DRAFT Juneau Community Energy Plan

Setting the scene and priority actions for the CBJ

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City and Borough of Juneau
Juneau Commission on Sustainability
www.juneau.org/sustainability

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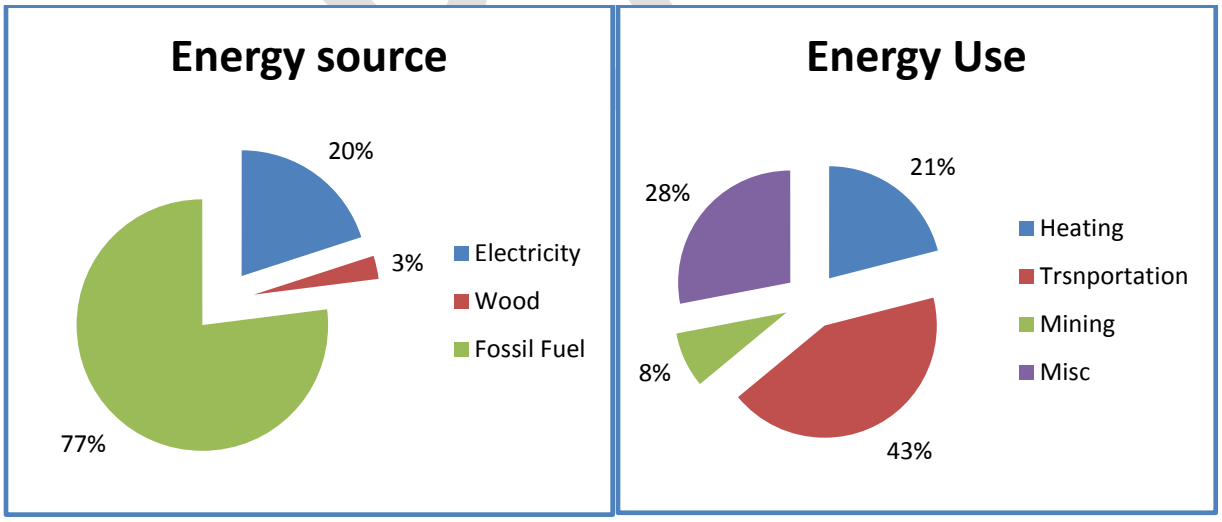
EXECUTIVE SUMMARY

The purpose of the Juneau Community Energy Plan (JCEP) is to define goals for Juneau's energy future, focusing on more efficient use of existing capacity and new energy supplies, and to develop strategies and policies for achieving these goals. This report is the first step in that process, providing the information and framework needed to take the next steps.

This plan addresses four key questions relating to Juneau energy:

1. "Where are we now?"
2. "Where are we going?"
3. "Where do we want to go over the next 20-35 years?"
4. "How can we get there?"

Juneau currently derives almost 100% of its electricity from hydropower, which provides economical renewable energy while limiting greenhouse gas (GHG) emissions. This hydroelectricity provides about 20% of the total energy used in Juneau. Another 3% comes from wood, another renewable source, used for heating. The remaining 77% comes from fossil fuels, which are the primary energy source for heating buildings (about 21%), for transportation (about 43%) and mining (about 8%). Fossil fuels are typically expensive in Juneau, take money out of the local economy, and create vulnerability to future price increases, particularly if carbon taxes are eventually implemented. Additionally fossil fuels are a major contributor to GHG emissions.



This report identifies three alternative future paths for energy use in Juneau which can be characterized as Do Little - Business-as-usual (BAU), Do Something - 25% by 2035 (some reductions in energy use and an increased share of renewables), and Do a Lot - 80% by 2045

(through deeper reductions in energy use and replacing most fossil fuels with renewable energy).

The "Business-as-usual" (BAU) path is derived from historical trends. Total energy use in Juneau is projected to rise at about the same rate as population growth, which has historically averaged about 1% per year. Gradual growth in energy use is tied to population change, driven primarily by cost considerations and the choices of private utility and fuel providers. However Juneau's small population, punctuated economic development, particularly by local mines, and shifts in energy technology make it unlikely that the future path of energy demand will be as smooth as the BAU projects.

The "Towards JCAP" path is derived from Resolution 2593, in which the CBJ Assembly in 2011 adopted a goal of reducing GHG emissions 25% over 20 years. The 2010 Juneau Climate Action and Implementation Plan (JCAP) identified a broad menu of actions for accomplishing this goal of reducing greenhouse gas emissions and use of fossil fuels. One of the actions recommended by the JCAP is the development of an energy plan to support renewable energy development and reduce Juneau's energy vulnerability. One value of the JCAP is that it identifies a wide array of approaches and actions that could reduce GHG emissions while saving money and reducing dependence on fossil fuels. As this Plan was written it was recognized that the JCAP provides a comprehensive list of many of the actions normally recommended in Community Energy plans and that this Energy Plan served as a useful addition in reviewing and understanding Juneau's energy picture. It was also recognized that the target of JCAP is likely to be missed because the recommended actions are not being implemented quickly enough. A key output of the Energy Plan is an identification of a subset of the JCAP actions that will deliver reductions in community energy use most effectively and produce some quick wins in working towards energy reductions that would also assist in meeting the JCAP reduction target. These actions led to eight broad strategy areas important next steps to deliver on these strategies identified. The strategies and next steps are shown in the table at the in this executive summary.

The "Beyond JCAP" path resulted from discussions with the Juneau Commission on Sustainability (JCOS), which served as the steering committee for the Juneau Community Energy Plan (JCEP) in 2015 and 2016. The intention was to describe steps relating to energy use and production that would need to be taken to deliver an 80% reduction in GHG by 2045. This ambitious target was in recognition that the December 2015 Paris climate agreement made it clear that significant action is needed as soon as possible to avoid the worst impacts of climate change, and that fossil fuels must be replaced with renewable energy sources over the next 50 years. This goal provides an opportunity for Juneau to consider what role it wants to play in this global issue.

The JCEP recognizes that there is no silver bullet, or straightforward path or plan, for accomplishing these ambitious goals, and no single entity or organization that could implement it if there were. Instead, a wide variety of actors are involved in making energy choices, including individual home and vehicle owners, businesses, energy suppliers such as AEL&P and

fuel companies, and government agencies. The JCEP emphasizes the role of the CBJ, both because it can take actions that save public money while reducing fossil fuel use, and because it represents community values and interests. But goals to shift energy use toward renewables can only be achieved through cooperation and collaboration between a range of private and public entities. Fortunately Juneau has many individuals and groups experimenting with, and tackling these issues. The JEDC Renewables Cluster, with its work on incentives for electric vehicles, and developing concepts for a Juneau District Heating are good examples. Other examples include installations of heat pumps in major buildings and residences.

This plan identifies three broad approaches for accomplishing these goals for Juneau's Energy Future:

1) Increase energy efficiency, and reduce energy use, to save money and make the most of existing sources.
2) Increase the use of renewable energy, to replace fossil fuels.
3) Increase the supply of renewable energy.

Energy efficiency is generally the most cost-effective way to reduce energy demand and GHG emissions. Among the priority strategies identified in this report are supporting energy efficiency measures for all buildings in Juneau, adopting best practices for the CBJ organization, and enhancing land use regulations that support compact, mixed use development.

Increasing the use of renewable energy can be accomplished by substituting hydroelectricity or other renewable sources for fossil fuels. Priority strategies include developing a downtown heating district using heat pumps, reducing dependence of the transportation system on fossil fuels, reducing space heating dependency on fossil fuels, and supporting electrification of mining operations. However, Juneau's current hydro capacity is limited, particularly in low water years. Hydro power is also out of seasonal phase with heating demands — less water is available in the winter.

Expansion of hydropower resources is the most obvious opportunity for increasing the supply of renewable energy in Juneau. Rain is one of our major resources. Other possibilities include development of biomass, tidal, wind, and solar resources, although these appear to be considerably more expensive than hydropower or fossil fuels. AEL&P has identified several projects that could add hydropower in the future, but it has no current plans to develop them. Sealaska has been working to develop a biomass supply, and uses pellets to heat their buildings in Juneau. Juneau Hydropower is planning to develop the Sweetheart Creek Hydroelectric Facility. AVISTA Utilities, a Spokane Washington based utility is exploring a non-renewable alternative, bringing in natural gas to Juneau.

This report recommends that the Assembly take the following actions to move forward in further developing the Juneau Community Energy Plan and delivering on the identified priority strategies:

- Adopt a goal for reducing fossil fuel use including percentages desired and time frames. This should take into account the 2010 Juneau Climate Action Plan Greenhouse Gas reduction target and the scenarios presented in this Energy Plan.
- Adopt and implement the relevant JCAP actions associated with the Energy Plan priority strategies. Require periodic review on their delivery.
- Direct the CBJ to more formally monitor its internal energy use and to explicitly incorporate energy into operational decisions.
- Direct the CBJ to monitor community energy use as a whole, by updating the Energy and GHG Emissions Inventory.
- Hire a CBJ Energy Manager to assist in accomplishing these actions.

#	Strategy	Responsibility	Timeframe to implement	Next Steps/Issues to be addressed
1	**Support energy efficiency measures for all buildings**	CBJ (CDD & Engineering), State	2 years	• Update building code for new construction • Explore policy options for retrofitting existing buildings • Convene working group to review commercial building Code • Develop case studies to demonstrate success stories • Explore funding of incentives using Federal and State resources • Leverage weatherization program to increase the number of retrofits in residential sector
2	**Increase use of electricity by cruise ships**	CBJ Docks and Harbors Local Electric Utilities, Cruise industry	1 year	• New dock has conduit, but no cabling connection infrastructure included • Clarify ownership and operation of electric infrastructure • Cost recovery opportunity through increased head tax to visitors • Concerns about current capacity of existing hydropower to service additional vessels in a cost effective way • Develop preliminary design and assess ownership and operational model.
3	**Adopt energy efficiency best practices for the CBJ organization**	CBJ	1 year	• Internally review and implement existing audits • Incorporate energy usage and efficiency at all levels of CBJ operations and decision making • Develop comprehensive energy accounting system to allow a complete picture of energy use. This should have the ability to calculate GHG emissions and be consistent with JCAP methodology. • Review procurement policies for equipment and assets to support energy efficiency • Conduct or review energy audits on all CBJ facilities • Implement recommendations with a 10 year or less payback • Apply for funding through the Energy Efficiency Revolving Loan Fund and pay the loan back through energy savings

#	Strategy	Responsibility	Timeframe to implement	Next Steps/Issues to be addressed
4	**Explore and implement district heating for downtown core, and other suitable areas, preferably using renewable energy**	JEDC, Private and public entities	5 years	• Develop a business model is for a DH system. Identify economic advantages and disadvantages • Explore potential locations including Willoughby and state/federal buildings • Identify heat load and market size to determine economies of scale required to make a DH viable. • Assess the feasibility of using renewable energy resources • Develop a preliminary rate design for the system • Business model should include assessment of loads, service territory, distribution pipe network, analysis of energy options and plant setting, and analysis of ownership and operating models
5	**Reduce dependence of transportation system on fossil fuels**	CBJ, JEDC, Local Electric Utilities	10 years	• Explore active transportation and opportunities to support electric vehicles • Consider parking policies to support electric vehicles • Assess centralized fleets for CBJ including appropriate vehicle choice (including electric vehicles)
6	**Reduce space heating dependency on fossil fuels**	CBJ, Local Electric Utilities, Local Property Owners	5 years	• Assess technical and financial issues of electrification of space heat for residential market • Conduct a biomass study in CBJ • Assess building code options to support alternatives to fossil fuel space heat • Study impact of increased electrification on electricity system • Study the potential for the use (expansion) of air source heat pumps and/or biomass for CBJ and other government owned buildings.
7	**Enhance land use regulations supporting energy efficient, compact, mixed use developments**	CBJ	Ongoing	• The Comprehensive Plan has many recommended actions • Continue to implement recommended actions • Develop metrics to monitor progress and do so

#	Strategy	Responsibility	Timeframe to implement	Next Steps/Issues to be addressed
8	**Support electrification of mining operations using renewable energy**	Local Electric Utilities, Local Mine Operations	5 years	• Work with mining industry, local utility and power producers to assess the cost, feasibility, development of transmission and generation required to achieve uninterruptible mine electrification

1.0 INTRODUCTION

1.1 WHAT IS THE JUNEAU COMMUNITY ENERGY PLAN?

The Juneau Community Energy Plan provides information to educate the community on the issues related to local energy supply and consumption. It identifies three possible scenarios for reducing reliance on fossil fuels and then recommends strategies for achieving these goals.

The plan identifies how the following can be achieved in the context of the existing situation while still allowing for growth of the local economy:

- Increase predictability and reliability in the price of energy
- Reduce community vulnerability to fossil fuel costs
- Deliver on Juneau's commitment to reduce greenhouse gases

The JCEP addresses four key questions and provides the following information (Figure 1).

Figure 1: Scope of JCEP

Issues Addressed by JCEP	Description of Activities
Where are we now?	• A profile of the physical and socio-economic features of CBJ • An inventory of energy consumption using latest available data • Description of existing energy sources
Where are we going?	• A business as usual forecast of energy use from the baseline year 2010 to 2045 • Discussion of the implications of choosing particular energy sources
Where do we want to go?	• A proposed energy target to work towards • An overarching framework and key strategies, including 's role and the community partners that will contribute to the strategies' success
How will we get there?	• Several high level strategies and a collaborative approach to implementation • Specific actions and policy tools that will advance energy use reductions in each of the strategies.

