska's state legislators and the Alaska delegation to Congress can pass legislation to fund the development of renewable technology, set cleaner air and pollution standards and increase fuel efficiency in automobiles.

Take action today. And spread the word.

If one household changes its light bulbs, it won't be enough. But if we all take responsibility, and help push our communities and state leaders towards a plan of action, we can stop global warming before it's too late.

I hope you enjoy this special edition of Center News- and then take action today!

*Randy Kizer*

# FORWARD

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Alaska has been aptly titled 'ground zero for global warming.' While the rest of the country debated whether the phenomenon actually existed, Alaskans have been compiling a list of scientific and anecdotal evidence detailing the ways climate change is affecting our way of life.

Today, the topic of global warming in Alaska is no longer relegated to personal speculation and small talk amongst friends. Over the past year, the state legislature created a Climate Commission, Anchorage Mayor Begich brought 35 mayors from 16 states to Alaska for a global warming summit, and the issue now makes headline news. A recent survey released by Leiserowitz and Craciun reveals that the majority of Alaskans not only believe that global warming is happening, but consider it a serious threat (specific numbers are referenced throughout this report).<sup>1</sup>

Alaska Center for the Environment created this special report to compile the ideas and observations of Alaskans who are dealing with global warming in their work and their daily lives. As this report progressed, we realized we were only just beginning to realize the scope of work being done in the state. Every day we learn of new individuals, organizations and elected officials who are developing innovative solutions to help their communities address this monumental issue.

This report provides an overview of the science that shows how global warming is changing our wildlife and ecosystems, affecting our culture and economy, and looks at some of the solutions that are being implemented right here in Alaska. This report also marks the kickoff of ACE's 2007 global warming campaign and we hope to actively engage all Alaskans in addressing this unprecedented challenge to life and livelihood in Alaska.

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by Edward E. Berg, US Fish and Wildlife Service, Kenai National Wildlife Refuge

Visitors and residents alike often complain that it rains frequently on the Kenai Peninsula, Alaska. In truth this is an illusion; the rainfall is light and it doesn't accumulate. Indeed, the western Kenai lowland is actually quite dry because it is situated in a strong rain shadow from the Kenai Mountains on the east side of the Peninsula. When 17 inches of annual precipitation fall on Sterling in the center of the Kenai lowland, as much as 120 inches fall on the eastern (Prince William Sound) side of the Peninsula at the port of Whittier.

Because the western Kenai is so dry, the landscape is extremely sensitive to increased summer drying which has occurred in recent decades. This drying is quite visible in the annual water balance at the city of Kenai (Fig. 1), for example, and has resulted in falling lake levels and the loss of many small ponds and wetlands (Klein et al. 2005).

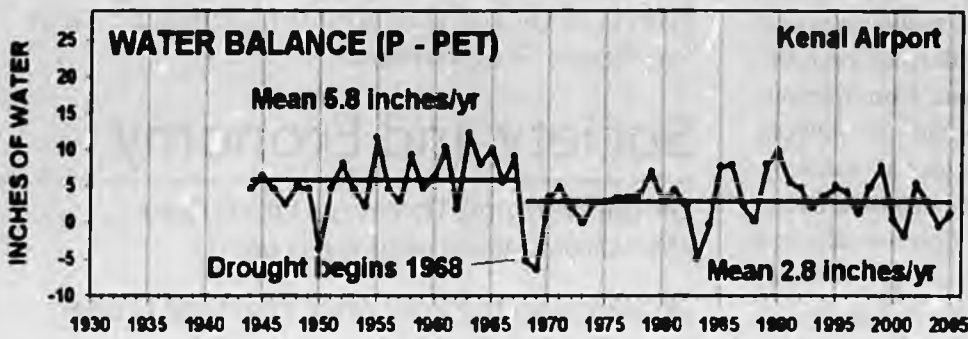


Fig. 1. The water balance, which is the difference between precipitation (P) and potential evapotranspiration (PET), represents the water available for stream flow, groundwater recharge and biomass growth. Warmer summers since 1968 have increased evapotranspiration, even though precipitation has remained unchanged.

Prior to the warming of North Pacific sea surface temperatures in 1977, several warm El Niño summers typically would initiate an outbreak of the spruce bark beetle (*Dendroctonus rufipennis* or SBB), which would subsequently be extinguished by several cool La Niña years. Since 1977, longer runs of warm summers have allowed SBB populations to grow exponentially, often by shortening the 2-year beetle life cycle to 1 year. Warmer winters have facilitated greater



Fig. 2. Cumulative spruce bark beetle mortality between 1989-2002 for south-central Alaska was 3 million acres. Mortality was higher on the southern Kenai because of monospecific stands of mature white spruce where the time-since-last-fire averaged 600 years.

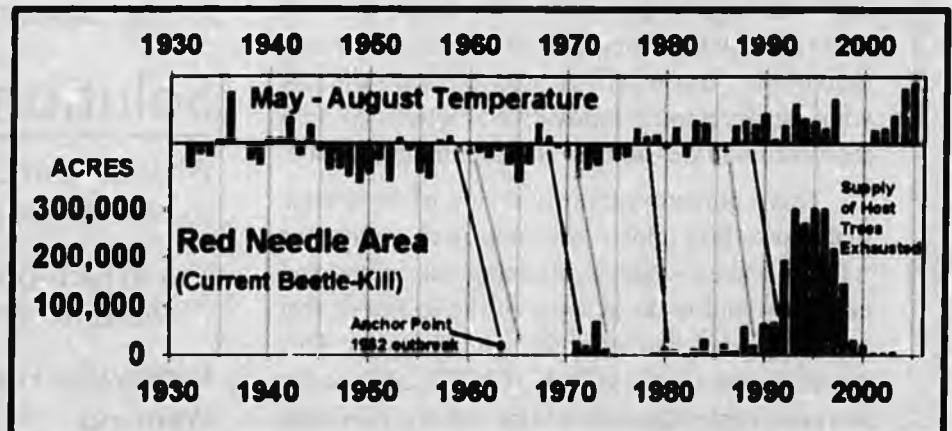


Fig. 3. Annual summer temperatures (Homer) and annual spruce bark beetle mortality in white/Lutz/Sitka spruce forests on the southern Kenai Peninsula. Forest mortality was estimated from US Forest Service aerial surveys beginning in 1971 and ground-based field reports beginning in 1950. Red indicates runs of two or more warm summers that initiated spruce bark beetle outbreaks. Blue indicates runs of cool summers that apparently extinguished or retarded outbreaks. Mortality has been at background levels since 2001 in spite of warm summers due to absence of mature spruce trees.

overwinter survival of larvae and adults. The 11-year run of wetland burning from 1967 to 1977, for example, produced the largest SBB outbreak ever recorded in North America (Figs. 2 & 3). The outbreak ended only when the beetles had exhausted available host material, not because the summers had cooled.

For the past 2500 years there has been no connection between SBB outbreaks and wildfire. Our fire history and SBB outbreak history studies indicate that white/Lutz spruce (*Picea glauca* and *P. x lutzii*) forests burn with a mean fire return interval (MFI) of 400-600 years, whereas the beetles thin the forests every ~50 years (Berg and others, this proceedings; Berg and Anderson 2006; Berg et al. 2006). Black spruce (*P. mariana*) – which is not significantly affected by the SBB – provides the dominate fire regime on the Kenai, with an MFI of ~80 years (De Volder 1999).

Although Kenai beetle-killed forests did not burn in the past, the climate is drier now and there have been several fires in newly-killed forests with red needles. A decade has passed since much of the forest was killed, and none of the forecasted conflagrations have so far materialized. The presence of much down timber, however, makes fires difficult to fight when they do occur, and the brittle dead branches increase the risk of spotting in wind-driven fires. Lush stands of tall bluejoint grass (*Calamagrostis canadensis*) have proliferated under the open dead spruce canopies. Fire managers thus still consider



*Fig. 4. Wetlands (orange) and black spruce forest (green) on the Kenai Peninsula. As the wetlands continue to dry with climate warming, they will be converted to shrubs and black spruce, providing greater continuity of the high flammable black spruce fuel type.*

the thousands of acres of beetle-killed spruce forest a major wildfire liability, especially during warm and dry periods in late spring before vegetation green up when the bluejoint grass is highly flammable.

The warmer summers are drying out Kenai wetlands. Peatlands that have been wet Sphagnum fens for 8-13,000 years are for the first time being invaded by woody shrubs and black spruce. In the past these wetlands were fire excellent firebreaks; as the climate dries they are becoming fuel bridges (Fig. 4).

With a warmer climate we expect that bark beetles will kill white/Lutz spruce before continuous canopy mature conifer forests can be re-established, and that the resulting grasslands and hardwood forests will provide a more heterogeneous vegetation cover in upland areas. The absence of conifers will make the upland areas more fire resistant, at least after spring green up. The lowland areas, on the contrary, will become more flammable with increased shrub and black spruce cover. The human population of the Kenai is growing at 2.2% per year, and much land has been subdivided after salvage logging of beetle-killed spruce. Most fires on the Kenai are human-caused, and increased fire suppression activity will probably be necessary in the expanding urban-wildland interface.

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by Jeff Short, Science Advisor to Alaska Marine Conservation Council

*Marine food webs are already responding to warmer ocean temperatures around Alaska, and few of the consequences will be beneficial. These impacts, clear consequences of global warming, will continue to be most obvious in the Bering Sea, where the progressive loss of sea ice may change the whole character of the ecosystem within as few as one or two decades. The sharp melting point of water means that even small increases, less than 1 ° F, can cause dramatic losses of seasonal sea ice and the biota that depend on it. Sea ice losses are already substantial in the southeastern Bering Sea, and left un-controlled, projected emissions of carbon dioxide and other greenhouse gases may result in an ice-free Bering Sea year round by the end of this century. This would not only result in the elimination of polar bears and the ice-dependent seals that are their prey there, it would also dramatically alter the nature of the marine food web.*

The Bering Sea currently sustains some of the largest and most valuable commercial fisheries in the world, and like all fisheries, these ultimately depend on the primary productivity of plants. A substantial proportion of this productivity is associated with algal communities attached to the underside of floating ice. The ice also exerts strong structuring effects on the underlying water column that mediate the phytoplankton productivity, and affects rearing habitat for numerous species of fin and shellfish. Loss of the ice will delay the spring phytoplankton bloom and thus prolong the winter starvation period of fish and shellfish that depend on it, and making survival through juvenile life stages more difficult. This may lead to increased food web fragility because of dominance by adults of a few species that are more vulnerable to over-harvesting management errors, and a decreased food web complexity overall.