1.2 HOW WAS THE PLAN DEVELOPED?

CBJ began to address environmental sustainability and climate change through a number of initiatives over the past several years. These initiatives are inter-related, with goals to improve the livability and long-term resiliency of Juneau. Based on these previous efforts, the CBJ sustains an

array of initiatives consistent with the theme of "living more and using less." Extensive community work has gone into developing the platform required for Juneau to begin to practically address local energy and climate vulnerabilities, including:

- CBJ Resolution 2528: "The City and Borough of Juneau is committed to a sustainable future that meets today's needs without compromising the ability of future generations to meet their needs;"
- Juneau Commission on Sustainability (JCOS);
- Juneau Climate Action Plan (JCAP), including ambitious emission reduction goals (CBJ Resolution 2593);
- Juneau Economic Development Plan's 10-year vision that encourages energy innovation and job creation.

The process for developing the JCEP built on these existing and ongoing initiatives. The JCEP formally began in February 2015 and included extensive involvement of the Juneau Commission on Sustainability (JCOS) to guide the development of the plan. Five workshops were convened with JCOS members to obtain input and feedback into the plan.

JCOS members involved in the development of the JCEP include:

- Amy Skilbred
- Ben Haight, Planning Commission Liaison
- Bob Deering
- Clint Gundelfinger
- Darrell Wetherall
- Duff Mitchell
- John Smith
- Greg Smith
- Kate Bevegni
- Kate Troll, Assembly Liaison
- Steve Behnke
- Sara Truitt

CBJ staff involved in development of this plan includes:

- Beth McKibben, AICP, Planning Manager
- Tim Felstead, Planner II
- Holly Kveum, Administrative Assistant II
- Megan Daniels, Administrative Assistant II
- Rob Steedle, Director, Community Development
- Allison Eddins, Planner I
- Marjorie Hamburger, Administrative Assistant II

1.2.1 Acknowledgement

This energy plan was developed with extensive input from JCOS members, City staff and the local electricity utility AEL&P (a wholly owned subsidiary of Avista Corporation, Spokane WA), and Juneau Hydropower, a local hydropower developer. The contribution of these organizations to the development of this plan is gratefully acknowledged.

1.3 JUNEAU COMMUNITY ENERGY PLAN OBJECTIVES

The JCEP is based on a scope of work developed by JCOS. The 2010 Juneau Climate Action and Implementation Plan (JCAP) noted as one of top ten implementing actions a need for an Energy Plan. Specifically, the JCAP recommended:

> *"Develop an Energy Plan for Juneau. This plan would identify and evaluate the technical and economic feasibility of renewable energy sources (including hydroelectric, biomass, solar, tidal, and wind) that will be available to meet the community's future need. The Energy Plan will need to be flexible enough to respond to changing conditions and will need to examine the full range of renewable energy options and the relative costs. Completion of an Energy Plan would require input from other levels of government and the private sector."*[1]

Based on this recommendation, a scope of work was drafted by JCOS. It became apparent during the scoping process that JCEP should consider broader issues than identified in the JCAP. The scope of work was drafted with the expectation of a larger budget than was ultimately available. Additionally, a considerable amount of time was spent trying to obtain data to update the 2010 Juneau energy and emissions inventory from local energy suppliers. Only the local electric utility released data on energy usage. Oil and gas suppliers were reluctant despite having previously providing the information for the earlier inventories.

The result is a high level document providing background on the potential decisions and illustrating the possible trade-offs needed to realize the recommendations in the JCAP and 2013 Comprehensive Plan for a JCEP. It is anticipated that the more detailed studies identified in this plan will be implemented as resources become available to more comprehensively identify Juneau's future energy options. Areas for future study are identified throughout this plan.

Discussion of GHG and climate change has intentionally been kept to a minimum in this document because this plan is intendeds to focus primarily on energy impacts.

1. **Public outreach** - develop and implement public outreach and education programs at appropriate times during the Energy Plan process to enable public comment on the Plan before it is finalized.

2. **Establish an energy usage baseline** – Based on relevant sources of background data and previous studies and baseline for Juneau's energy use as a community should be established.

3. **Interpret collected energy data** - To make rational decisions about energy supply and infrastructure, it is necessary to collect data on existing energy consumption and take into account projected changes in energy requirements.

[1] Juneau Climate Action and Implementation Plan Pg. v, Nov, 2011

4. **Identify and evaluate efficiency and conservation measures** – To determine how CBJ can influence both the adoption rates of efficiency and conservation measures, as well as the specific measures that individuals and businesses seek to adopt, in order to achieve optimum utilization of Juneau's energy infrastructure and supply.

5. **Understand the expected need and demand for energy –** Understanding the future demand for energy and mix of energy sources, and the implications of using one energy supply over another, is crucial for the public to make sound decisions as individuals and as a community.

6. **Explore potentially viable sources of energy in Juneau** - Consider the economics of energy sources including hydroelectricity, biomass, natural gas, solar electricity or thermal energy, geothermal, tidal, and wind, and assess how they can meet the community's needs in the future.

7. **Identify and Prioritize Measures Which the Community Should Pursue** – Should include policy tools, capital improvement projects and potential funding resources.

Given the limited resources available for the development of this plan, some objectives have been covered with greater detail than others. Areas for future study are identified throughout this document.

1.4 RELATED PLANNING INITIATIVES

Prior to CBJ formally committing to reducing GHG emissions in 2007, a number of coordinated community planning efforts were completed. These efforts are guiding community action and investment. Excerpts of key planning documents are presented in the Appendices. While these goals and actions are still relevant, they need to be re-evaluated through a broader community process. While numerous initiatives are identified the level of implementation is less clear. There is very little done to monitor the numerous goals, actions etc. included in these plans.

1.4.1 Juneau Climate Action and Implementation Plan, Adopted 2011, CBJ Assembly Resolution 2593

Juneau's Climate Action and Implementation Plan outlines goals and a path for reducing community emissions 25% by 2032, and proactively addresses local climate vulnerabilities. It inventories (using 2010 data) current community energy uses and emissions, sets targets, and presents a set of actions and implementation strategies.

Key baseline data compilations and technical findings of the plan include:

- 2007 and 2010 summaries of Juneau's total energy use and greenhouse gas emissions (page 10)
- 2010 total energy use statistics for Juneau including greenhouse gas emissions by source and sector (page 11)
- 2007 to 2035 emission baseline and forecasts, both with and without local targets and action (page 19)

The JCEP is ultimately building its analysis starting from this plan's 2010 data, and extending/reinforcing the JCAP recommendations and targets as a framework for community direction in these specific areas:

- State and federal weatherization programs
- Local building code updates to more stringent energy standards
- Encouraging federal, state, and local government agencies to conserve energy
- Partnering to develop local professional expertise
- Supporting energy efficiency and renewable energy pilot projects in Juneau
- Seeking various energy cost savings related to energy efficient transportation, including electric vehicles for personal use and transit, human-powered alternatives
- Implementing public outreach and education
- Prioritizing implementation and capacity-building

1.4.2 Juneau Economic Development Plan, Adopted 2015, CBJ Ordinance 2015-10

This recently adopted plan considers Juneau economic trends and provides strategies that address the community's economic and strategic strengths, weaknesses, opportunities, and threats. Although the plan is not specifically related to energy, elements of this plan and its' implementation remain critical in terms of CBJ having both the tax base to invest in energy conservation and renewable alternatives, and overall population stability. Key elements of this plan include:

- Reduce the cost of living (including affordable energy prices, efficiency savings, and local energy supply);
- Support business development and job creation;
- Identify opportunities for energy infrastructure investments; and
- Support industry cluster development (potentially including in the renewable energy field, and an "Energy Innovation District").

Additionally, the plan strongly supports expanding Juneau's limited settlement base, primarily into West Douglas, which would both require extension of urban services (water and sewer) and add new housing and building stock that will require an energy supply.

1.4.3 GHG Policy and Sustainability Initiatives

To use a local slogan, Juneau is proactively focusing on "living more and using less" at all levels within the community. Policies are an important aspect of mobilizing the community to make short term investments that achieve cost savings over time, and move the community closer to its emission goals. Following are a number of formal policies and initiatives that indicate a local willingness to reduce local GHG emissions and enhance local sustainability:

- (2007) CBJ Resolution 2397 - The CBJ Assembly endorsed a 1% greenhouse emission reduction target for municipal buildings and operations and a 20% emission reduction for the entire community by 2012 using 2007 emission levels as a baseline.

- (2007) CBJ Resolution 2401AM (later extended and superseded by CBJ Resolution 2528 in 2010created the Juneau Commission on Sustainability (JCOS) whose mission is to promote the economic, social, environmental, and governmental well-being of Juneau and all its inhabitants, now and in the future.
- (2009) CBJ Resolution 2502 - Assembly endorsement of previous GHG goals and preparation of a Climate Action Plan.
- (20011) CBJ Resolution 2593 - Juneau adopted the Juneau Climate Action & Implementation Plan with a community goal of reducing emissions 25% by 2032.
- Juneau Unplugged. Juneau Unplugged is directed by local non-profits and the City in partnerships with community groups, local media, the business community, AEL&P, and local schools. With the dual goals of providing information and support, the campaign endeavors to provide the community with information about conservation, safely reducing electricity consumption, progress on efforts to repair the damaged lines, political and administrative responses to the crisis, and education about energy alternatives. The campaign was initiated when Juneau faced with a crisis that suddenly pushed electricity prices up to five times the usual, and was instrumental in helping to cut local energy consumption during the crisis.
- Renewable Energy Seed Cluster, Juneau Economic Development Council. A Southeast initiative with specific Renewable Energy Action Initiatives, including expanded use of electric vehicles in Juneau, and Renewable Energy Education and Outreach in conjunction with the U.S. Forest Service and the Mendenhall Glacier Recreation Area.
- (2015) Resolution 2722 – Expressed support for the advancement of electrified transportation vehicles and supporting infrastructure in Juneau. This was based on recognition of the limited road network, low cost hydroelectricity and community support for electric vehicle use.
- Ordinance 2010-42 required both new and renovated CBJ buildings with a cost of over $5m to be meet LEED standards.

Additional formal and informal community initiatives and programs include:

- Federal biomass and renewable energy initiatives;
- State programs to encourage and help fund efficiency investments;
- Community energy and conservation project implementation in key community facilities;
- Businesses creatively reducing their carbon footprint;
- Individual and homeowner daily actions and investments in efficient technologies;
- Local businesses and the electric utility exploring additional hydroelectric resources and uses such as electric vehicles and district heating.

2.0 WHERE ARE WE NOW?

2.1 COMMUNITY CONTEXT

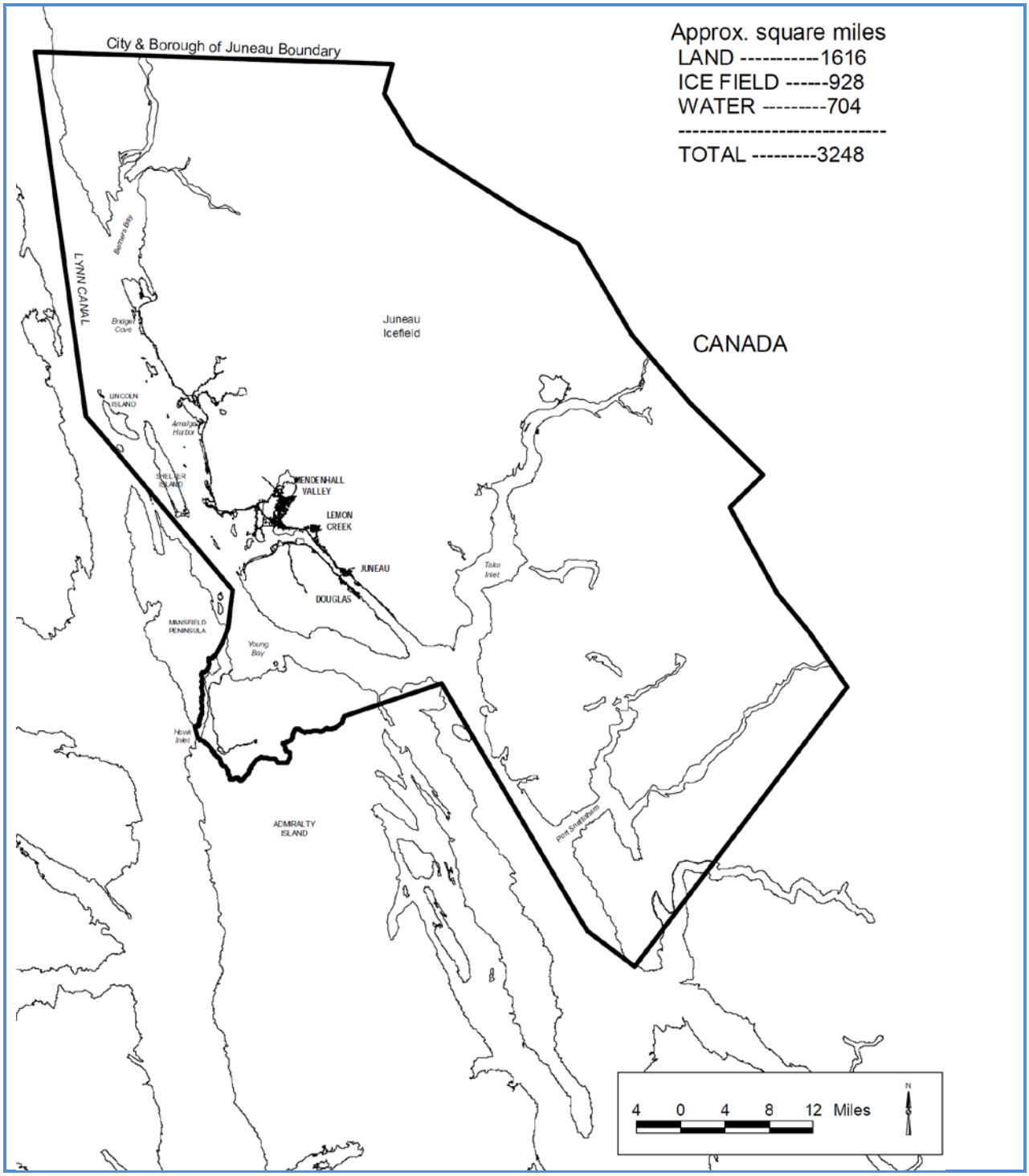
Community data and relevant plans, policies, and initiatives are summarized in this section to provide context for developing this document. The intent is to ensure that this plan is informed by local opportunities and trends, aligns with previously adopted community goals and policies and builds off work that has been completed.

2.1.1 Geography

The CBJ covers 3,255 square miles (80% land, 20% water) in Gastineau Channel, from Tracy Arm to the south and just beyond the north shore of Berners Bay (See **Figure 2**). Juneau's separation from other regions by significant bodies of water and its rugged terrain significantly impact community energy use. Non-local energy sources, such as fossil fuels must be barged in, increasing their cost. Juneau's geography, bordered by water on one side and mountains on the other has created a linear settlement pattern rather than a more compact one resulting in long supply lines and longer travel distances.

Despite these challenges, Juneau's geography and topography provides significant renewable energy opportunities, with tides averaging 16 feet and extensive mountain peaks at greater than 8,200 feet in the Coast Range along the Canadian border. These mountains are covered by the Juneau Ice field, a large ice mass from which more than 30 glaciers begin.

Figure 2 - City and Borough of Juneau



Source: CBJ

2.1.2 Climate

Local climate is a significant driver of Juneau's energy profile with the greatest heating demand in the winter and little demand for air conditioning in the summer. Juneau's maritime climate is milder than its' 58° northern latitude may suggest due to the moderating influence of the Pacific Ocean with a mean annual temperature of 42° F, based on 63 years of record[2]. Historically, the community has on average 8,574[3] annual Heating Degree Days[4], and experiences a yearly average of 87.4 inches of snowfall at sea level and significantly higher amounts at higher elevations. Annual snowmelt and rain, feed streams and subsequently hydro-electric generation operations, Juneau's primary electrical source. Hydroelectric peak production takes place between May and October.

For context, a comparison of heating degree days for different US locations is presented in **Figure 3**. According to global climate models, Juneau's temperatures are predicted to rise by 10° F before the current century ends.[5] Warming effects are expected to be the largest during the coldest part of the year, with potentially 50 to 70 fewer frost days per year. This will reduce the number of heating degree days therefore reducing space heating requirements. Other energy reductions may be observed due to reduced snow removal operations and a reduction in of cold engine starts, which reduces vehicle fuel consumption.

Figure 3: Comparison of Heating Degree Days by Location

City	Average annual heating degree days (1981-2010)
Barrow, AK	19,893
Anchorage, AK	10,470
Juneau, AK	8,574
Seattle, WA	4,615
Portland, OR	4,366
Phoenix, AZ	1,040
Honolulu, HI	0

Juneau's latitude and lower sun angle, along with its coastal rainforest climate mean that air conditioning is generally not a contributor to local energy use patterns. The community has generally moderate temperatures, moderate levels of sunshine, and abundant precipitation, as Juneau's coastal mountains intercept moist air masses as they arrive from the Gulf of Alaska. Juneau annually averages between 55 and 92 inches of rainfall, depending on the location.

2.1.3 Setting the Context for Climate Action and Energy Efficiency

Juneau, like many coastal communities, is concerned about the potential long-term threat of climate change. To better anticipate and respond to projected climate changes, CBJ

[2] 2007 *Climate Change: Predicted Impacts on Juneau,* CBJ Scientific Panel on Climate Change, (page 15).
[3] http://ggweather.com/ccd/nrmhdd.htm based on NOAA datasets
[4] Heating degree days is derived from the cumulative number of degrees, averaged over a day, the outside temperature is below 65°F for each day of the year.
[5] 2007 *Climate Change: Predicted Impacts on Juneau*, CBJ Scientific Panel on Climate Change (p.4)

convened a Scientific Panel on Climate Change in 2007. A report of their findings highlights possible warming effects, and recommends enhancing local energy efficiency to realize "immediate economic benefits, as well as reduce the long-term costs associated with large scale environmental changes."[6]

In 2007 Juneau formally made a commitment to reducing local carbon dioxide (CO2) and other GHG emissions. In the years since, CBJ has embarked upon a number of initiatives to reduce GHG emissions in the community:

- 2007 – Juneau became a signatory to the 2007 US Conference of Mayors Climate Protection Agreement.
- 2009 – CBJ performed a baseline inventory of greenhouse gas emissions based on 2007 data.
- 2009 – The CBJ Assembly endorsed a 1% greenhouse emission reduction target for municipal buildings and operations and a 20% emission reduction for the entire community by 2012 using 2007 emission levels as a baseline. (Resolution 2502)
- 2011 – Juneau adopted the Juneau Climate Action & Implementation Plan (2011), with a community goal of reducing emissions 25% by 2032.

2.2 POPULATION AND ECONOMIC TRENDS

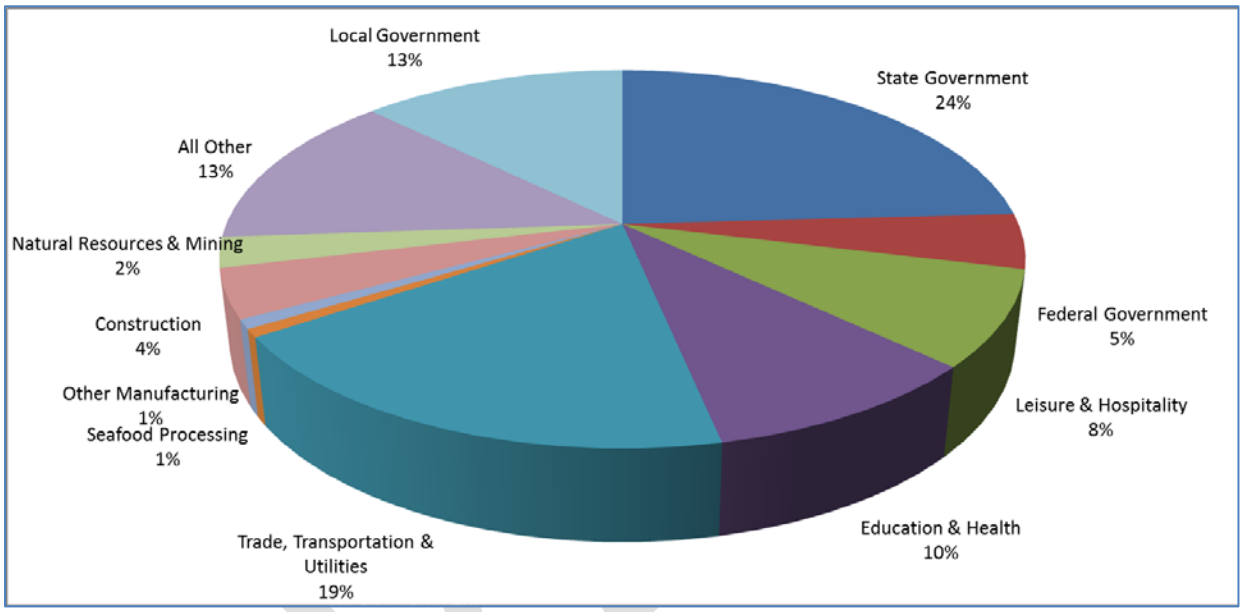
Population is a driver of energy consumption and has a direct effect on the number of homes, business, and vehicles that travel in the region. Juneau's population grew substantially in the last 50 years with a population of 6,050 in 1970 growing to 19,528 by 1980 (222.8% increase)[7]. It is currently estimated to have 33,026 residents[8]. Although for many decades Juneau grew at a steady annual rate of about 2.4 percent, a number of trends have slowed this growth to 0.1% over recent years[9], a trend that is expected to persist into the future based on a number of variables, including:

- ***Demographics***. Future demographic trends will see relatively lower birth and migration rates, and an aging population. Within a decade, 20 percent of Juneau's population will be over 65 years of age (up from about 13 percent today)[10].
- ***Growth Barriers***. Juneau's growth is impacted by the real and perceived lack of affordable housing, high cost of living, and geographic characteristics (e.g., the community's limited land base to support new settlement, physical separation from other communities, and dependence on expensive supply chains and modes of regional transport).
- ***Economic Changes***. As the State Capitol and a regional hub, Juneau has the largest and most stable employment base in the region, and enjoys one of the state's lowest unemployment rates. At the same time, Juneau has seen a steady decline in government employment over the past decade, and a shift toward seasonal, non-

[6] 2007 *Climate Change: Predicted Impacts on Juneau*, CBJ Scientific Panel on Climate Change, (page 73).
[7] US Census (June , 2015).
[8] 2014 Alaska Department of Labor and Workforce Development <http://labor.state.ak.us/research/pop/popest.htm>
[9] *Alaska Economic Trends*, June 2014, (page 7).
[10] 2015 Juneau Economic Plan, (page 11).

resident private sector workforce (38% of total employment)[11]. Low oil prices and reduced State tax revenues also are likely to reduce the number of stable government jobs in the Juneau, which in 2011 totaled 41.5% of the workforce, as shown in **Error! Reference source not found.** Because of the local multiplier effect, this is likely to affect other job sectors. Smaller job markets, such as leisure and hospitality, natural resources, mining, and seafood processing, may not be as heavily impacted.

Figure 4: Juneau Employment by Sector[12]



2.2.1 Population Projections 2012 to 2042 for the Juneau Borough

Population projections for Juneau over the next several decades indicate stable population levels well into the future, with nearer term population growth generally off-set by reductions. Population projections are based on the current population and historical trends in birth, death, and migration levels (see **Figure 5)**.

Figure 5: CBJ Population Forecast[13]

Year	2012	2017	2022	2027	2032	2037	2042
Population	32,832	33,419	33,839	34,045	34,042	33,879	33,617

[11] 2015 Juneau Economic Plan, (page 11).
[12] Source: The Alaska Department of Labor and Workforce Development, 2011
[13] Source: The Alaska Department of Labor and Workforce Development, 2014.

2.2.2 Housing[14]

According to the Juneau City Assessor, there were 12,774 housing units in 2012. Approximately half (49%) of these housing units are single-family homes, and nearly one-fifth (18%) are apartments. **Figure 6** provides a breakdown of housing by type.

Figure 6: Housing Profile – Juneau Assessors Data

Housing Unit Type	2012 Total Units	2012 %
Apartments	2,319	18
Multi-Unit Housing	1,500	12
Condos & Townhomes	1,216	10
Cabin or Mobile Home	1,372	11
Single Family Homes	6,367	50
Total	***12,774***	

Source: 2012 City & Borough of Juneau Housing Needs Assessment

In general, new construction activity is influenced by population growth. The modest growth projection for population suggests the residential stock will remain relatively stable. However, while projections show population growth being relatively flat over the next 25 years, there is currently an identified need for additional housing stock in Juneau[15]. Depending on the nature of the additional housing stock, while more energy efficient compared to older buildings, it could result in an overall increase in energy usage per capita. Larger houses will tend to be less energy efficient than smaller homes while detached housing tends to be less energy efficient than multi-family or common-wall dwellings.

2.2.3 Space Heating in Homes

To place the use of energy for space heating into context, a recent study of energy end use in Alaska estimated that 78% of household energy in communities in Climate Zone 6 (which includes Juneau) is used for space heating (**Figure 9**).

Nearly 70% of households use fuel oil for heating, and are supported by private delivery service (see **Figure 7**). A relatively high proportion (~25%) of households use electricity for home heating. This is likely because the low cost of hydro-powered electricity. Around 10% of households use heat source alternatives such as wood or propane.

[14] 2012 City & Borough of Juneau Housing Needs Assessment
[15] Draft Juneau Housing Action Plan, 2016.

Figure 7: Main Home Heating Fuel used by household

Fuel	2014 5 year census		AELP Electric Rate (2012)	
	Number of households	% of households	Number of households	% of households
Gas/Propane	*592*	*5*		
Fuel Oil	*7,859*	*65.1*		
Coal or Coke	*12*	*0.1*		
Wood	*404*	*3.3*	**9,996**	**72.4**
Solar energy	*0*	*0*		
Other fuel	*152*	*1.3*		
No fuel used	*72*	*0.6*		
Non-Electric	**9091**	**75.2**		
Electricity	**2,980**	**24.7**	***3,184***	***27.6***
Total	***12,801***		***13,810***	

Source: 2014 US Census American Community Survey 5 year estimates and Electric Utility data based on number of connections

New residential electrical connections per year by Juneau's electric utility provider are shown in **Figure 8**. The connections are separated by source of space heating and hot water provision each year. In recent years there has been an increase in the number of new connections where electricity is identified as the primary source of space heating[16]. This shift can be explained by:

a) A higher proportion of multi-family units being connected in recent years; typically these units use electric heat rather than a collective fuel oil boiler system[17].
b) Changes in energy price making electricity more competitive with fuel oil as a heat source.

[16] This data is derived from the residential tariff a dwelling signs up to when they are first connected by the utility provider (Rate 11 - electric heat and water, Rate 12 - electric water only, and Rate 13 - no electric heat or water).
[17] Personal Communication with Alec Mesdag, AELP 12/04/15.

An important caveat on using this data is that the counts identified by the electric utility may not fully describe the source(s) of heat in a residential housing unit. Home owners and landlords are not required to notify the utility when they make changes to their space heating source or hot water arrangement. Additionally, the three categories of residential customers all have the same electricity rate. Another challenge of understanding residential heating, is not knowing the size of dwellings using electric heat versus those using other fuel sources. Furthermore, it is not uncommon for homes to have more than one form of heating (e.g. Monitor/Toyo/Wood/Pellet stove). There is a recent trend in the use of air source heat pumps in Juneau[18] for all, or a portion, of home heating. There is no robust dataset to identify the heating source that is being replaced by these new installations.