Less drastic but still significant changes are also likely in the Gulf of Alaska. Some sense of the magnitude of such change may be gained from the 1977 "regime shift", probably the first big food web reorganization in the northern Pacific that was induced by global warming. In the Gulf of Alaska, this event was associated with the widespread transition from a food web dominated by benthic production, which supported large scale commercial fisheries for crabs and other bottom dwelling organisms, to one with increased pelagic production. This contributed to, and perhaps caused, the collapse of the crab fisheries in the Gulf, and to increased production of economically worthless species such as arrowtooth flounder. It now seems clear that the cooler temperatures that prevailed prior to 1977 are unlikely to return, but further temperature increases could lead to new food web transitions to unknown states in the future.

In some respects, marine food webs in the Arctic may well benefit from warmer temperatures. Although sea ice loss in the Arctic will also threaten polar bears and other ice-dependent mammals such as seals and walrus, the

ensuing warmer temperatures will expand coastal migration corridors for salmon and other species. Several species of salmon are already expanding their reproductive habitat into the Arctic, the most dramatic example being invasion of the Mackenzie River by chinook salmon, which may expand the available habitat for this species considerably. But overall productivity throughout most of the Arctic will always be constrained by the long winter starvation period induced by the absence of sunlight to support the base of the marine food web.

Ocean acidification is another less widely appreciated but equally insidious consequence of rising atmospheric carbon dioxide levels. The acidification results when carbon dioxide dissolves into seawater, forming carbonic acid. On current emission trends, the amount of acidity in the surface layer of the ocean will triple by the end of the century worldwide. An increase of this magnitude is enough to seriously impair organisms that depend on calcium carbonate, such as coral reefs and many molluscs including clams, because the increased acidity promotes dissolution of their support structures. Other species, such as shellfish generally, also depend on calcium carbonate to provide rigidity to their shells. Models indicate that doubling the acidity of the marine surface layer may already be unavoidable, as a result of the carbon dioxide increases over the last 50 years.

All these changes induced by global warming will exacerbate the already difficult challenges faced by those charged with managing the world's living marine resources. Coping with them will require new management paradigms to deal with the increased uncertainties attending these changes. Stabilization of the world's atmosphere, soon, would enhance the likelihood that we might still preserve a considerable portion of kind of marine environment we have adapted to as a species.



by Sue Mauger, Cook Inlet Keeper

*In the mid-1990s, millions of acres of spruce trees, in watersheds of some of the most cherished salmon streams in southcentral Alaska, died from a massive spruce bark beetle epidemic. Local communities, who rely on salmon for sport, commercial and subsistence fishing, began asking how this and the subsequent logging activity would affect the health of these streams. In response to these concerns, the Homer Soil and Water Conservation District and Cook Inletkeeper began an intensive water quality monitoring program in 1998. In the end what we've found is that streams on the lower Kenai Peninsula are showing signs of stress, not because of the spruce bark beetle infestation, but for the same reason the infestation happened – a warming climate.*

Water temperature is one of the most significant factors in the health of stream ecosystems. Temperature affects salmon egg and fry incubation, fish metabolism, resistance to disease, and availability of oxygen and nutrients. Starting in 2002, we've used Onset's StowAway TidbiT temperature data logger, which is a cost-effective, reliable tool, to collect continuous temperature data in the Anchor River, Stariski Creek, Deep Creek and Ninilchik River. We program the data loggers to record water temperature readings every 15 minutes from May to September. The data is downloaded to computers after we pull the instruments from the water.

The results have been alarming; monitoring has revealed that salmon streams on the lower Kenai Peninsula are warming, frequently above state-assigned standards set to protect spawning and passing fish. In 2002, temperatures exceeded Alaska's standards for egg and fry incubation on more than 50 summer days. By 2005, exceedances occurred on more than 80 days. This is not just a local concern for residents of the lower Kenai Peninsula: recent studies in tributaries of the Kenai River and Susitna River also show consistent water temperature exceedances.

The implications of warming salmon stream temperatures are potentially sweeping. While biologists elsewhere have recorded short-term increases in run strength after the onset of warming stream temperatures, there's also ample documentation showing high water temperatures can increase salmon vulnerability to pollution, predation and disease. On the Yukon River, for example, warming temperatures have been implicated in an increase in Ichthyophonous – a parasite that renders fish tissue mushy and inedible – and potential pre-spawning mortality among chinook salmon.

Climate models tell us that air temperatures will continue to increase between 13oF and 15.5oF for the Cook Inlet basin by 2100. Water temperatures are predicted to follow suit and rise 5.4oF in the coming years. Yet despite

the association between warming water temperatures and reduced salmonid survivorship - there is little or no consistent, long-term temperature data for salmon streams in Alaska. Without such basic information, it is impossible to gauge the health of Cook Inlet's salmon habitats and resources, and equally difficult to develop management responses to improve watershed resiliency to climate change.

In the year ahead, we hope to work with other community groups and Soil and Water Conservation Districts to develop a network of water temperature monitoring sites to increase our understanding - and to promote public and governmental awareness - of the current and increasing risk to water resources and fisheries from rising water temperatures in Alaska's salmon streams due to climate change.



*Sue Mauger is Stream Ecologist with Cook Inletkeeper, a citizen-supported nonprofit organization dedicated to protecting the Cook Inlet watershed and the life it sustains.*

by Mike Williams, co-chair of the Alaska Intertribal Council

*This article appeared as a Compass in the Anchorage Daily News on Feb. 4, 2006 and is reprinted here with permission from the author.*

*Global warming is undermining the social identity and cultural survival of Alaska Natives. As we watch our ice melt, our forests burn, our villages sink and our animals become diseased, we know that our health and our traditional ways of life are at risk.*

Our elders, in particular, are deeply concerned about what they are witnessing. Unpredictable weather and ice conditions make travel and time-honored subsistence practices hazardous, endangering lives.

Everything is changing so quickly. Lakes are drying; new insects are appearing; permafrost is melting; berries are disappearing; storms are fiercer; animal populations are changing; our fish are rotting on drying racks; and polar bears are drowning.

Because of massive, record-breaking forest fires, our youths and elders are having trouble breathing. Our ice is so much thinner, or entirely gone. And our coastlines are eroding, washing away ancient artifacts from our ancestors as well as modern infrastructure.

In recognition of this tremendously serious situation, the Alaska Inter-Tribal Council unanimously passed a resolution urging the U. S. Congress and the president to move forward on a national, mandatory program to reduce global-warming pollution and prevent irreversible harm to public health, the economy and the environment. Traditional knowledge and science both strongly support urgent, meaningful action.

For many reasons, Alaska Natives are the Paul Reveres of global warming. From first-hand experiences and observations we know: "The BTU's are coming; we are being threatened; and we must take action to protect current and future generations now." There is so much at stake in Alaska and, of course, in the entire nation.

As a resident of the small village of Akiak on the Kuskokwim River, I have also experienced global warming as an Iditarod race musher. "The Last Great Race" has changed in many ways since I first starting participating in it, in 1992. Because of an absence of snow in recent years, we have had to move the start on numerous occasions from more southerly Wasilla to more northerly Willow and even Fairbanks. To keep the dogs cool, since the days are too warm, we have to mush mostly by night now. And, we also

mush more on land and less on the frozen rivers because of thawing.

I hope as many Alaskans as possible will learn about the huge threats that global warming presents and communicate our deep concerns to our elected leaders. We owe it to future generations and to our elders.

Throughout Alaska we are in peril from global warming. Our leaders must take responsible action in 2007 to document the extensive costs of global warming, to reduce greenhouse gas emissions and to help those communities such as Shishmaref that need to be moved, repaired or otherwise assisted because of the adverse impacts of global warming.

This is our most sincere and urgent plea.



Alaska Division of Tourism

by Peter Larsen and Fran Ulmer, Institute of Social and Economic Research

Research on the causes and effects of global climate change has many dimensions, because of the inherent complexity of the issue. Many researchers have been studying the underlying causes or the ecological or biological consequences of climate change. Now, a handful of scientists are beginning to look at the implications of a changing climate for our social, economic, and political systems.

At the Institute of Social and Economic Research (ISER), which is part of the University of Alaska Anchorage, we're analyzing the costs of replacing public infrastructure—roads, airports, bridges, and hospitals—that may be damaged by climate change. We're estimating replacement costs under different climate scenarios looking well into the future.

We hope this work will help Alaskans understand and prepare to deal with the potential economic effects of climate change in our state. Our research is partially funded by the National Commission on Energy Policy in Washington D.C. and is part of a broader research initiative underway at 14 universities assessing the effects of climate change. The initial results of this ISER project will be available early in 2007.

In addition to the original research we're doing, we're also working with faculty from the University of Alaska Fairbanks to create and support the Alaska Center for Climate Assessment and Policy, Regional Integrated Science Assessment (RISA for short). That work is funded by the National Oceanic and Atmospheric Administration and is one of eight similar programs nationwide designed to support research examining complex climate-sensitive

issues of concern to decision-makers and policy planners at the regional level.

For now, the center is concentrating on potential effects of climate change on transportation and is looking for businesses and organizations that could use more specific products from government to help them plan for the effects of climate change.

The center is organizing a meeting to be held in Anchorage on February 15, 2007, in conjunction with the Alaska Forum on the Environment, which is being sponsored by the U.S. Environmental Protection Agency.

The goals of the meeting are 1) to identify scientists, policymakers, planners, representatives of industry, and others who might be interested in becoming partners in a RISA network; 2) to identify specific partnerships for exchange of currently available scientific information; and 3) to begin building partnerships for the exchange of new research and information.

*If you're interested in participating in the RISA effort, please contact Fran Ulmer, Director, by phone (907-786-7710) or e-mail ([affau@uaa.alaska.edu](mailto:affau@uaa.alaska.edu)).*



Alaska Division of Tourism

*Global warming, climate change, whatever you'd like to call it, has been affecting Shishmaref and its residents monumentally for the past 100 years. At a recent work session of the Shishmaref Erosion and Relocation Coalition, the local elders committee were invited to attend and help critique each of the nine potential sites for relocation.*

The discussion included the known activities of our community since the founding of our village by the Russian explorer Lt. Otto Von Kotzebue in 1816 to present. During the discussion, one of the elders mentioned that in 1920 the federal government wanted to relocate our community to Nushigak near Dillingham due to the flooding and erosion occurring in our community.

Our people were told that the new area that they wanted us to relocate to was similar to our area and had much of the same animals that we hunt and the same climate as we have. In the early 1950s, our grandfathers first reported in their local Traditional council meeting that the flooding and erosion was getting worse and was starting to be a real concern of our people.

In October 1973, after a massive storm washed away 30' of shoreline, the community met with the governmental agencies and decided to relocate on the mainland 5 miles away. A year later in 1974, the community decided to stay on the island, due to the promise that a seawall would be built along our shoreline, which would protect our people from the fall storms. During August 1974, 50,000 sandbags were installed in the worst areas of the community and fifty years later, still no full beach front protection has been built for our community.

After the 1997 storm, which forced our community to relocate 13 homes to higher ground within the community, we decided that we must form a committee to help ourselves find a solution to our flooding and erosion and find a suitable site for relocation. In 2001 we formed the Shishmaref Erosion and Relocation Coalition, which is made up our local governing bodies and our local Native Corporation and the Elder and youth groups' representatives.

The coalition has monthly meetings and public meetings to help with planning and funding requests and to develop an organization that can help coordinate our activities with the state and federal governmental agencies. In 2002, the Coalition developed a strategic relocation plan to help with the planning and funds requests for the beach protection and relocation project. Since the formation of this Coalition, we have done the following projects for our community:

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## 2001

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- Formation of the Erosion and Relocation Coalition consisting of the City Council of Shishmaref, the IRA council, and the Board of directors of Shishmaref Native Corporation to find a solution to beach erosion and represent the community in activities associated with relocation to the mainland.
- The USDA-NRCS begins evaluation of 11 relocation sites identified by the Coalition.

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## 2002

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- Shishmaref votes to relocate to the mainland realizing that the relocation could take 15 to 20 years to accomplish.
- Senator Stevens calls for a GAO study of villages experiencing flooding and erosion.

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## 2003

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- USDA-NRCS completes a Reconnaissance Report: "Shishmaref Site Analysis for Potential Emergency and Evacuation and Relocation Sites."
- The GAO completes its report to Congress and confirms that 186 Alaskan villages are encountering flooding and erosion. Shishmaref is mentioned as one of the top communities most affected and in need of relocation. Of the 20 villages in the Bering Straits Region, 18 are being affected by flooding and erosion.

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## 2004

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- A \$1m Cost of Alternatives study includes information on the impacts of relocation on subsistence use and the culture of Shishmaref residents. The study estimates the cost of staying in place (\$110m), relocating to a nearby mainland location (\$180m), co-locating to Nome (\$93m), or co-locating to Kotzebue (\$141m).

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## 2005

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- Transportation bill provides \$4.25m to start construction of the relocation road, \$5m is appropriated.
- The State Legislature obtains a \$500,000 match requirement and a Reconnaissance study is to be started in 2006 by ADOT and Kawerak Inc.



In closing, Subsistence is our way of life, we are hunters and we are gatherers. Prior to this, Tribal members moved within our traditional lands for the subsistence harvest using Shishmaref as a winter camp for the past 4,000 years. Our ancestors followed the seasons, moving from the rivers and streams, to the coast, and then on to the coastal islands. This tradition is still followed today. Our subsistence lifestyle takes us to our camps in numerous locations along the mainland and coastal islands.

Today, we travel by snow machine over the ice and by boat when the ice is no longer safe. Our primary subsistence foods include: bearded seal, walrus, fish (salmon, white fish, trout, and herring) moose, musk-oxen, caribou, ducks, geese, ptarmigan, berries (salmon berries, blackberries, blueberries, and cranberries), and assorted greens just to name a few.



Notice the trash can in the image on the left, before the storm, and in the image on the right, after the storm. Images courtesy of Nome Nugget Newspaper.

Who and what we are is based on where we live and the way we live. We have been here for countless generations. We value our way of life, we value the environment as it sustains us; it provides for our very existence. The no action option for Shishmaref is the annihilation of our community. We are a community tied together by family, common goals, values, and traditions. We are different from our neighbors.

The community of Shishmaref has a long and proud history. We are unique and need to be valued as a national treasure by the people of the United States. We deserve the attention and help of the American people, the state and the federal government. Although our community decided to relocate onto the mainland, we have not received the basic infrastructure improvements that were provided to other Alaskan communities; we must be allowed these public services to support our own community.

The State and federal government must not disregard our cries for assistance to improve our everyday needs as Shishmaref and many other Alaskan communities have been dealing with the challenges of global climate change for the past 100 years.



Students of Shishmaref K-12 School. Bering Strait School District.



Tony Weyouanna

by Joe Stock, Alpine guide and ACE member

*I became glacier obsessive in 1988 when I first saw the Tasman Glacier. Dad and I were heading into Mount Cook National Park to climb a small summit ten miles across the Tasman—New Zealand's longest glacier. A family friend told us about making the same trip 20 years before. "From the trailhead I climbed up the Tasman's lateral moraine. Then I climbed up to the glacier's white ice." When we arrived at the crest of the moraine—a ridge of debris dumped off the glacier's margin, the white ice was gone. Instead we saw a crumbling wall of boulders and gravel dropping 500 feet to rock-covered ice. Somehow we had to get down and across this war zone of rubble. Maybe this was how glaciers are supposed to be, we thought.*

After that trip into Mount Cook, I worked with glaciologists who showed me how to observe the health of a glacier by the shape of the ice, distribution of snow, and scour lines on the mountainsides. I began seeing glaciers not simply as permanent and powerful masses of moving ice, but also as vulnerable beasts, easily knocked around by a small rise in temperature. Now, as I travel to glaciers around the world, their ailing bodies are painful to see. I wish I could ignore their dying groans and be happy in the mountains, but I'm watching my favorite places disappear.

Last spring, friends and I skied a 100-mile glacial traverse of the Neacola Mountains—those low jagged peaks visible across Cook Inlet from Anchorage, Alaska. When fog settled onto the glaciers and visibility became zero, we compared GPS units against our 1958 USGS maps to navigate. I began noticing a difference between the GPS elevation and map elevation, and recorded and compared these elevations during the rest of the trip. The glacier surface had dropped 70 feet in 48 years. Subtract 70 feet of ice from the top of the Matanuska Glacier and that's enough water to supply Anchorage for 78 years. Shave 70 feet off all Alaska's glaciers and sea level rises.

In the Neacola Mountains, the shrinking glaciers made traveling easier. With less seasonal snow, the glacier conveyor belt has slowed down and fewer crevasses form. We normally rope together and I feel like a hyperactive dog on a leash, but with less crevasse danger, the rope stays packed. Glaciers no longer threaten us. We threaten them by turning up the heat.

Fewer crevasses are the only bonus of climate change for mountaineers. Our approaches to mountains are now moraine bashes where glaciers once flowed. Blocks of seasonal snow cascade off glacier-polished slabs below the routes. On mountain faces, rocks frozen for hundreds of years drop like cannonballs toward our flimsy helmets. Classic routes are now gone. The Black Ice Couloir on Grand Teton is now dirt. The Ice Window Couloir on Mount Kenya is a rock climb. The legendary White Spider is gone from the Eiger. Ten years remain to see the snows of Kilimanjaro. The glaciers of Montana, Wyoming, Colorado,

and California are just prehistoric dinosaurs, hiding under piles of moraine.

Last weekend, my wife Cathy and I skied on the Lane Glacier in the Talkeetna Mountains. I knew that for the next eight months the Lane would be comfortable under its winter blanket of snow. Then another summer of heat and rain will melt through the snow and then the ice. In five years the Lane will be gone.

Glaciers point their thawing fingers right at us. They are at our mercy, yet we humans, who are responsible for their decline, are at risk. Glaciers can't grab a thicker blanket of snow from the closet, just like we don't have another planet. We have the ability to care. To vote. To scrutinize the true importance of everything we put in our carts at Home Depot. To sell our SUVs and get 45-mile-per-gallon rides. To show that minimizing climate change is a good thing, even for the most self-interested.



*Observing glacial recession while enjoying the freedom of the hills.  
Photos courtesy of Joe Stock.*

*Joe has been climbing and backcountry skiing for 20 years. He was alpine-guide certified in 2003 and is working towards ski mountaineering guide certification. Joe is also a writer, photographer, and hydrologist.*

# SOCIETY AND ECONOMY

by Susanne Fleek, Municipality of Anchorage

*A little over a year ago, Mayor Mark Begich hired former ACE director Kevin Harun as Anchorage's first-ever Renewable Resources Coordinator. After attending the 2005 Sundance Summit sponsored by ICLEI – Local Government for Sustainability, Mayor Begich was inspired by the concrete steps mayors were taking across the country to reduce global warming emissions - steps that also save cities money.*

“Mayors across Alaska are now recognizing that we need to be part of the solution,” stated Mayor Begich, “the steps we are taking in Anchorage make sense economically and environmentally.”

In 2005 alone, the 160 cities taking steps to reduce emissions through ICLEI's Climate Protection Campaign saved 23 million tons of global warming pollution and \$600 million in energy and fuel costs. In Anchorage, Mayor Begich is tackling the issue from all sides, including:

- Installing energy-efficient technology in City Hall that will save between \$30,000 to \$40,000 in electricity costs each year,
- Installed a methane recovery system at the Municipal Landfill that will power 2,500 homes,
- Switched to energy-efficient LED lights in Town Square Park for City of Lights,
- Building the new Dena'ina Convention Center to be a model of energy efficiency through electrical and HVAC innovations,
- Working to promote and secure funds for the Fire Island wind project and looking into the

possibility of generating geothermal power from Mount Spurr, and

- Pioneered Anchorage's first green building interior design during the renovation of the Sadler building in Mountain View.

One of the cornerstones of the new Renewable Resources Program has been to revitalize the Anchorage recycling program. Within the next year, the City hopes to have a curbside recycling plan that is ready to implement. “ACE's work has brought this issue to the front burner for the City,” stated Kevin Harun.

In addition, Mayor Begich has signed onto the Mayor's Climate Protection Agreement and the Cities for Climate Protection Campaign. Along with Alaska Conservation Foundation, ICLEI-Local Governments for Sustainability, and the U.S. Conference of Mayors, Begich sponsored a national meeting of 35 mayors from 16 states in Girdwood this September. The meeting highlighted the costs our communities are facing right now, and in the near future, due to global warming. It also demonstrated just how much one community, like Anchorage, can accomplish in a short amount of time.