Uncertainty in the data hinders projections of potential future electric energy demand if more of Juneau's dwellings use electricity for their space heating and hot water demands. While a precise figure of energy use for space heating is not possible, it is possible, using the 2010 emissions inventory, to reasonably estimate the current amount of energy required to fulfill all of Juneau's space heating needs.

SPOTLIGHT: INVESTING IN ENERGY EFFICIENCY

It has been shown that the cheapest method to provide additional energy is to reduce what is currently being used by making existing buildings and new buildings more energy efficient.

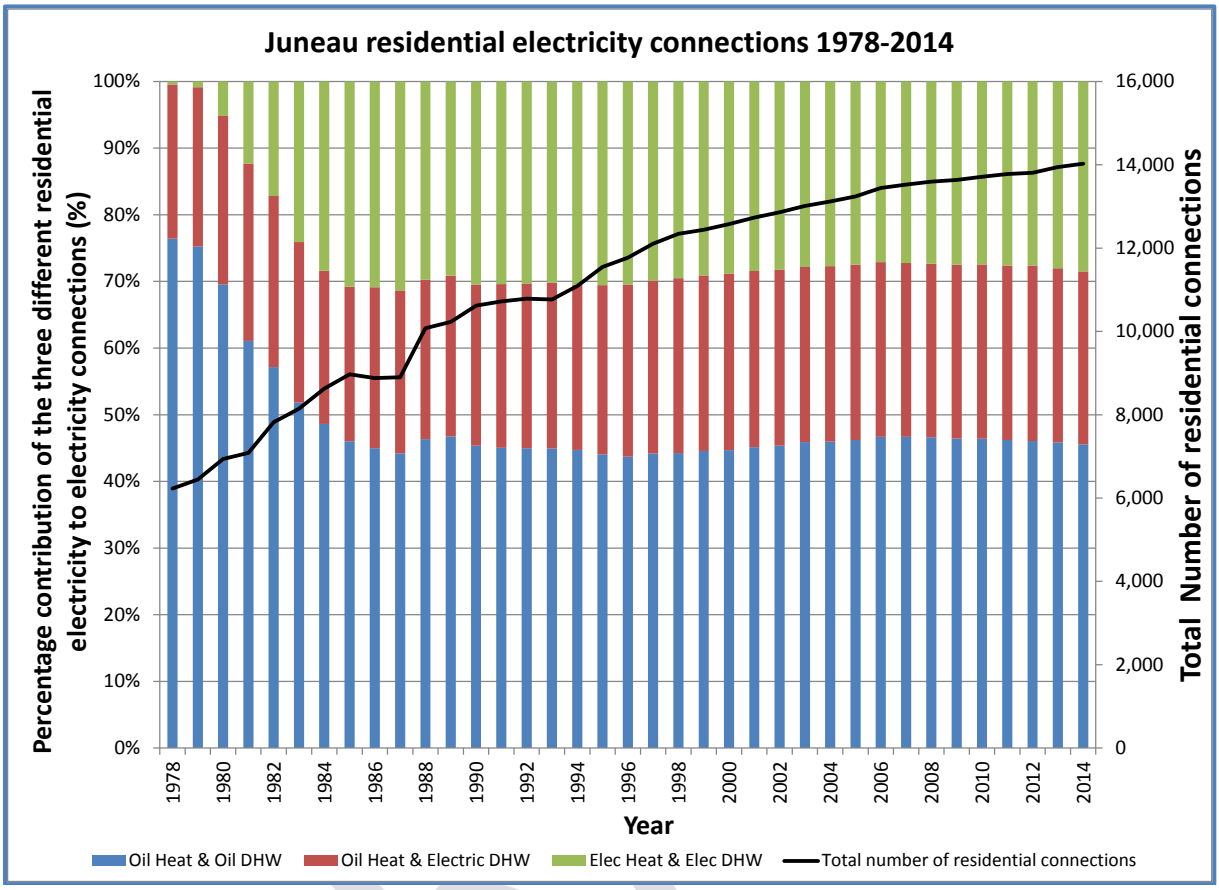
The Alaska Housing Finance Corporation (AHFC) provides a number of programs to encourage energy efficiency in homes. Alaska's Home Energy Rebate, the Weatherization, Energy Efficiency Loan Rate Reduction and Second Mortgages for Energy Conservation Programs are Alaska State funded programs that have provided funding or incentives in recent years to help home owners make their dwellings more energy-efficient or purchase homes which are more energy efficient. To date, 4.5% of Juneau's households have participated in efficiency upgrades. Compared with other participants in the state, Juneau's homes were typically older and smaller, reflecting historical settlement patterns; the average age of the participating home was 40 years, and average size 1,792 square feet.[19]

Administered by the AHFC, the Alaska Energy Efficiency Revolving Loan Program provides financing for permanent energy-efficient improvements to buildings owned by Regional Educational Attendance Areas, the University of Alaska, the State and local municipalities. Borrowers obtain an Investment Grade Audit as the basis for making cost-effective energy improvements, selecting from the list of energy efficiency measures identified. All of the improvements must be completed within a year of the loan being provided. The guaranteed savings from energy efficiency improvements are used to repay the loan.

[18] Juneau Empire Article 'Bringing LNG to the CBJ' Nov 1 2015; and Personal Communication with John Howard, Local Installer of Air Source Heat Pump Systems

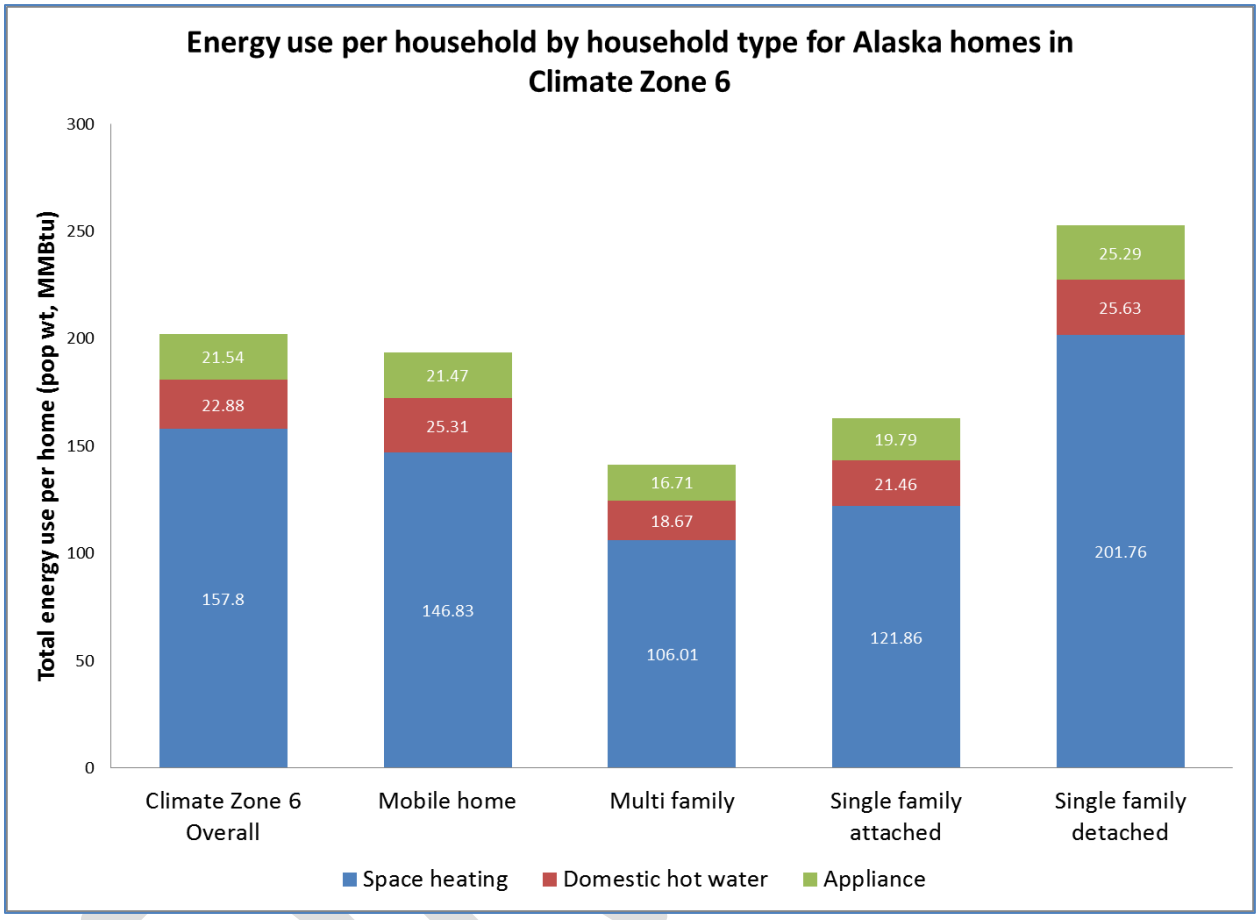
[19] 2012 *Snapshot: The Home Energy Rebate Program,* ISER.

Figure 8: Space Heating Fuel Trend



Source: Data from Electric Utility provider as reported to Regulatory Commission of Alaska

Figure 9: Estimate of energy used per household type



Source: Alaska Energy Authority, 'End of use study' 2012

2.2.4 Institutional and Commercial Buildings

As Alaska's Capital City, Juneau supports many State offices and the legislature when in session. The community is an important hub for government and regional services. Downtown Juneau has a compact core and cultural center featuring civic, historic, hospitality, and retail buildings. Commercial building and public facilities also serve the local community.

In 2010, Alaska's Legislature passed HB 306 establishing a statewide energy policy including the goal of "decreasing public building energy consumption through energy-efficient technologies. That year the State Legislature also passed SB 220 establishing a $250 million Energy Efficiency Revolving Loan Fund to help fund these retrofits. In 2011, Alaska Housing Finance Corporation used American Recovery and Reinvestment funds to conduct energy audits on 327 public facilities throughout Alaska.

Eighteen Juneau public facilities have had full audits[20]. Based on a 25 year lifecycle, potential monetary savings were identified that could be made by implementation of the energy efficiency measures highlighted (although fossil fuel energy prices used were higher than present). The overall savings to Investment Ratio (SIR) ranged from 1.9 to 9.6. More detailed audit information may be needed by CBJ to confirm these costs and savings. A number of these buildings, including many schools and the airport have been upgraded for greater efficiency.

SPOTLIGHT: CRUISE SHIPS

The cruise ships that visit Juneau primarily use diesel-electric propulsion systems. This uses an onboard diesel generator to produce electricity which is then stored in batteries for use by electric motors for propulsion and for on-board electricity. Requirements to meet local air quality emissions standards have been the greatest driver in designing cruise ships that accept shore side power instead of burning onboard fossil fuel to provide their own power. The construction of the Franklin Dock, owned by Princess Cruises, meant Juneau was one of the first ports in the US to provide shore side generated electricity to cruise ships.

In 2015, the city had 443 large cruise ships visit its docks. However, only some of these ships are able to receive shore side electric power (estimated to be 43% of all visiting large cruise ships[21]). The three other large cruise ships docks in Juneau do not currently provide shore side power. The CBJ cruise ship berths currently under construction will not provide shore side electricity, but designs have been explored so that shore side power infrastructure can be added at a later date. The variety of system voltages and location available for connections on the ships adds complexity to the design of necessary shore side infrastructure.

The provision of shore side electricity has a number of benefits to both cruise ships and local users but there are additional costs associated with installing necessary infrastructure improvements.

Additionally, the CBJ Land Use Code (49.35.800) requires a LEED standard for all new construction and renovation of CBJ buildings and facilities costing more than $5 million. [21]

[20] A White Paper on Energy Use in Alaska's Public Facilities, 2012. Individual audit reports can be found at http://www.akenergyefficiency.org/southeast_audits/[21] Figure provide by Juneau Hydropower

[21] Figure provide by Juneau Hydropower

2.2.5 Self-generating users

There are currently some industrial businesses that burn fossil fuels for their own electricity generation (as opposed to those that burn fossil fuel for heating purposes) because they are not connected to the Juneau electricity grid. Converting these operators to renewable energy would work towards Juneau's climate and energy goals. However, to provide them with electricity may require significant upgrades to the existing electricity distribution network. New large industries such as mining and seafood processing, as called for in the Juneau Economic Development Plan, could be used as 'anchor' users that result in additional generation capacity and infrastructure to unserved areas of the borough such as West Douglas and north of Lena Point.

SPOTLIGHT: MINES

Historically, Juneau's first hydroelectric sources were developed for the mining industry that established the city. The HECLA Greens Creek Mine (GCMC) is connected to the Juneau electricity distribution network via overhead and undersea transmission between West Juneau to the mine site on Admiralty Island. The undersea cable and overhead transmission on Admiralty Island are owned and operated by Kwaan Electric Transmission Intertie Cooperative (KWETICO), which receives a wheeling charge for the energy traveling through their transmission infrastructure to the mine. This extension is intended to one day connect to Hoonah. $13M of the funding of this project was provided by the Denali Commission. The connection to the Greens Creek mine was funded by a combination of federal funding provided to KWETICO and investments by AEL&P and GCMC. The HECLA mines used 72,559,050 KWh in 2015.

For example, the Kensington Mine (KGM) is located north of Juneau near the northern side of Berners Bay. This is outside the service boundary of the local electric utility. KGM is not connected to the Juneau electric grid. KGM currently generates all of its electricity using diesel generators. A connection to the mine has been proposed but requires permitting approval for construction. The cost to construct the connection is estimated between $22M – $30M. Additional local electricity generation capacity would be needed unless there was a significant reduction in the demand in Juneau. If a private power producer provided this electricity then the local electricity utility would receive revenues from 'wheeling' this power over their electricity grid and this additional revenue could be passed on to the utility's firm customers.