*Mayors from around the country visit Exit Glacier while in Alaska for the “Strengthening Our Cities: Mayors Responding to Global Climate Change” meeting.*

by Tim Treuer, former AYEA student

*I've always been skeptical that a single person can be a catalyst for measurable social change on a large scale. It's always seemed to me like trying to change the way people think is one of the hardest things that one can endeavor. Or at least that is, until last year I witnessed just that during Alaska Youth for Environmental Action's (AYEA) Global Warming Campaign.*

The story begins with an AYEA student named Verner Wilson. After seeing firsthand some of the impacts of climate change in his native Dillingham in the summer of 2005 he was inspired to write an open letter to the leaders of our state demanding action on climate change. As other AYEA students read the letter, someone came up with the idea of turning it into a student petition and trying to get as many Alaskan students to sign it as possible. The petition soon became the centerpiece of a project to educate students of Alaska about the issue of climate change and to show that when properly informed they too would demand action.

One of the big early surprises for me in the early stages of the project was how important that education component was. Even with recent media exposure and the extreme pertinence of the issue to our state, most of the students we talked with initially had very little knowledge or concern about the impacts of global warming. They were, however, very quick on the uptake, which shows that even the increased media exposure hasn't done enough to raise public awareness about the issue.

In just three and a half months of traveling from class-to-class, school-to-school and town-to-town across Alaska, we managed to reach around 8,000 students from over 100 communities while presenting to over 300 classrooms. In the end we achieved our initial goal of 5,000 signatures. More than just achieving a numeric objective, however, I think Verner's petition accomplished something much greater. His letter inspired a handful of students to take up arms against the ignorance and apathy of our generation, and we were able to create social change on a large scale.

Our campaign was partially or fully responsible for the unanimous passage of the Alaska Association of Student Governments' strongly worded resolution on climate change (submitted by students that joined the campaign after listening to our presentation), the unanimous passage of the first piece of legislation addressing climate change by our state legislature, and the agreement of Mayor Begich to sign onto the Mayor's Climate Initiative.

The campaign culminated in a trip to D.C. to meet with members of Congress. A group of six AYEA students met with nearly a dozen congressmen and their respective staff to discuss the issue. The meetings finished with a press conference with Senator Murkowski where she was formally



*AYEA takes their global warming campaign to D.C. Make sure to join their current 3-2-1 campaign (details on page 19)!*

presented with the 5,000 signatures. The final meeting with Murkowski initiated a very subtle yet dramatic change in the position the senator took on the issue. She had not planned on supporting a bill requiring mandatory reductions in greenhouse gas emissions, but in a radio address following our meeting, she referenced our campaign and said that she was open to the need for mandatory emissions reductions. Given the intense political interests and lobbying pressures surrounding the issue, this was a major breakthrough.

I think it was on that very afternoon that I first started believing in the power of the individual. Verner and his letter initiated social change that became broad enough in scope as to signal a change in group knowledge, the way a whole demographic of people thought about the issue. Sen. Murkowski's near about-face showed that we had demonstrated a consensus among her constituents.

The solution to global climate change is dependent upon everybody. We all must properly understand the issue and be willing to deal with it in a meaningful way. That is why this project was so beautiful; one person wrote a letter and as a result at least 1 out of every 10 Alaskan high school students have declared that they refuse to remain ignorant or apathetic towards global climate change. It really made me appreciate just how much of a difference each of us can, and must, make.

*Alaska Youth for Environmental Action (AYEA) is a program of the National Wildlife Federation. For more information on global warming, recycling, or other AYEA projects, go to: [www.ayea.org](http://www.ayea.org) or call (907) 339-3907.*

## Alaska's Role in Global Warming

by Chris Rose, Renewable Energy Alaska Project

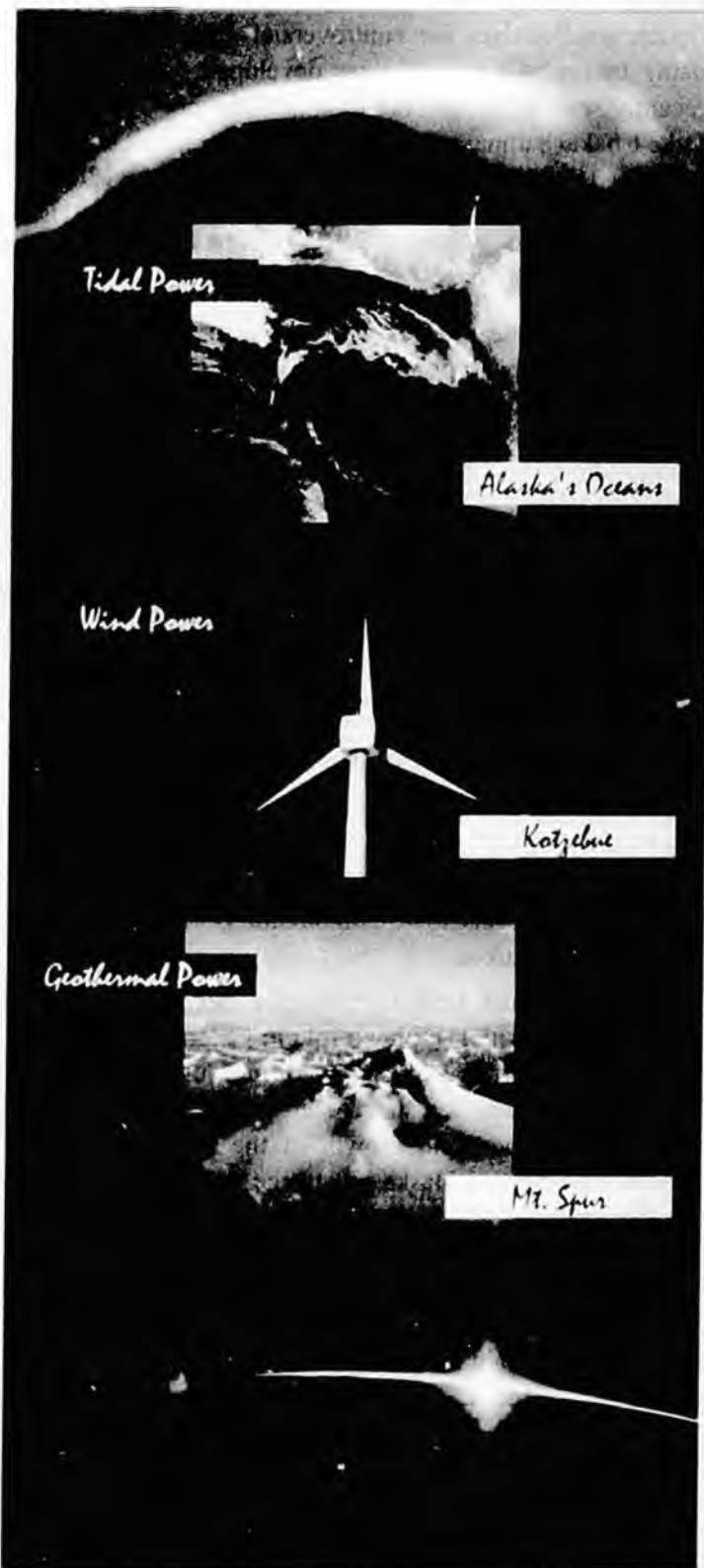
*Two important ways Alaskans can do something about our own greenhouse gas (GHG) emissions is to use energy as efficiently as possible, and generate as much of it from clean renewable sources. Alaska has a vast array of renewable energy resources including wind, geothermal, biomass, ocean power, and hydro that can offset Alaska's need to burn fossil fuels.*

For decades Cook Inlet gas has enabled most of urban Alaska to burn a relatively clean fossil fuel to generate the large majority its electricity. Today Cook Inlet gas is diminishing. As those supplies dwindle and Alaska gas becomes tied to Lower 48 pricing mechanisms, local gas prices have begun to escalate. In less than three years, the price Chugach Electric Association pays for its gas has more than doubled, and utility bills are increasing.

The entire state, especially the transmission connected Railbelt, is facing important energy choices, and a window of opportunity now exists to develop renewable energy to replace a portion of our reliance on gas. If we don't develop more renewables now, utilities may turn to Alaska's abundant coal deposits for energy, which could drastically increase Alaska's GHG emissions.

Fortunately, Chugach, Municipal Light and Power, Golden Valley Electric Association, and Homer Electric Association are all working toward Alaska's first large-scale wind farm on Fire Island, off the coast of Anchorage. Though 50 MW is currently proposed, the island could accommodate up to 120 MW of generating capacity (the peak demand for the entire Railbelt between Homer and Fairbanks is approximately 800 MW). Final FAA approval and construction of the infrastructure to connect the island with Anchorage are the project's two remaining hurdles. If built, Fire Island will provide an excellent example to Alaskans of how a local and inexhaustible resource can displace significant amounts of fossil fuel as it generates clean power. Golden Valley is also moving ahead quickly with its own plans to build a wind project near Healy that could produce up to 100 MW of power, and Kodiak Electric Association is working toward a wind project that would displace significant amounts of diesel.

With the recent installation of the state's first geothermal power plant at Chena Hot Springs Resort, interest in geothermal power for the Railbelt is also growing. State government, Railbelt utilities and private developers are all enthusiastic about the possibility of a 50-100 MW geothermal plant near Mt. Spurr, a volcano about 80 miles west of Anchorage. Initial exploration of the area in the 1980's indicates that a viable geothermal resource probably exists, and the power plant could be located within about 25 miles of the existing power grid at Beluga. Geothermal



*to buy energy-efficient appliances (73%) or contact their politicians (60%).*

power would provide the grid with more "base load" electricity that would be available nearly 100% of the time, as opposed to wind which is typically available only about one third of the time.

Southcentral Alaska also has potential hydro projects (much smaller than the controversial 1500 MW Susitna dam) that could possibly be developed. Interest has recently revived in generating approximately 300 MW at Lake Chakachamna, near Mt. Spurr. The Railbelt currently has over 160 MW of hydro capacity, including the 120 MW Bradley Lake project near Homer. In Southeast Alaska most electricity is already generated from hydropower.

The need for more renewable energy is urgent in the 200 or so remote villages across Alaska. Though those communities rely almost exclusively on imported diesel for electricity and fuel oil for heat, many villages have great potential to develop renewable sources for both heat and electricity.

Six villages are already displacing significant amounts of diesel with small 50-225 kW wind turbines that are interconnected with existing diesel generators to form wind-diesel hybrid systems. Approximately 70 villages have developable wind, but need up-front funding to get projects going. Along the Aleutian chain geothermal potential exists along side of wind resources. Naknek, Akutan, and Dutch Harbor are all looking at possible geothermal development. In interior Alaska, plans to burn wood from Native lands for heat and electricity look very promising. Small hydro proposals may also help displace diesel in village Alaska, including proposals to test in-stream generators in large rivers like the Yukon.