2.2.6 Transportation system

2.2.6.1 Local Ground Transportation

Juneau's downtown is compact and relatively walkable for the residents living there, and for the hundreds of thousands of tourists who arrive each summer by cruise ship. Beyond this core area development is more suburban in nature, and is primarily served by automobile, bus (including public school and transit services), and to some degree bicycle. Settlement extends from downtown Juneau north along the community's 40 mile long Glacier Highway, and also across Gastineau Channel on Douglas Island including the 11 mile long North Douglas Highway. A breakdown of population by neighborhood is presented in **Figure 10**. [22]

Figure 10: Juneau Population Distribution by neighborhood

Neighborhood	2014 Estimated population	Percentage of total estimated population (%)
Auke Bay/Lynn Canal	5,339	16.2
Mendenhall Valley	12,972	39.3
Lemon Creek/Salmon Creek	5,287	16.0
Downtown Juneau	3,658	11.1
Douglas Island	5,770	17.5
Total	***33,026***	

SPOTLIGHT: ELECTRIC VEHICLES

Juneau has a growing number of electric vehicles. In 2015 it was estimated there were 60-75 vehicles.[22] Additionally, a recent collaboration between the Juneau Community Foundation, CBJ, Juneau Hydropower, AELP, IBEW and other donors funded and installed 17 electric vehicle charging ports at 10 locations throughout Juneau. The limited length of the Juneau road system is particularly well suited to electric vehicles because the vehicle battery is unlikely to drain before reaching a charging point.

An experimental Electric Vehicle Rate has been provided to a limited number of electric vehicle owners in order to better understand the impacts on the electricity distribution network. In principle, electric vehicles are attractive since they are a relatively steady, predictable year round load on the electricity network.

[22] Juneau Economic Development Council, Renewable Energy Cluster Working Group; data provided by AK Department of Motor Vehicles. Vehicle registration data does not require a propulsion type to be indicated and so the number of vehicles is estimated from vehicle models. This approach will become less accurate in the future as plugin electric drivetrains are offered on more 'standard' vehicle models.

Source: ADOLWD, Trends Bulletin Feb 2015

The amount of fuel used in ground transportation is affected by fuel efficiency and by miles driven. Recent years have seen a modest increase in overall US fleet average[23] and model year fuel efficiency[24]. Nationally, there is expected to be some continued improvement in vehicle fuel efficiency into to the future[25]. More efficient, conventionally fueled vehicles, as well as advanced hybrid and all electric propulsion systems, are all creating improvements in average fleet emissions in the lower 48, particularly on the West Coast. Average vehicle mileage also strongly influences overall fuel use in the transportation sector. This in turn is influenced by the general economy in particular fuel prices. How national trends translate into the future Juneau fleet is unknown since the make-up of the general Juneau vehicle fleet may be very different from the rest of the US in terms of vehicle type (e.g. a greater percentage of trucks and 4WD vehicles), mileage and age. Currently there is little known about the composition of Juneau's vehicle fleet.

2.2.6.2 Other Transportation.

Juneau can only be accessed from outside by air and water. Long travel distances and supply lines add significantly to the energy footprint of the community. It is challenging to quantify Juneau's energy use and GHG emissions for air and water transportation because of the community's role as a transportation hub. For example, the 2010 energy use baseline in the Juneau Climate Action & Implementation Plan included all marine fuel sales based using quantifiable data from receipts. The data therefore only includes:

- Fishing boats that use Juneau as a home port, but that are likely to leave CBJ boundaries to access fisheries;
- Refueling vessels that are traveling up the coast, and only stopping temporarily in Juneau, including freight, recreational boaters, and large tourism cruise boats (although this is seldom necessary for the larger cruise ships); and
- Vessels that use Juneau as a main port for passenger and freight service, with regional service lines, such as the Alaska Marine Highway system.

Similarly, the Juneau International Airport is a regional and state hub for air travel. Only refueling events that occur in Juneau are captured by the 2010 emissions inventory. A total of 321,573 air passengers boarded or arrived in Juneau in 2013[26]. Ground operations at the airport are examined in the 2010 emissions inventory including energy used by the airport terminal. The municipality-owned airport facility has installed an innovative ground source heat pump system and LED runway and terminal lighting upgrades. Facility energy uses are considered within all City-owned buildings.

[23] http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_09.html
[24] http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_09.html
[25] https://www.eia.gov/todayinenergy/detail.cfm?id=16871
[26] Air Carrier Activity Information System

2.3 ENERGY PROFILE

To understand the future energy needs of Juneau it is important to understand the current supply and demand profile.

2.3.1 Electricity

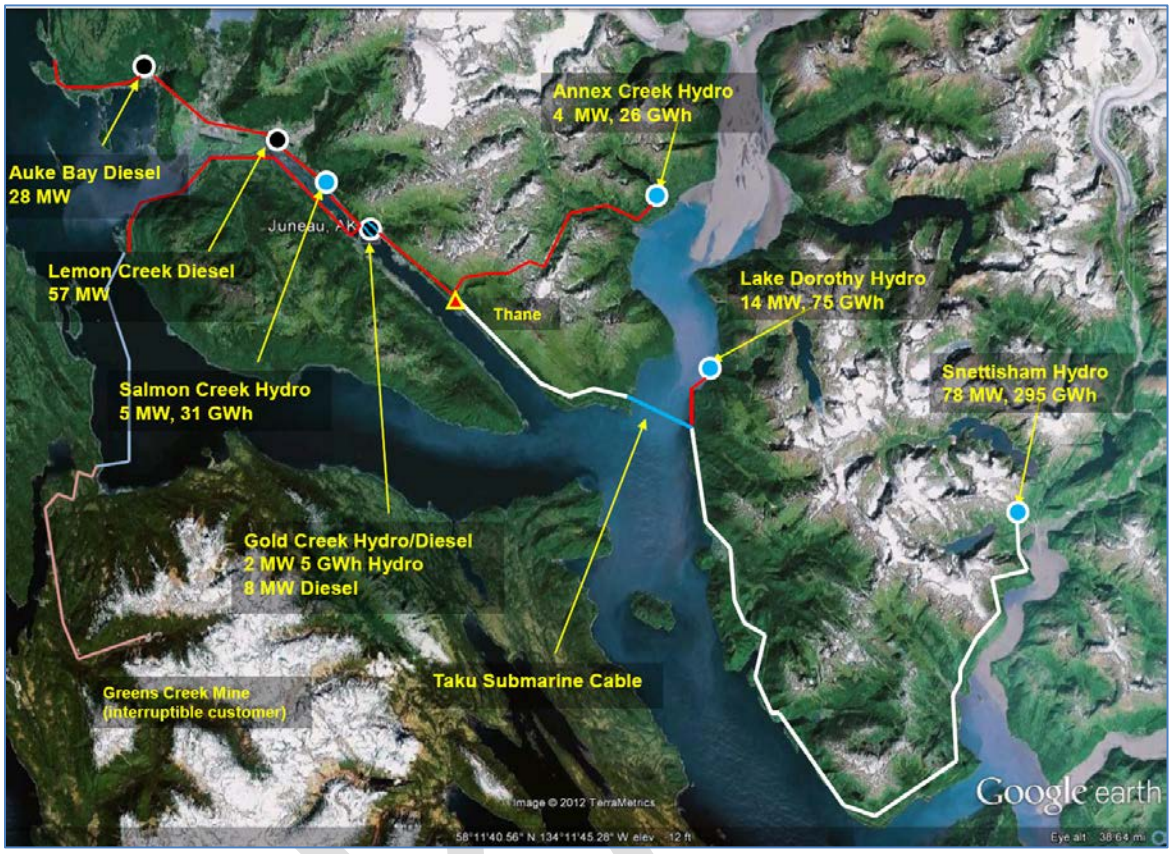
Hydroelectricity currently provides relatively low-cost electricity that meets around 25% of Juneau's energy needs but nearly 100% of electricity needs. Juneau benefits from some of Alaska's lowest electrical costs with a 2014 residential price of about 11 cents per kilowatt-hour. The community relies on five plants operated by Alaska Electric Light & Power (AEL&P), Juneau's privately owned utility (see **Figure 11**).

Figure 11: Hydroelectricity Generating Resources

Hydro Plant	% Power	Annual Average	Capacity	Distance from CBJ	Type	Built
Snettisham	70%	295 GWh	78.2 Mw	28 miles south	Lake-fed	1973/ 1990
Lake Dorothy	17%	75 GWh	14.3 Mw	15 miles south	Stair-step lake fed	2009
Salmon Creek	7%	31 GWh	5 Mw	3 miles northwest	Dam	1914
Annex Creek	5%	24 GWh	3.2 Mw	11 miles east	Lake-fed	1916
Gold Creek	1%	5 GWh	1.6 Mw	Downtown	Run-of-the-river (May–Sept.)	1914

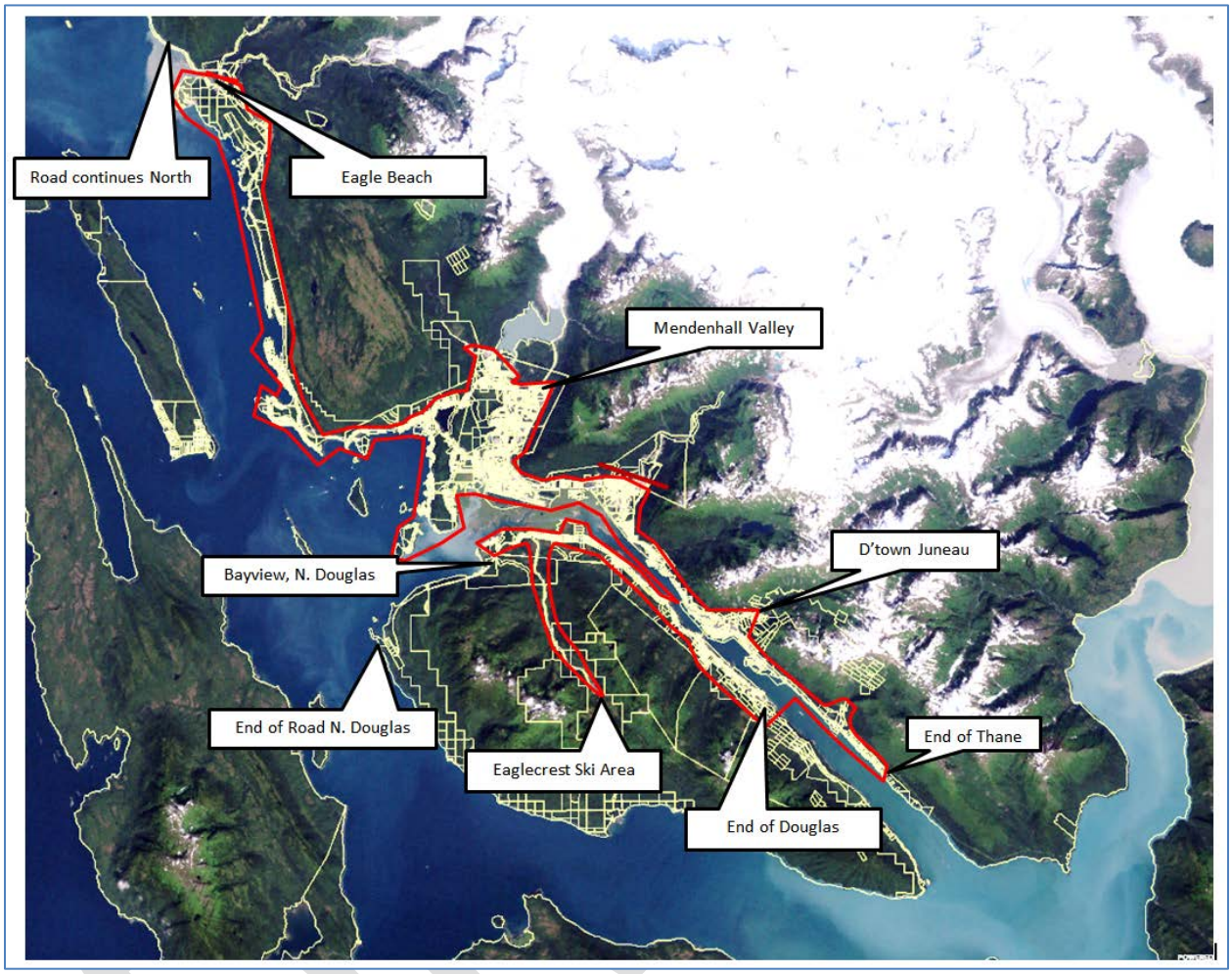
The approximate extent of electrical service provision is highlighted in the map below (**see Figure 13**).

Figure 12: Electricity Distribution Extent



Source: RCA U-14-120 May 15, 2015

Figure 13: Local Electric Utility Service Area Boundary



Additionally, there are recent efforts to extend the Juneau electrical grid to interconnect the Kensington Mine. The Lynn Canal Transmission Corporation[27], a local non-profit corporation has previously filed a certificate of convenience and necessity with the Regulatory Commission of Alaska for a high voltage transmission license to develop and operate the system[28]. This application was dismissed as incomplete. The company is free to resubmit another application future.

Transmission of electricity from remote locations has some risk involved. In 2008 and 2009 the main transmission line from the Snettisham Dam was brought down by avalanches leaving Juneau heavily reliant on back-up diesel generation. While the local utility has since

[27] Members are Alaska Power and Telephone, Juneau Hydropower and Coeur Alaska Kensington Mine
[28] Regulatory Commission of Alaska, Docket R-15-109

implemented significant mitigation efforts, strategic vulnerabilities remain, particularly on the main Snettisham transmission line that brings power to Juneau.

Regional interties have been proposed, both to deliver hydro-electric power to towns in South East Alaska and to export hydropower from the region. Connection with the Yukon Territory, Canada has also been promoted to aid energy security for Juneau in the event that transmission lines from resources south of Juneau fail. It has been argued that interties could also provide a larger demand base for new hydroelectricity projects thus making then instantly more economical. The concept of interties has been supported at the CBJ[29] and the State level.