As wave and tidal technologies become more cost effective they will also play a role in generating electricity for Alaska that is stably priced and climate friendly. However, because legislated state policy is the driving force behind the rapid growth of the renewable energy across the country, Alaska must urge their elected leaders to provide the same kind of incentives to spur the clean energy industry in Alaska that are already being offered to fossil fuel developers. Without strong state policy and investment, the pace of renewable energy development in Alaska will remain modest.

*Chris Rose is Executive Director of Renewable Energy Alaska Project. ACE is a founding member of REAP, a coalition of Alaska utilities, businesses, conservation groups, consumer groups, and Alaska Native organizations that share the goal of increasing the production renewable energy in Alaska.*

## The Alaska Climate Impact Assessment Commission

The Alaska Climate Impact Assessment Commission was established by passage of House Concurrent Resolution 30 by Representative Reggie Joule, D-Kotzebue. Commissioners will work on developing a comprehensive overview of the likely impacts of climate change affecting Alaska, and steps we can take to mitigate that impact. The Commission's work should provide information which will protect public health, resource development, fish and game resources, protect public facilities and infrastructure, identify financial implications of climate change, and help our local communities with planning activities.

### Appointees:

#### **Senators**

Gary Stevens (R-Kodiak)

Donald Olson (D-Golovin)

#### **Representatives**

Ralph Samuels (R-Anchorage)

Reggie Joule (D-Kotzebue)

#### **Public Members**

Cpt. Bob Pawlowski

- Alaska Fisheries Development Foundation

Mr. Lance Miller

- Juneau Economic Development Council

Ms. Stephanie Madsen

- North Pacific Fishery Mgt. Council

Mr. Dennis Nottingham - PND Engineers, Inc.

Mr. Caleb Pungowiyi - Maniilaq Assn.)

Mr. Michael Hurley - Conoco-Phillips AK

Mr. John Shively - Holland-America Line

The Alaska Climate Impact Assessment Commission will perform its duties through 2007, and make a final report to the legislature on January 10, 2008. It will soon initiate a series of public hearings, with the first to be held in Fairbanks on December 7th and 8th.

To address the tremendous threat of catastrophic global warming, we all need to take action at the individual, local, state, and federal levels; and we need to do it quickly. We can do this. We have successfully tackled numerous significant challenges in the past with individual and collective actions, including: acid rain, tobacco restrictions, slavery, and voting equality. To provide hands on, specific, helpful tools for individual action and advocacy, Alaska Conservation Solutions (AkCS) unveiled a new global warming website in September 2006, available online at [www.alaskaconservationsolutions.com](http://www.alaskaconservationsolutions.com) and the following article describes some of the features that you can use to tackle the problem of global warming.

## The Alaska Carbon Calculator

Personalized by each region of Alaska, the AkCS Carbon Calculator allows individuals to see how much they contribute to global warming by asking a series of simple questions, including vehicle use, flights taken each year, and the cost paid each month for electricity.

The Website computes an individual's average annual carbon emissions while comparing it with the Alaska average of 24,000 pounds year and then offers a multitude of suggestions to reduce one's personal emissions. Ideas and links for reducing emissions are clustered into three categories: Conservation; Energy Efficiency; and Renewables.

## Conservation

In the conservation category, solutions are grouped into 13 actions, all of which have specific recommendations for action in Alaska, including: 1) walk, bike, ride public transit, or carpool; 2) make sure your tires are fully inflated and your car tuned up; 3) lower your water heater and home thermostats; 4) unplug appliances that are not in use; 5) recycle as much as you can, or reuse products that are not worn out; 6) buy locally produced food – look for the Alaska Grown logo; and 7) cut down on consumerism.

## Energy, Renewables, and Carbon

The Energy Efficiency category features four major highly linked action recommendation pages: 1) Reduce your home's heat and energy losses; 2) Replace incandescent lights with fluorescents; 3) Replace your appliances with "energy star" rated appliances and 4) buy a hybrid car. Many of the suggestions, when implemented, will save thousands of pounds of carbon emissions per year per person.

The renewable energy section similarly offers four major, highly linked action recommendations: 1) Install a solar panel on your roof to heat water or to generate electricity; 2) Install a wind turbine on your windy property; 3) Install a hydro system in a nearby stream; 4) Use biofuels to power your car or home generator.

For individuals and companies that want to be carbon neutral, the Website provides information on carbon offset options, emphasizing a program that is designed to promote renewable energy in Alaska: the Denali Green Tag program run by Bonneville Environmental Foundation. By purchasing enough Green Tags, you can reduce your net emissions to zero.

## Be Heard

Finally, the Website includes a "Be Heard" section where Alaska residents can find ways to support critical change at the local, state, and federal levels. The section discusses current global warming issues, opportunities and legislation, and offers sample letters. A few topics covered include the U.S Mayor's Climate Protection Agreement and the Alaska Climate Impact Assessment Commission.

The requisite for meaningful federal action is especially essential. Our delegation needs to hear from Alaskans about the importance of passing legislation like the 2005 Safe Climate Act. This Act requires a reduction in emissions of 80% from 1990 levels by 2050 through a cap and trade mechanism, motor vehicle standards, renewable energy requirements, energy efficiency improvements, and other measures. Because Alaska is on the front line of global warming, our Senators, in particular, need to have a proactive role in addressing the causes and impacts. If they hear from enough of us, they will.

## Final Word

The primary creator of the website was Heather Benz, who was born and raised in Alaska and now attends Stanford University. She observes, "We wanted to give users the resources to follow through and carry out positive carbon-reduction changes and advocacy in their lives, while showing Alaskans that fighting global warming can be both easy and economical. We can each reduce our impact and protect Alaska for my generation and the generations to come. The power to stop global warming is in our hands!"

*As we enter the New Year and the season of resolutions, it is tempting to start tackling the projects of 2007, such as ACE's Global Warming Campaign, but let's first look back at all we've accomplished this year. Thanks to supportive members like you that such a strong voice for conservation resonated across the state. Whether writing letters, testifying at hearings, making phone calls, or celebrating at our events, you are the reason behind ACE's success, and here are just a few examples of what we've accomplished together:*

- **ACE members made their voices heard in Juneau.** State bills creating the Climate Impact Commission, riparian protection standards, and the Knik River Public Use Area were passed while the Stampede Road and the infamous "Bridges to Nowhere" were cut from the state budget.
- **Provided public backing to promote wind power at Fire Island.** Over the past year, ACE members have swamped Senator Murkowski's office asking for federal support for wind power. Thanks to your efforts, the project is poised to move ahead.
- **Put the pressure on Governor Murkowski to file for additional damages in the Exxon Valdez Oil Spill 'Re-opener.'** Working with a statewide coalition, Alaska Center for the Environment members played a key role in pressuring the Governor to do what few thought possible just a year ago.
- **Expanded environmental education to the Mat Su Valley.** Trailside Discovery Camp began offering field trip programs for elementary schools during the school year and expanded summer camp programs at the Spring Creek Farm in Palmer.
- **Stopped the Northern Susitna logging sale.** The controversial logging sale off the Petersville Road received no bids in the face of strong opposition from local residents and ACE members.
- **Worked for a balance between motorized and non-motorized recreation on our public lands.** On the Kenai, ACE supported a balanced version of the Forest Service's Kenai Winter Access plan. In Wrangell St. Elias National Park, ACE joined the National Parks Conservation Association and others to challenge illegal off-road vehicle use in court.
- **Helped protect Teshepuk Lake.** When the BLM attempted to open critical wildlife habitat to oil and gas exploration in the Western Arctic, ACE's Conservation GIS Center created a map that easily communicated the lack of balance in the proposed plan. The US District Court halted the sale based on the information presented by conservation groups.
- **Raised ocean awareness through the Oceans Festivals.** The winter Alaska Ocean Film Festival traveled to 10 communities reaching nearly 2,000 viewers with educational programming. In the summer, a record 6,000 attendees celebrated our Alaskan ocean heritage at the Alaska Oceans Festival.
- **Successfully petitioned the federal government to reconsider an endangered listing for Cook Inlet beluga whales.** Following a petition by ACE, Cook Inlet Keeper, and others, the National Marine Fisheries Service ruled that there was "substantial scientific and commercial evidence" to warrant consideration of an ESA listing.
- **Increased bear awareness on the Kenai Peninsula** through television PSAs and education on fishing clean-up practices.
- **Led the fight against the Knik Arm Bridge and urban sprawl in Anchorage.**
- **Joined with new allies to publicize the flaws in Governor Murkowski's oil tax and gas line proposals.** ACE worked with former state officials, unions, and members of several political parties to alert the public regarding the damaging elements of the oil and gas proposals from Governor Murkowski.
- **Reached out to Alaskans statewide.** Going door to door, our outreach team visited more cities than ever before. Hundreds of new members signed up even more renewed.
- **Created GIS maps used in national publications.** ACE's maps were featured in National Geographic, Flyfisherman Magazine, and in National Parks Conservation Association and Trout Unlimited publications.
- **United Chugach communities and celebrated Chugach National Forest.** This year's Chugach Days celebration reached over 1,000 people through 12 events in 8 communities with over 100 sponsoring partners.
- **Got our hands dirty.** Ace staff, board, and volunteers make it a point to get out in the field throughout the year and participate in Creeks Clean Up, adopt-a-road, adopt-a-trail, and other projects.

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Take  
Action!

ALASKA YOUTH FOR ENVIRONMENTAL ACTION



907-339-3907/3980 fax

AYEA@nwf.org

www.AYEA.org

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## I pledge to

- 3—Replace 3 incandescent (regular) light bulbs with 3 compact fluorescent bulbs\* (saves 300 lbs. CO<sub>2</sub>/year\*)
- 2—Keep my house 2 degrees colder in winter (2,000 lbs. CO<sub>2</sub>)
- 1—Unplug 1 electronic appliance (toaster, hair dryer, etc.) when not in use (1,000 lbs. CO<sub>2</sub>)

\* CO<sub>2</sub> statistics courtesy www.AlaskaConservationSolutions.com

# CF bulb disposal: www.TotalReclaim.com

SIGN THE PLEDGE AT WWW.AYEA.ORG

## ACE Member Application/Renewal Form

- Individual \$35-\$99       Family \$60-\$99       Advocate \$240-\$499       Champion \$750-\$999      Amount \$ \_\_\_\_\_
- Student/Senior \$15       Supporter \$100-\$239       Leader \$500-\$749       ACE Visionary \$1000+

Alaska Center for the Environment is Alaska's largest home-grown citizen's group working for the sensible stewardship of Alaska's natural environment. With 7,000 dues-paying members from around the state, Alaska Center for the Environment is your voice for public lands conservation, clean air, clean water, and livable places. The way we win is with our members (that's you). The more members we have, the louder our voice is to promote conservation in Alaska.

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City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone \_\_\_\_\_ Email \_\_\_\_\_

Credit Card# \_\_\_\_\_ Exp. Date \_\_\_\_\_

Support Conservation in Alaska. Donate online at [www.acecenter.org](http://www.acecenter.org)

## Give monthly or quarterly gifts by joining the Puffin Club

Monthly \$ \_\_\_\_\_ OR Quarterly \$ \_\_\_\_\_

I have enclosed a check for my first gift or have provided my credit card number above. Please transfer future scheduled gifts in the above amount directly from my checking account/credit card. I understand that future tax deductible gifts will be transferred directly from this account each month or quarterly as indicated above, and that a record of my contributions will appear on my monthly bank/credit card statements. If at any time you wish to change your giving, simply call ACE at (907)274-3639 and we will gladly accommodate your request.

REQUIRED FOR PUFFIN CLUB: Signature \_\_\_\_\_ Date \_\_\_\_\_

Return to: Alaska Center for the Environment • 807 G Street, Suite 100 • Anchorage, AK 99501

## Planned Gifts

You can leave a legacy to conservation that will protect Alaska's wilderness and wildlife through a planned gift to the Alaska Center for the Environment. Planned gifts can be as simple as an outright gift of cash in a will or as sophisticated as a charitable trust or foundation that is integrated into a multi-faceted financial and estate plan. To make a planned gift, or learn more, contact our Membership Director at [clare@akcenter.org](mailto:clare@akcenter.org) or 274-3626.

# Ground Zero for Global Warming

## Ground Zero for Solutions



### Alaska Center for the Environment's Campaign Against Global Warming

Alaskans have an opportunity to shape national policy - and forge national solutions - by telling our story, crafting local and state policies to minimize our impacts, and empowering our congressional delegation to lead the fight for climate security. That's why ACE has created a comprehensive campaign to confront global warming and will concentrate advocacy on:

- Bringing public attention to the threat of global warming.**
- Reducing individual and business energy consumption.**
- Shaping energy policy on local, state and federal levels.**
- Providing online information and educational resources.**

More than ever, we need the grassroots support of our members to make an impact on this issue. Your calls to elected officials, efforts to reduce your own energy consumption, outreach to friends and financial support are crucial to the success of this campaign. To become a key activist and volunteer on our global warming campaign, send an email to [globalwarming@akcenter.org](mailto:globalwarming@akcenter.org).

**Together, we will make the difference.**



**Alaska Center for the Environment**  
807 G Street, Suite 100  
Anchorage, Alaska 99501  
[www.akcenter.org](http://www.akcenter.org)  
(907) 274-3621

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308 G Street, Suite 218  
Anchorage, Alaska 99501  
907-929-7770 (phone & fax)  
hwillard@alaskarenewableenergy.org

[www.alaskarenewableenergy.org](http://www.alaskarenewableenergy.org)

642 South Alaska Street, Suite 200  
Palmer, Alaska 99645  
907-745-6000 (phone & fax)  
crose@alaska.net

### **GOAL**

REAP's goal is to increase the production of renewable energy in Alaska.

### **MISSION STATEMENT**

REAP's mission is to facilitate the increased development of renewable energy in Alaska through collaboration, education and training, and advocacy.

### **VISION STATEMENT**

For economic and environmental reasons, we believe Alaska, the United States, and the Earth will benefit greatly from the rapid development of renewable energy resources and that Alaska can and should be a leader in such development.

### **STRATEGIES**

- 1) To help get viable and already proposed renewable energy projects in the ground;
- 2) To help implement policies that will increase the production of renewable energy in Alaska;
- 3) To build a market in Alaska for renewable energy;
- 4) To foster and demonstrate stakeholder unity in support of renewable energy and;
- 5) To promote energy efficiency.

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UPC Wind Management  
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RENEWABLE ENERGY

# ATLAS OF ALASKA



# Why Renewable Energy is Important

**A**s concerns about rising fossil fuel prices, energy security, and climate change increase, renewable energy can play a key role in producing local, clean, and inexhaustible energy to supply Alaska's growing demand for electricity, heat, and transportation fuel. Because there are little or no fuel costs associated with generating electricity from renewable sources, more Alaskans are looking to resources like wind, geothermal and biomass to hedge against the increasing cost of natural gas and diesel.

Renewable energy resources provide low-risk energy that, over the long term, can lower costs. With some of the best renewable energy resources in the country, Alaska has an opportunity to be a leader in their development and bring new revenue streams into the state's economy.

**T**he Renewable Energy Atlas of Alaska is designed as a resource for policy makers, advocates, landowners, developers, utility companies and others interested in furthering the production of electricity and fuels from wind, solar, biomass, geothermal, hydro and ocean power resources. Produced with the use of GIS technology, this Atlas brings together the best renewable resource maps and data into a single comprehensive publicly available document. While the maps contained in this atlas do not eliminate the need for on-site resource assessment, they do provide an estimate of the available resources.

This entire Atlas will eventually be available in an interactive format on the Alaska Energy Authority web site at [www.akenergyauthority.org](http://www.akenergyauthority.org).

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Below, left to right: TDX Power, Cordova Electric Cooperative, Alaska Energy Authority, Ocean Power Delivery, Ltd., Alaska Energy Authority, Chena Hot Springs Resort.

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power lines, natural gas pipelines, fuel "tank farms" and related facilities. Alaska has over 200 remote, stand-alone electrical grids serving villages as well as larger transmission grids in Southeast Alaska and the Railbelt. The Railbelt electrical grid follows the Alaska Railroad from Fairbanks through Anchorage to the Kenai Peninsula and provides 80% of the state's electrical energy.

Powered by wood until 1927, Fairbanks switched to coal after the Railroad provided access to Nenana and Healy coalfields. The Anchorage area has enjoyed relatively low-cost heating and power since expansion of the Eklutna hydro plant in 1955 and the development of major Cook Inlet oil and gas discoveries in the 1960s.

Completed in 1986, the state-owned Willow - Healy Intertie now provides a diversity of energy sources to the six Railbelt electrical utilities.

Approximately 70% of the Railbelt's electricity comes from natural gas generators. Major power generation facilities in the Railbelt include Chugach Electric Association's 430 MW natural gas-fired plant west of Anchorage at Beluga, Anchorage Municipal Light and

near Homer. In total, 1,340 MW of installed power generation capacity exists along the Railbelt to serve an average load of approximately 500 MW and a peak load of approximately 770 MW.

During the early 1980s the state completed four hydropower projects to serve Ketchikan, Kodiak, Petersburg, Valdez, and Wrangell. With a total generating capacity of 76 MW, the "Four Dam Pool" projects displace the equivalent of approximately 20 million gallons of diesel fuel per year for power production. Other major hydro facilities supply the communities of Juneau and Sitka.

With a few notable exceptions, most of the rest of Alaska's power and heating needs are fueled by diesel that is barged from Lower 48 suppliers or transported from petroleum refineries in Nikiski, North Pole, and Valdez. After freeze-up, many remote communities must rely on the fuel that is stored in tank farms, or pay a premium for fuel flown in by air tankers. Currently state and federal authorities are supporting a large program to fix leaky tanks, improve power generation and end use efficiency, and exploit local energy sources such as wind and hydro.



Nome

BERING SEA

ALEUTIAN

ISLANDS

Unalaska / Dutch Harbor

ARCTIC OCEAN

Infrastructure

Average Electrical Generation

MW	Gas	Oil	Coal	Hydro-electric	Wind	Bio-mass	Solar	Geo-thermal
< 0.1		●			✈	—	☀	—
0.1 - 1		●	—	●	✈	▲	—	▲
1 - 10	●	●	■	●	✈	▲	—	—
> 10	●	●	■	●	—	—	—	—

Electric Transmission



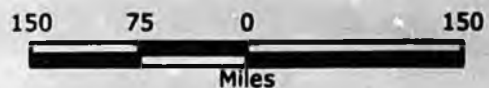
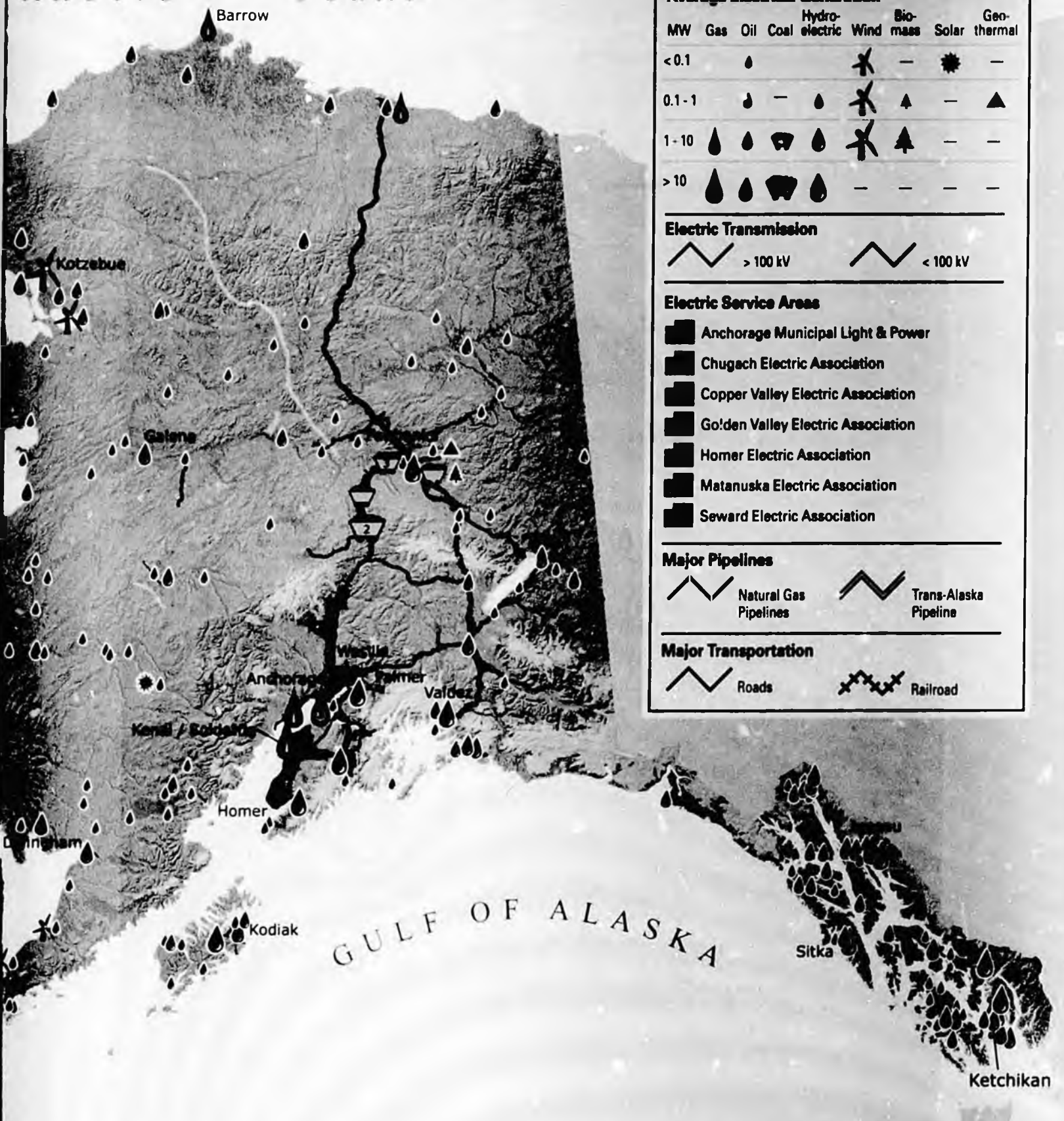
Electric Service Areas