Interties with other Southeast Alaska communities and the Yukon have been examined in a number of past studies with the most recent study being the Draft Southeast Integrated Resources Plan[30]. The study determined that the economics of constructing such an intertie were not favorable based on the information available. It argued that money would be better spent on other, more localized energy infrastructure improvements including the displacement of heating oil with biomass for space heating. Locally, the intertie would deliver little benefit to the local electric utility unless it provided access to a significant number of additional customers. The 2003 intertie study for Southeast Conference[31] (an umbrella organization for Southeast Alaska communities) was more positive, arguing it would provide a useful economic benefit to the entire Southeast region by providing cheap energy. However, the report also acknowledged that for the concept to be cost-effective the construction costs would have to be borne by grants which did not need to be paid back.

2.3.1.1 Juneau Hydro Supply and Demand

Existing electricity supply

All of Juneau's hydroelectricity is owned and/or operated by the local electricity utility (AEL&P). The Salmon Creek and Annex Creek hydroelectric plants were built in 1914-16 to provide electricity to gold mining operations in Juneau, and as these industries closed down, the electricity generated was available to the city. The Snettisham electric facility was constructed in two phases by the Federal Government - 1973 (Long Lake) and 1990 (Crater Lake). It was sold to the State of Alaska in 1998, with AEL&P responsible for maintenance and operation of the plant. AELP is also responsible for repayment of the bonds issued for its purchase. The bonds

[29] CBJ Resolution 1882, A resolution supporting a twenty year power grid plan for Southeast Alaska. August 18, 1997 and CBJ Resolution 2203, A resolution supporting the Southeast Alaska intertie project, April 14, 2003.

[30] Alaska Energy Authority, Draft Southeast Alaska Integrated Resource Plan, July 2012. *That this relatively comprehensive study remains a draft illustrates that not all parties interests and beliefs can be supported in energy studies that can only rely on the best available data and energy market forecasts to support the conclusions.*

[31] Southeast Alaska Intertie Study – Phase 2 Final Report; December 2003

are due to be paid off by 2034. It is unclear how repayment of the bonds will affect future electricity rates.

Gold Creek is a run-of-the-river facility, meaning its power output depends on the flow of the creek. Power production drops off almost completely in winter when the creek freezes though a warming climate may reduce these occurrences. Its contribution is not counted when the utility measures annual energy capacity. The current plant was built in 1914 and upgraded in the early 1950s.

Lake Dorothy Phase I is the latest hydroelectric project to be constructed and began providing power in 2009.

In general, the capacity from existing hydroelectric supply is largely governed by the ability to store sufficient water in the reservoirs throughout a year. Supply of water to the dam reservoirs is lowest during the winter months when much of the precipitation is held in the snow pack on the surrounding mountains.

Instantaneous hydroelectric supply from dams is 103MW and diesel generators can provide an additional 70MW. However, this maximum output cannot be supplied at all times or water would be drained from the dam at a greater rate than it would be replenished. When maximum is not required from the hydroelectric dams, water can be accumulated to reach full storage capacity again (mostly in summer months) and 'spilled' from the dam without generating electricity when storage capacity is exceeded.

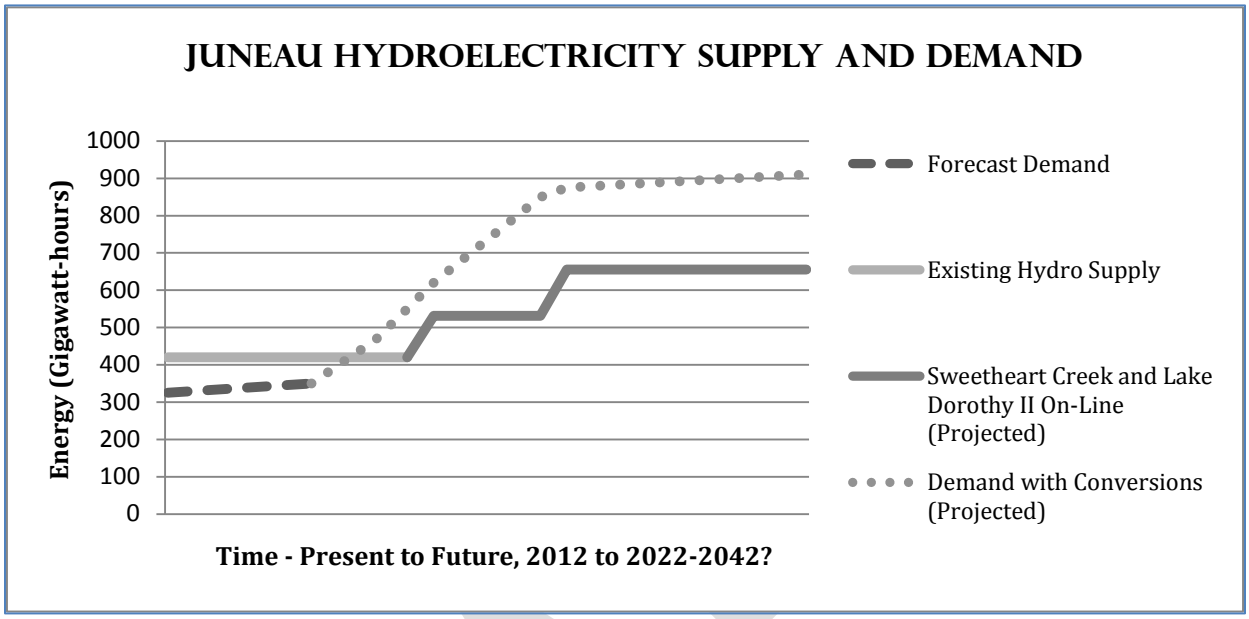
Annual demand and peak load demand

Demand on the electricity system can be considered in terms of **annual total** energy requirement in GWh, or by **instantaneous** energy requirement for electricity in terms of load on the system (MW). The **peak load** is the highest instantaneous demand seen in the year.

An illustration to forecast Juneau's annual hydro capacity compared to projected demand is presented in **Figure 14** – the timescale for this illustration would change depending on demand. Juneau's 2014 annual electrical energy consumption (including interruptible sales) was 399 GWh[32] and the current average annual hydro electric supply capacity is approximately 425 GWh[33]. Juneau's **peak load** is estimated to be 75MW (including interruptible customers) in any given year.

[32] AELP 2014 Sales and Distribution Report. RCA TA 433-1, February 12, 2015
[33] Gold Creek production is excluded as it is not available year round when creek freezes in the winter.

Figure 14: Juneau Electricity Supply and Demand Forecast[34]



Source: 2013 Juneau Comprehensive Plan

Future growth in demand from industrial activity, a trend of increasing use in the residential sector due to fuel switching, switching to electric vehicles and of moving existing non-firm customers to become firm customers suggests that additional electricity capacity will need to be added over the study period unless significant energy consumption reductions can be made.

The current electricity supply model has some customers who can be interrupted should electricity demand outstrip supply. These customers are referred to as 'non-firm' or 'interruptible' customers. The largest non-firm custormers are Green's Creek Mine and the Franklin Cruise Ship Dock. Some of the revenue generated from these sales goes to off-set the electricity rate of the customers who cannot be interrupted ('firm' customers) – homes and businesses in Juneau[35].

The future demand for electricity is unclear. The local electric utility has typically used a 1% annual increase in demand based upon historical trends although this trend is particularly sensitive to both electricity and fossil fuel prices. It also does not account for significant demand increases due to new mines, implementation of electric based district heating, connection of cruise ships and growth in electric vehicles.

[34] Source: *2013 Juneau Comprehensive Plan.*
[35] Combined, the 'non-firm' Greens Creek mine and Franklin Dock cruise ship power use is estimated to reduce Juneau rate payers bills by 20% - AELP communication March 10, 2016.

Supplying non-firm customers and potential demand such as the Kensington Mine (currently outside the AEL&P service area) could be considered as an unmet demand since they have to use much more expensive diesel generated electricity some or all of the time. If additional capacity were created that allowed current non-firm customers to be given guaranteed electricity supply then additional infrastructure would be necessary to connect them. This would have to be paid for by newly connected customers while upgrades to existing infrastructure to carry additional loads would need to be borne by the existing firm customers. However, if this additional capacity is provided by a private company this could be covered by a 'wheeling charge' for access to the transmission lines. Wheeling is the transmission of electricity by an entity that does not own or directly use the power it is transmitting. Alternatively, a private company may apply to build the new transmission line. This would need Regulatory Commission of Alaska (RCA) approval. [37]

SPOTLIGHT: REDUCING ELECTRICITY USE - LIGHTING

The U.S. Energy Information Administration (EIA) estimates that approximately 5% of household energy is dedicated to lighting. According to the EIA[36], the cost of LED lights will be about equal to the cost of incandescent and fluorescent bulbs by 2020, but will use only 1/10th or 1/5th the electricity respectively. They will also last for ~25 years. It is forecasted that 50% of lumen –hour sales will be fulfilled with LED lights by 2020. This will result in a 15% reduction in energy use for lighting by 2020 and 40% by 2030. The largest relative reductions are expected to come from the commercial and residential sectors.

The switch to LED runway lights at the Juneau International Airport caused a noticeable reduction in community electricity load when the lights were switched on and off.

CBJ is undertaking a systematic replacement of street lighting throughout the Borough. Some CBJ street lights are on a metered system while others are charged by the local Electricity utility based on estimated electricity usage per light fixture per year (non-metered). Nearly all metered lights in Juneau have now been converted to LED. Figures have not yet been collected to determine energy savings but at least a 50% reduction is expected. Switching to LED street lights also appears to have reduced maintenance costs.[37]

In 2016, the Downtown Marine Parking Garage upgraded the entire lighting system to a 'smart' LED system that provides significantly improved levels of illumination, enhancing security and reducing energy used by the facility by 90% (131,365KWH to 12,816KWH). Annual maintenance costs will also be reduced. The 'smart' element of the design uses sensors and timers to dim lighting during daylight hours and when no motion is detected during darkness hours.

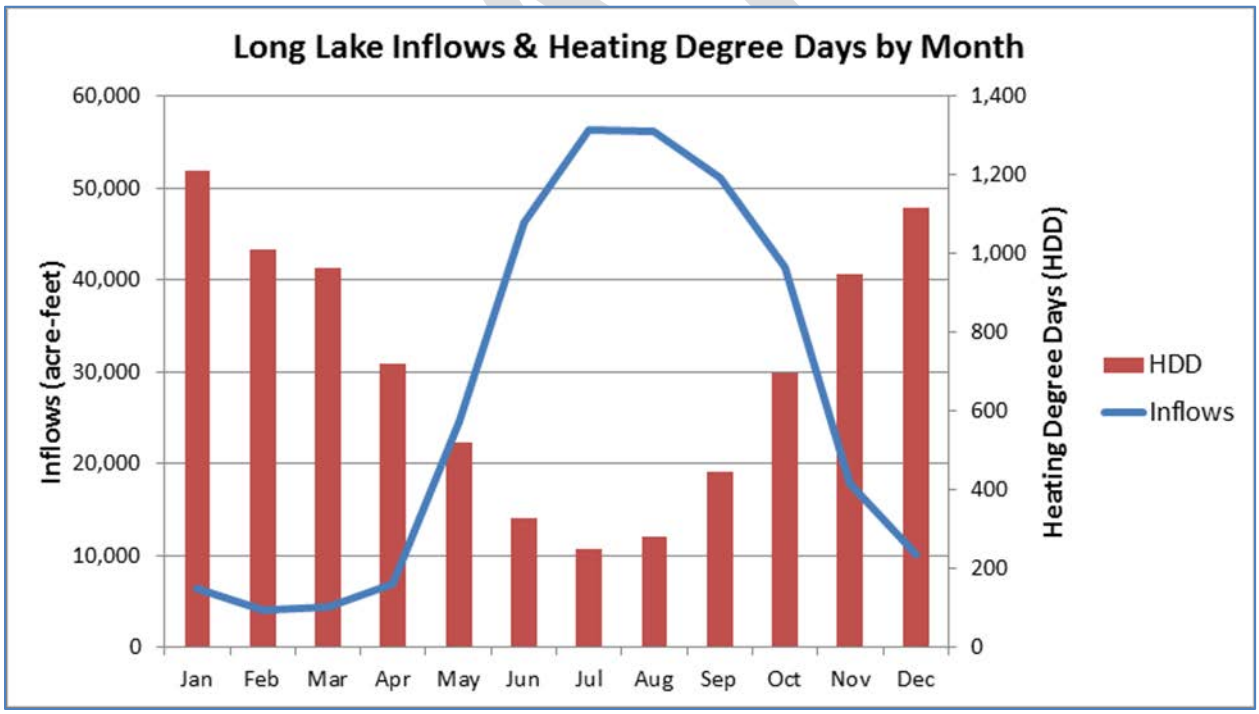
[36] U.S. Energy Information Administration, Annual Energy Outlook 2014 Early Release
[37] Personal Communication, Ed Foster, CBJ Streets Superintendent Jan 27 2016.

The annual balance of supply and demand

Electricity demand for light and space heating is highest during the winter due to darker days and colder temperatures. Supply of water at the reservoirs is lowest in the spring, when lake levels have fallen because of increased winter time loads and much of the precipitation remains held in the snow pack on the surrounding mountains. As the snow pack melts and runs into the resorvoir during the summer months, the available supply can exceed the relativly low demand. With the existing capacity, the electricity utility has to balance between selling electricity to non-firm customers with ensuring water levels are high enough to maintain reserves for the winter months. **Figure 15** shows the total monthly inflows to the reservoir the and the heating demand in Juneau.

A certain amount of generation capacity is reasonably guaranteed based on historic rainfall patterns and a relatively certain load demand. The supply of electricity to non-firm customers allows the local utility to make the most of circumstances in which they have excess water.