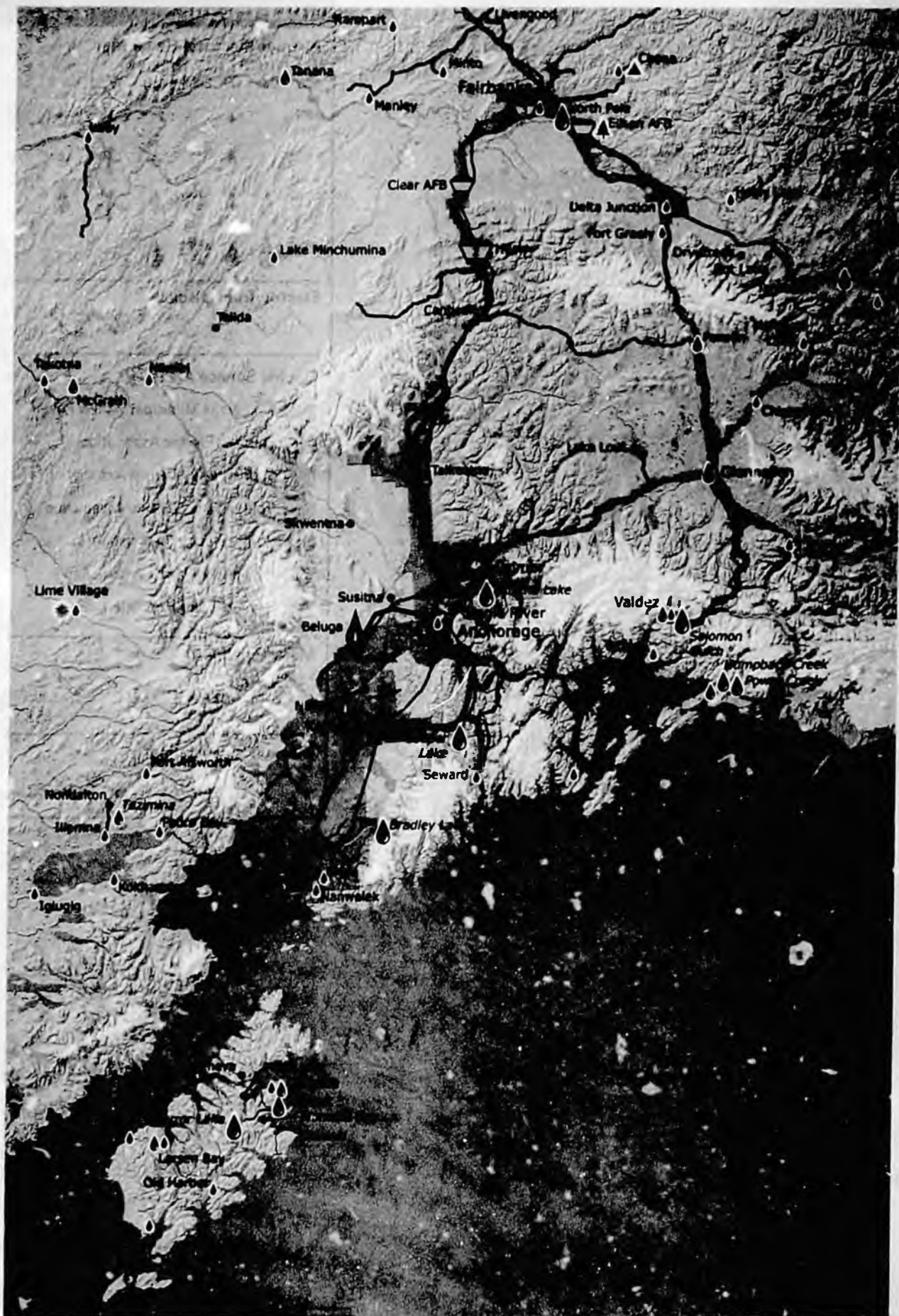
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- Copper Valley Electric Association
- Golden Valley Electric Association
- Homer Electric Association
- Matanuska Electric Association
- Seward Electric Association

Major Pipelines

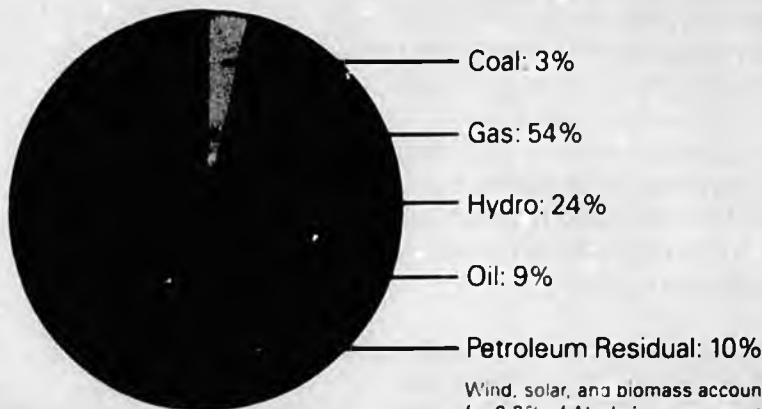


Major Transportation





## Statewide Electrical Generation in Alaska by Energy Source



Wind, solar, and biomass account for 0.2% of Alaska's energy generation.

## Infrastructure

### Average Electrical Generation

MW	Gas	Oil	Coal	Hydro-electric	Wind	Bio-mass	Solar	Geo-thermal
< 0.1		●			✶	—	☀	—
0.1 - 1		●	—	●	✶	▲	—	▲
1 - 10	●	●	■	●	✶	▲	—	—
> 10	●	●	■	●	—	—	—	—

### Electric Transmission



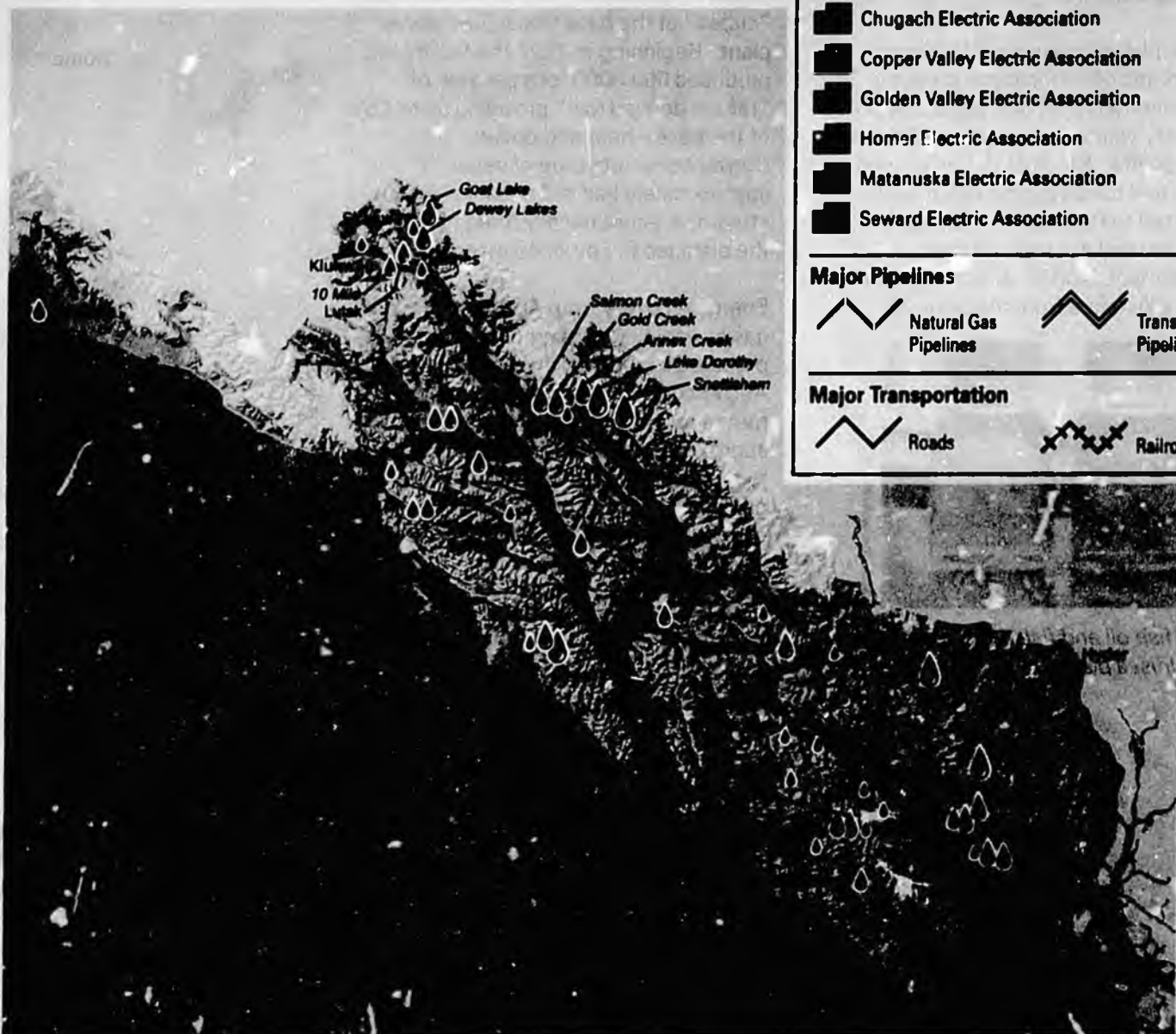
### Electric Service Areas

- Anchorage Municipal Light & Power
- Chugach Electric Association
- Copper Valley Electric Association
- Golden Valley Electric Association
- Homer Electric Association
- Matanuska Electric Association
- Seward Electric Association

### Major Pipelines



### Major Transportation



byproducts, and municipal waste.

Wood remains an important renewable energy source for Alaskans, with over 100,000 cords per year used for space heating statewide. Closure of the major pulp mills in Sitka and Ketchikan in the 1990s brought an end to large-scale wood-fired power generation in Alaska. However, recent increases in oil prices have raised interest in using sawdust and wood wastes as fuel for lumber drying, space heating, and small-scale power production. Alaska has also seen renewed interest in converting low-value wood and wood wastes to liquid fuels such as ethanol.

Groundfish processors in Unalaska, Kodiak and other locations produce approximately 8 million gallons of pollock oil every year as a byproduct of fish meal plants. Much of the oil is used as boiler fuel for drying the fish meal or exported to Pacific Rim markets for livestock and aquaculture feed supplements and other uses. In 2001, with assistance from the State of



Raw fish oil and fish oil biodiesel from the Unisea plant in Dutch Harbor.

Alaska, processor On Sea Inc. conducted successful tests of raw fish oil fuel blends in a 2.2 MW engine generator. Since then, the company has expanded the operation and now uses approximately one million gallons of up to 70% fish oil for power production each year. Currently state, federal and university groups are working together to assess the potential for recovering a portion of the estimated 12 million gallons of fish oil returned to the ocean each year as fish processing waste.

Alaskans generate approximately 650,000 tons of garbage per year. Eielson Air Force Base, near Fairbanks, densifies paper separated from the local waste stream and then co-fires the 4 cm square "cubes" at the base's coal-fired power plant. Beginning in 1997, the facility has produced 600-3000 tons per year of "refuse-derived fuel" providing up to 1.5% of the base's heat and power. Conventional recycling of paper, approximately half of Fairbanks' waste stream, is economically marginal given the distance to Lower 48 markets.

Energy recovery from Anchorage landfill gas is viable, according to a report prepared in 2005 for the Municipality of Anchorage. The landfill will produce methane with an energy equivalent of approximately 1.9 million gallons of diesel fuel per year over the next ten years. The gas could be used to heat nearby military or school facilities, or be converted to 2.5 MW of electrical power, enough to supply 2,500 homes in the Railbelt.

It is also possible that Alaska's agricultural lands may be used to produce energy crops, such as rapeseed, to produce biodiesel.

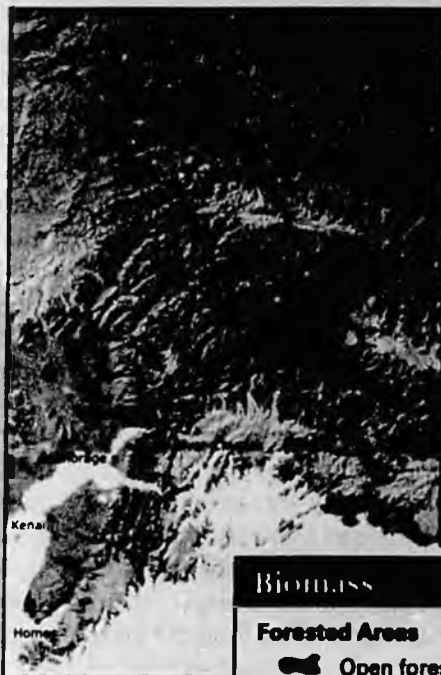
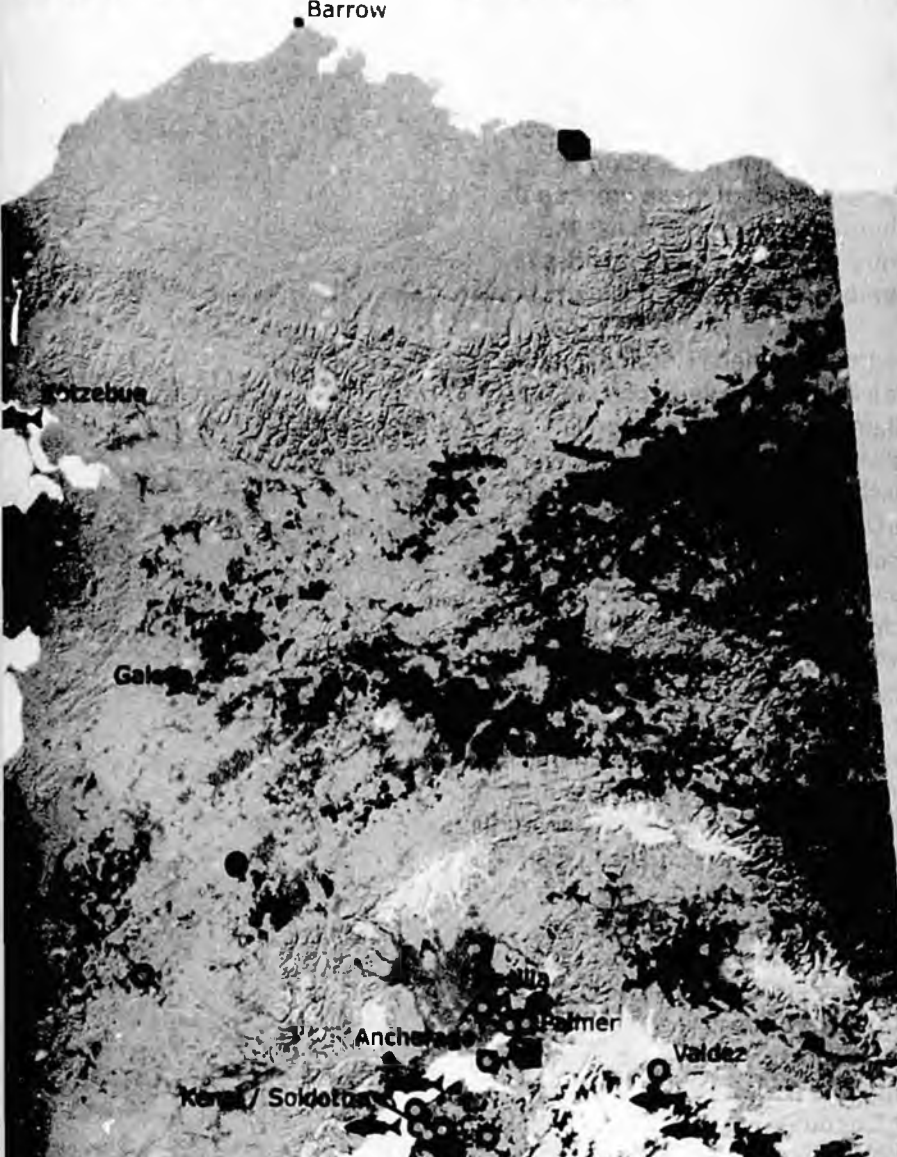
BERING SEA

ALEUTIAN ISLANDS

Unalaska / Dutch Harbor

ARCTIC OCEAN




Barrow





State and privately owned agriculture lands.

**Biomass**

**Forested Areas**

-  Open forest and tall shrub
-  Mixed forest and broadleaf
-  Closed spruce


**Sawmills**

-  Primary sawmills
-  Secondary sawmills

**Fish Processors**

-  Communities with at least one major fish processor

**Landfills**

-  Communities with at least one Class I landfill

GULF OF ALASKA



**A**laska has four distinct geothermal resource regions: 1) The Interior Hot Springs, which include the band of hot springs that runs east-west from the Yukon Territory of Canada to the Seward Peninsula, 2) The Southeast Hot Springs 3) The Wrangell Mountains, and 4) The Ring of Fire Volcanoes, which includes the Aleutians, the Alaska Peninsula, and Baranof Island.

The Interior Hot Springs and the Southeast Hot Springs are low to moderate temperature geothermal systems with surface expression as hot springs. The Wrangell Mountains are composed of several active volcanoes that may have geothermal energy development potential. The Ring of Fire is an active volcanic arc that circles the Pacific and hosts high-temperature hydrothermal systems. These systems have surface expression as hot springs, geysers, and fumarole fields.

The use of geothermal resources falls into two categories: direct use and electricity production. Direct use of geothermal energy includes all non-electricity-producing applications. Potential applications for direct use of geothermal energy in Alaska include district heating, greenhouses, absorption chilling, mariculture, process heating in the seafood industry, swimming pool heating, and hydrogen production.

Three large-scale geothermal electric power generation projects have been proposed in Alaska: the Mt. Makushin project to provide power to the City of

Unalaska, the Akutan project to provide power to the City of Akutan, and the Mt. Spurr project to provide power to the Railbelt grid. If developed, the Makushin and Akutan projects would also provide district heat and process heat to local, municipal, and fish processing customers. Each of these proposed geothermal power projects has the potential to produce tens and possibly hundreds of megawatts of electric power.

In the Interior, Chena Hot Springs Resort serves as an example of diverse use of geothermal energy. The resort is installing the first geothermal power plant in Alaska with assistance from state and federal agencies. Underway in 2006, the project includes two 200 kW organic rankine cycle generators, and is anticipated to displace 150,000 gallons of diesel per year. Based on current fuel costs the \$2.1 million project will save over \$375,000 per year. In addition to the electric power plant, the Chena Resort uses its geothermal resources for outdoor baths, district heating, swimming pool heating, and to provide heat and carbon dioxide to its greenhouses. The site also demonstrates the use of geothermal energy for refrigeration. The resort installed a 16 ton absorption chiller in 2005 to provide chilling to an outdoor ice museum, which is kept frozen year-round. The chiller uses water from a 165°F geothermal well as a heat source, and a 40°F creek as a heat sink. This technology has potential applications in other Alaska communities that could use waste or geothermal heat to provide cooling for fish processing, ice production and community cold storage.



ARCTIC OCEAN

Barrow

Wetzebue

Galena

Fairbanks

Hot Springs

Mount Spurr

Wasilla

Palmer

Anchorage

Valdez

Kenai / Soldotna

Homer

Seward

Kodiak

GULF OF ALASKA

Deaf


Sitka

Baranof Island

Ketchikan

**Geothermal**

**Potential Geothermal Resources**




---

**Wells and Springs (temperature in °F)**

● 55° - 100°	● 200° - 300°
● 100° - 200°	● > 300°

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▲ **Volcanoes**