Figure 15: Example of mismatch of water inflows vs HDD (used to represent demand)



Source: AEL&P

Providing additional supply capacity while maintaining low electric rates - striking the balance

As summarized in the 2011 JCAP the community challenge is to: "Use its clean energy wisely in order to stretch existing hydroelectric capacity as far as possible, limiting the need to use back-up diesel generators."

Using the existing capacity more efficiently will delay the need for additional infrastructure and the associated costs to the community.

Timing the construction of new hydroelectric projects - Often, during discussions regarding Juneau's community greenhouse gas emissions, or at times of high oil prices, use of hydroelectricity is touted as the solution. At present there is not enough surplus electricity to handle a complete community level switch from fossil fuels to electricity. In addition to finding suitable locations for additional hydroelectric resources there are also community cost implications if additional hydroelectric capacity is built too large or too early. It may be more financially viable to use diesel generation if demand exceeds hydroelectric capacity for short periods only (e.g. during daily peak periods). While diesel is expensive to operate due to high fuel costs running it for short periods may be cheaper than a new hydroelectric source used for only short periods.

Hydroelectricity projects require a 5-10 year license preparation period prior to approval by relevant Government agencies so early recognition of deficiencies of energy supply is necessary. Some plans for additional hydroelectric capacity in Juneau are already being explored and are in various stages of the design and permitting process. Lake Dorothy Phase II project (80 GWh) will use the same transmission infrastructure as Lake Dorothy Phase I. However, the Lake Dorothy Phase I supply would be hindered by Lake Dorothy Phase II so the net increase in hydroelectric capacity will be less than 80 GWh. Additionally, a private company, Juneau Hydropower, is expected to receive its Federal Regulatory Commission license in summer 2016 for the Sweetheart Lake Hydroelectric Facility which proposes to add 116 GWh[38]. A second 'run-of the river' project has also been explored by AEL&P at Sheep Creek but the project is not currently being pursued.

The cost of new hydroelectricity projects - When new hydroelectric projects are constructed they often have large surpluses of energy as they are 'oversized' to account for future growth in energy demand and because topography surrounding lakes or dams lend themselves to being a particular size. The construction cost of the facility is fixed once completed and operation and maintenance can be well predicted. Therefore the total cost of the facility can be

[38] Sweetheart Lake Hydroelectric Project, Environmental Impact Statement P-13563, October 29, 2015. Federal Energy Regulatory Commission. *The company have stated that their project business strategy is to provide industrial hydropower to the Kensington Mine, cruise ships and provide other industrial users of power when AELP are unable to provide this power. The Sweetheart Lake Hydroelectric Project would also provide back-up power to the Juneau community.*

estimated as a fixed amount over a specified lifetime. The local electric utility is allowed to set its rates to pay for operation and maintenance costs and any costs related to new infrastructure and facilities – this rate is agreed with the RCA. Over the medium term, regardless of how much electricity is sold, the utility will be able to recover its costs. With this in mind, the total cost for construction of the new facility is recouped by selling electricity – the more electricity is sold the lower the cost per KWh for the consumer. However, the facility is actually selling electricity generated by water so in effect it is selling captured water. Any water that is captured but NOT used to generate electricity is potential revenue lost. It is in the consumer's interest for all captured water to be used. Often, large new loads are sought out to use as much of the surplus and share in the cost of the new facility. The ideal demand is is constant throughout the year, opposes the timing of the peak load (i.e. used at night time) and is guaranteed to exist for a long time. The charging of a mature electric vehicle market is a good example of this.

To match increases in demand, in addition to building new facilities, new capacity in the transmission and distribution network may be required. There are already some existing bottlenecks in Juneau's distribution system which, in some situations, may limit distribution capacity at various locations Juneau.[39] If Juneau were to see large growth in peak loads, upgrades to the distribution system would be required. The costs of these upgrades would likely be passed on to the customer.

The role of private energy suppliers - In addition to local electric utilities, private energy suppliers also exist. These suppliers are known as Qualifying Facilities (QFs) and have to be approved by Federal Energy Regulatory Commission (FERC). Juneau Hydropower recently received approval as a QF. In Alaska, local electric utilities are obligated to provide access to their transmission lines to allow transfer of electricity generated y by independent power producers. Transmission rates have to be approved by the Regulatory Commission of Alaska (RCA). The electric utility who owns the distribution infrastructure, with approval from RCA, can levy a 'wheeling charge' for use of their infrastructure.

A recent ruling by the RCA has added greater incentives for QFs since their electricity now has to be purchased by the local utility if it is cheaper than the utility's most expensive current or future supply. The rate that could be charged by these QFs would have to match the current or future "avoided" costs. In the case of the existing supply situation in Juneau, this would see a QF having to sell its electricity at a cost that was less than using diesel generators. It is important to note that the RCA would review the use of this alternative electricity source to ensure it would not cause overall rates to increase[40]. Previously the utility could use an average cost of all their current generating sources but now must use the federal standard of incremental avoided cost.

[39] Personal communication, Alec Mesdag, AEL&P, January 14 2016.
[40] Regulatory Commission of Alaska R-13-002 - In the Matter of the Petition Filed by ALASKA ENVIRONMENTAL POWER, LLC to Amend 3 AAC 50.750 – 3 AAC 50.820 Addressing Cogeneration and Small Power Production

2.3.1.2 Diesel Electricity Generation

In years with low rainfall, AELP disconnects interruptible (non-firm) customers, and if loads continue to outpace inflows, hydropower is supplemented with diesel generation. Other emergency situations, such as another avalanche, may require supplemental diesel generation. Use of diesel is more costly compared to existing hydroelectricity. The local electric utility has a mechanism that the RCA has approved, where the rate charged can incorporate any instances where diesel power is used. The availability of this back-up power generation solution is crucial to Juneau. In 2008 after avalanches interrupted hydropower and forced the use of diesel generation, electricity costs per KWh increased fivefold. The sudden price hike and impressive education and outreach effort reduced the community's daily electrical use by 25% from the same time in 2007[41].

Since this event , the Juneau community has expanded its dialogue around energy vulnerability. AELP has added new capacity (Lake Dorothy I hydroelectric facility), as well as developed a rigorous avalanche mitigation program, which includes active avalanche control, diversion structures, tower relocation, and other measures.

Until electricity capacity is significantly increased using diesel generators may be the most cost-effective method to provide the required electricity. There is point when it becomes more economical to build additional hydropower capacity than using diesel generated electricity.

2.3.2 Oil Heating Fuel

Approximately 80% of Juneau's energy is derived from petroleum products[42] which are shipped in by barge. This is mainly used to supply heat and transportation for Juneau's 33,026 residents[43].

It is estimated that the average Juneau home that is heated by fuel oil uses 780 gallons of heating fuel per year.[44] Based on a January 2016 local heating fuel oil price of $3.00 per gallon, this means the average Juneau home is spending $2340 per year on heating. As with many petroleum fuels the price of heating oil has been subject to significant variation over recent years. **Figure 16** shows the variability in heating oil, gasoline and electricity prices both locally and nationally since 1996. This chart highlights Juneau's vulnerability to external influences on its energy supply.

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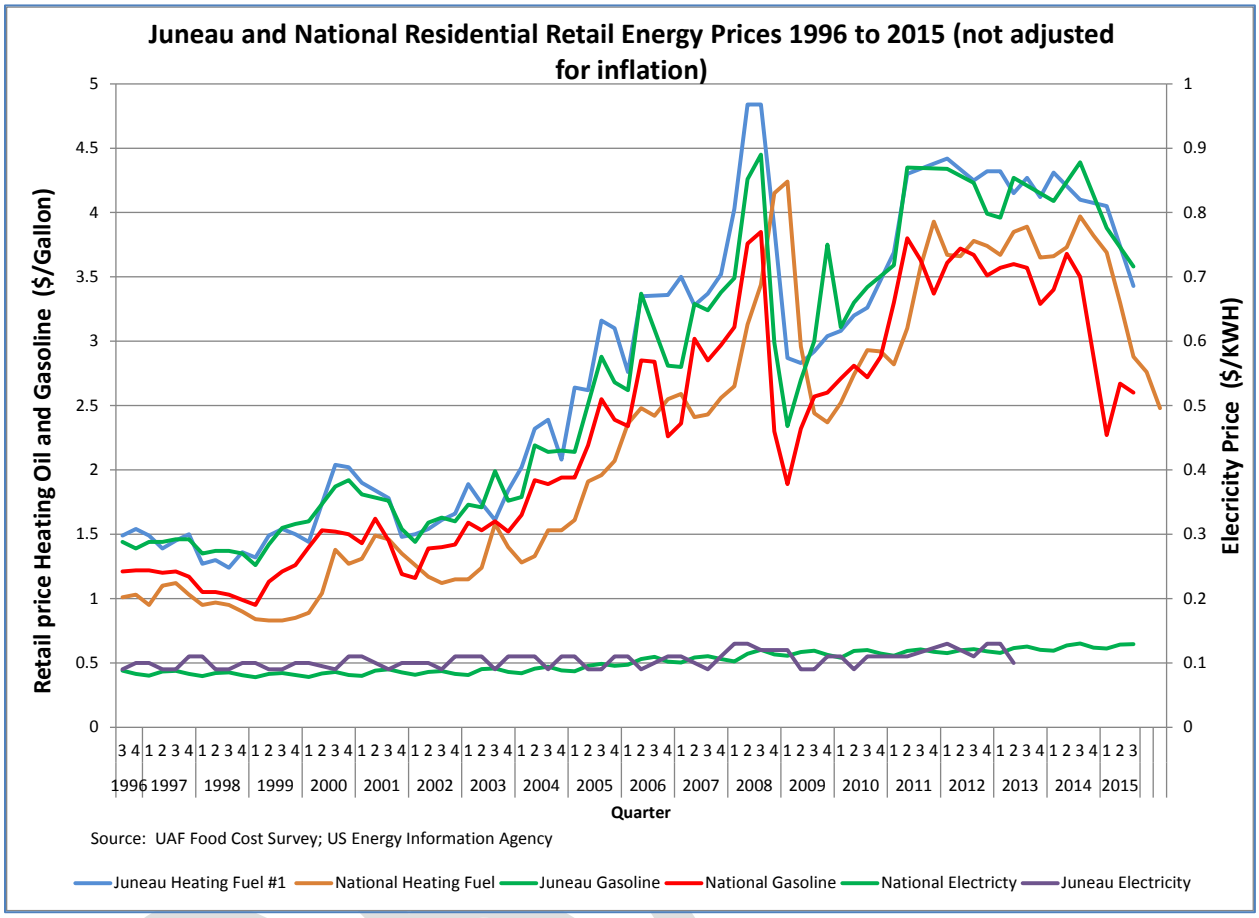
[41] Leighty and Meier 'Short-term electricity conservation in Juneau, Alaska: A study of household activities' Paper presented at 2010 ACEEE Summer Study on Energy Efficiency in Buildings. Data provided to author by AEL&P.

[42] http://www.juneau.org/sustainability/

[43] Source: *2013 Juneau Comprehensive Plan.*

[44] Assuming that the heating system is 78% efficient, a typical home uses 86 million/Btu per year. The amount of heating energy required by a home will depend on variables such as insulation, the size of the building, specific climate and many others. Juneau uses 9.5 million gallons of home heating fuel per Steve Colt, ISER, University of Anchorage that he based on census housing and other studies. This number was divided by 2010 US Census that Juneau had 12,187 households to determine that the average CBJ household heated by fuel oil consumes an average of 780 gallons of home heating fuel per year.

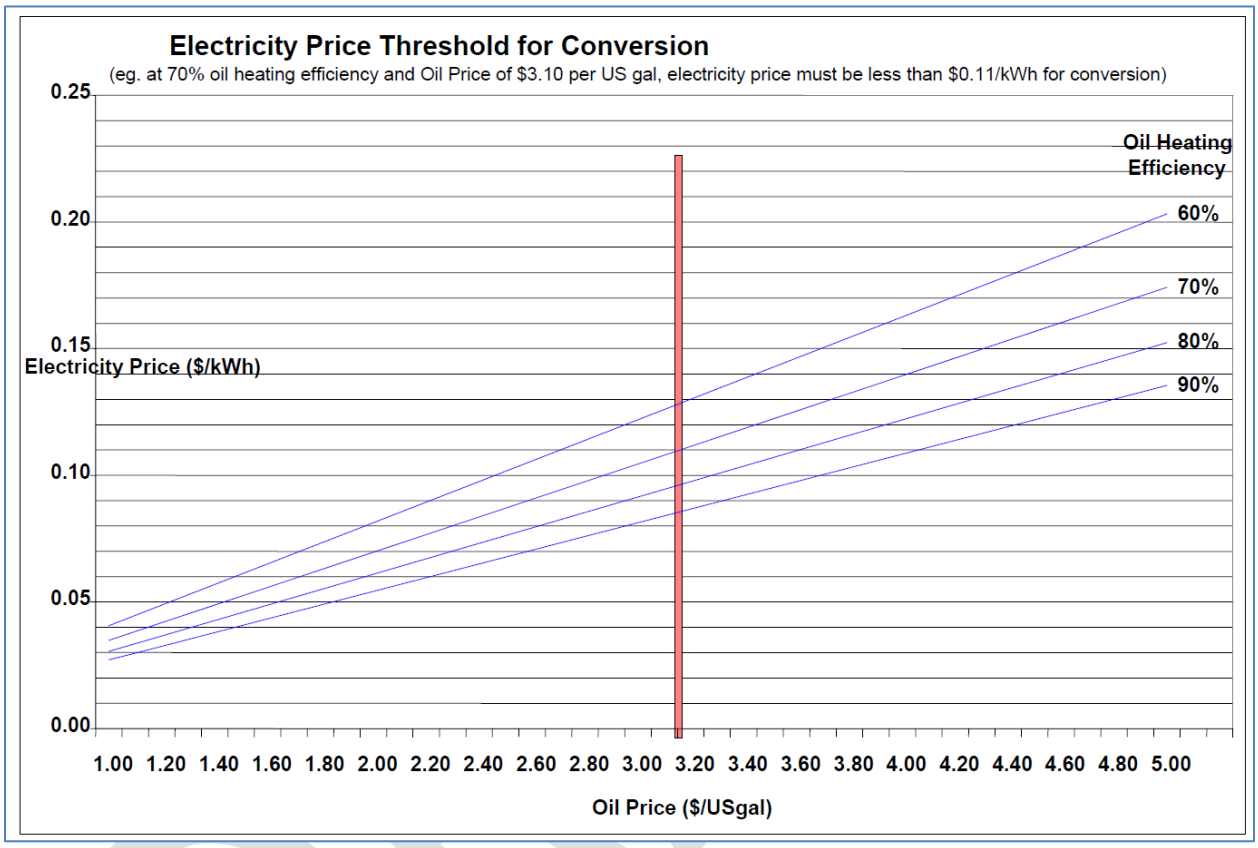
Figure 16: Trends in Fuel Pricing



SPOTLIGHT: ELECTRIC HEAT VERSUS FUEL OIL FOR SPACE HEATING

An example of this relationship is shown in **Figure 17**. This chart shows the breakeven point of using electricity for space heating over fuel oil. Some households with both electric and fuel oil space heating options can readily switch between the two fuel sources. Those households that only have one heating source are often committed to the incumbent heating source until prices are different enough, for long enough, to make a switch in their heating system financially worthwhile. Heat pumps, with more efficient use of electricity to provide heat, can move the relationship much more favorably to electricity (see Spotlight on Heat pumps).

Figure 17: Cost effectiveness of electricity versus Fuel Oil for Space Heat



Source: City of Sitka Electric Department

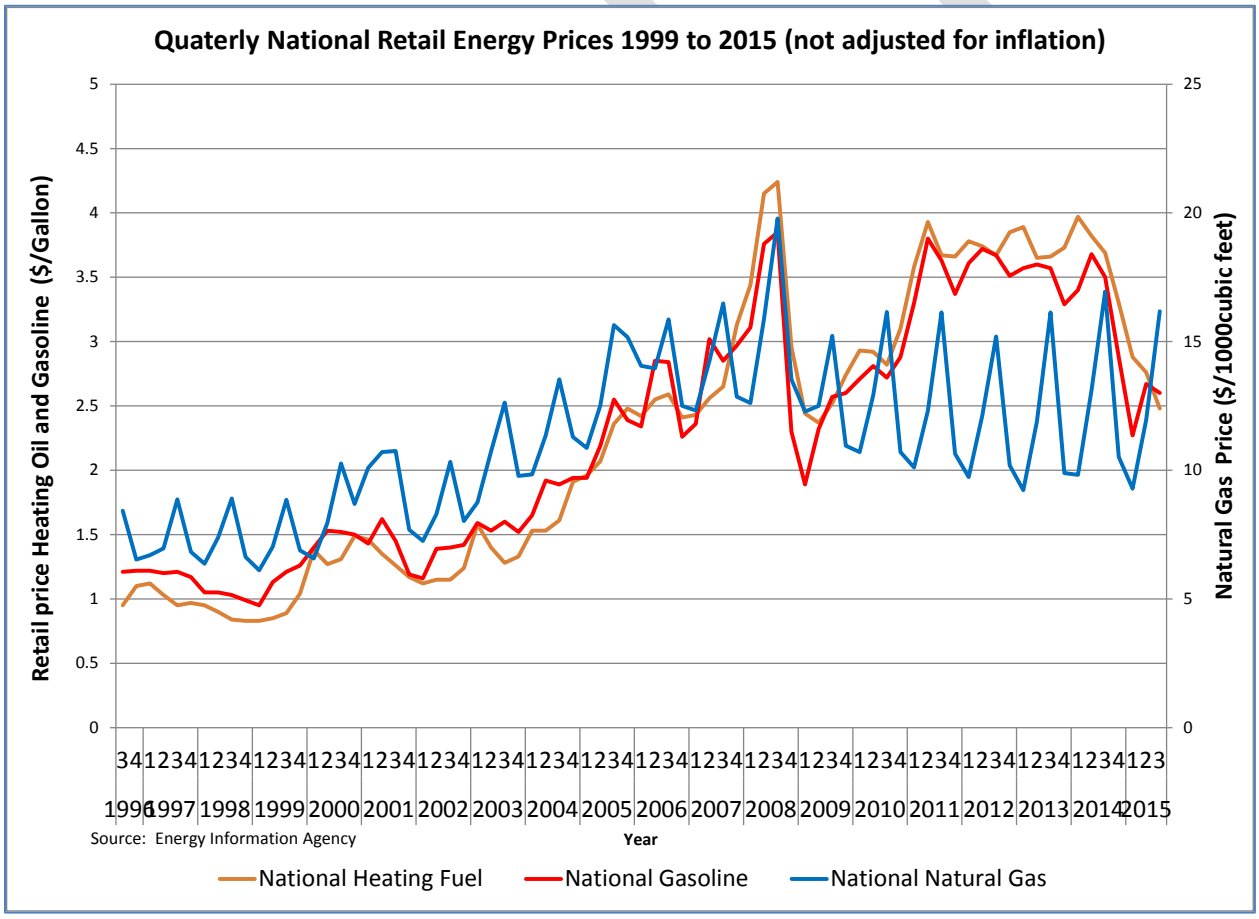
2.3.3 Natural Gas

Currently, there is no natural gas service or infrastructure in Juneau. Based on public announcements in 2015 by Avista (AEL&P's parent company), the potential for bringing natural gas to Juneau is being actively considered. The consideration is in the very early stages, and Avista would need to obtain a certificate of public convenience from the RCA. If this occurs, and the natural gas is offered at a competitive price, it could have an impact on the choice of fuel for heating buildings, residential and commercial cooking and other appliance use, possibly providing peak load and backup power for electricity generation. It is less likely to be used as fuel for light and heavy duty vehicles. Avista has stated that they may require State and local

public funds to help support customer conversions.[45] They are also looking for support for long term local tax exemptions to allow them to provide financial assistance for new installations with this cost being repaid through property tax abatement on the gas facility. Put another way, this approach would see CBJ subsidize conversions by forgoing any new property tax revenue generated from Avista's gas facility.

The piped natural gas will require significant permitting, investment, and construction activities, including a local plant to turn the liquid fuel back to gas. It will also require excavation of the Juneau road network for installation of distribution piping. The switching of heating systems would be most cost effective in buildings that currently use either air or hydronic heat distribution systems. Natural gas prices are subject to similar fluctuations in price as heating oil. **Figure 18** shows national residential consumer prices for natural gas.

Figure 18: Natural Gas Price

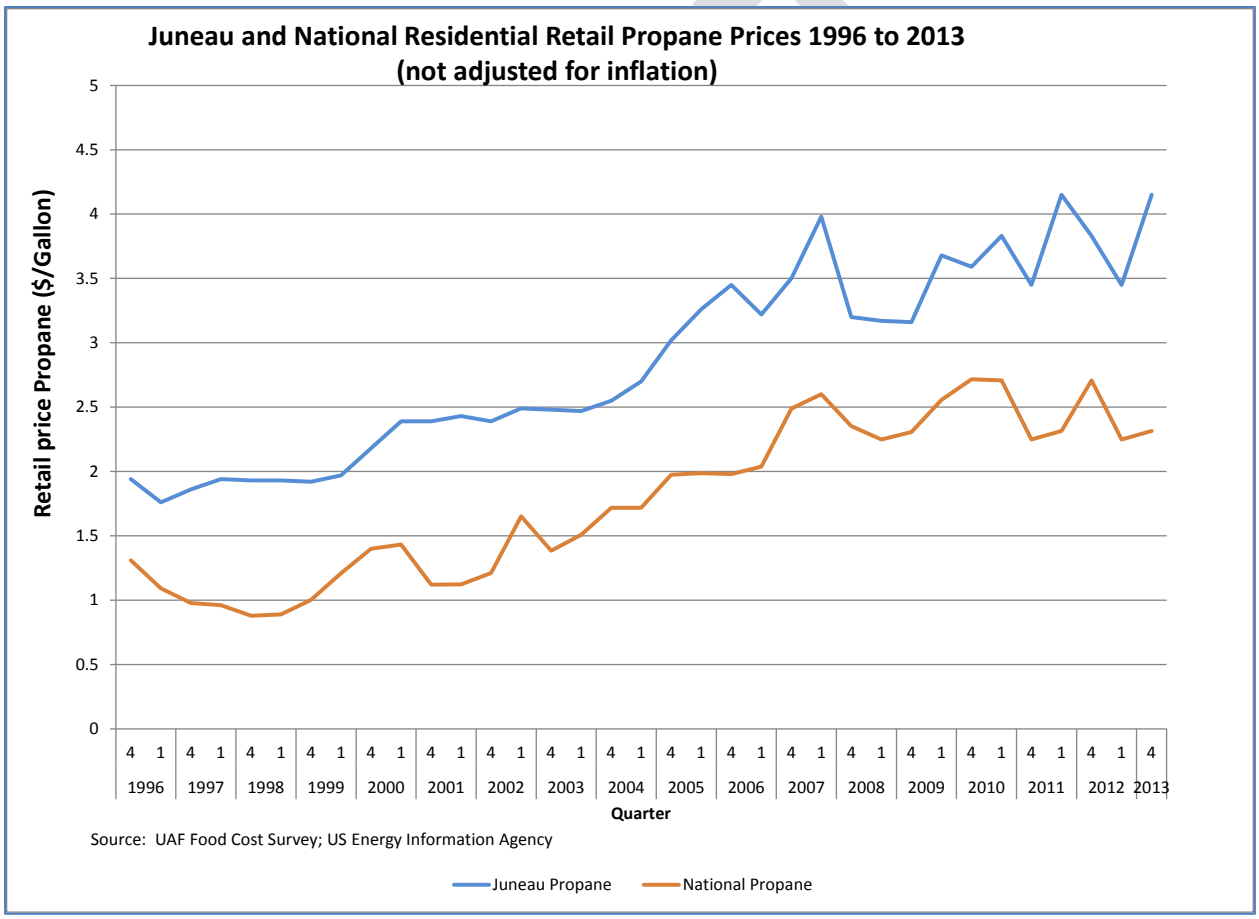


[45] Avista Q3 2015 earnings call transcript.

2.3.4 Propane

The 2010 Juneau emissions inventory estimated that propane has a 2% share of Juneau's energy market. With no piping infrastructure, the two current Juneau vendors deliver via tankers to tanks that are on the customer's properties. There are number of residences as well as commercial buildings and businesses that use propane. Propane boilers and stand-alone space heaters can be highly efficient. As with all Juneau fossil fuels, it is transported in bulk via the barge system which adds to the price a Juneau consumer would pay compared to the Lower 48. See **Figure 19**.

Figure 19: Propane Price



2.3.5 Biomass (including Wood)

Wood is estimated to provide approximately 3% of Juneau's energy. The use of wood is primarily related to the provision of space heating though more sophisticated systems are available that can also provide hot water. Woody biomass can be used for space heating as cord wood, wood chips or processed wood pellets. Wood pellets systems are most akin to fuel oil systems in terms of the minimal day to day involvement in its operation. Pellet stoves also produce the lowest smoke exhaust of the three options since they are able to use a more uniform fuel source compared to larger cord wood. This is important in the Mendenhall Valley where, in response to particulate air quality issues, there are times of the year where operation of wood stoves is banned[46]. Pellet stoves are exempt from this ban to reflect the cleaner smoke emitted by these systems. In residential situations, wood is often used as a secondary heat source for a specific room. Currently the nearest pellet production facility is in Ketchikan but much of the cord wood burnt is obtain locally. Like diesel and propane, pellets must be shipped in to Juneau by barge.

SPOTLIGHT: USE OF BIOMASS

A recent study funded by the Alaska Energy Authority (AEA)[47] advocated for a greater use of wood sourced pellets for space heating in Southeast Alaska specifically including Juneau.

One of the key drivers for the AEA study was to understand how Southeast communities can reduce their dependence on imported fuel oil and the associated price uncertainties. Another was to respond to concerns that some Southeast communities were reaching the limit of their hydroelectric resources. To deal with both concerns the AEA study notes that if fuel oil is to be replaced for space heating purposes, the use of wood pellets might be a preferred option over conversion to electric space heating since the latter has implications for electricity demand.

The study argues that it is important to reserve electricity for uses which have no viable alternative such as lighting and power of appliances. The use of electricity for replacing fuel oil space heating and water heating may require additional capacity to be provided unless significant electricity efficiency savings can be found from other uses.

Depending on the level of switching that occurs from fuel oil to wood heating and the ability of a local supply market to grow, it is possible that supply of the pellets may be required from outside of Southeast Alaska. This would again bring into play the influence of external market forces and shipping costs on the fuel price.

In Juneau, several of commercial buildings already use wood pellets for heating purposes including the Sealaska Building and Walter Soboleff Center.

[46] Ord. 2008-28 – An Ordinance amending the wood smoke control program regarding solid fuel-fired burning devices.

[47] Alaska Energy Authority, Draft Southeast Alaska Integrated Resource Plan, July 2012.

2.3.6 Transportation Fuels

The transportation sector is the largest energy consumer in Juneau. The 2010 emissions inventory showed it accounts for 43% of Juneau's total energy use. Juneau's transportation system is almost completely fuelled by gasoline or diesel although there are a growing number of electric vehicles in Juneau.

Gasoline and diesel prices have been subject to the same fluctuation in price as heating oil (see **Figure 16**). The use of electricity in the transportation sector is still small although local initiatives are in place to encourage its use. As with heating oil, there is an economic tipping point at which electricity is financially more attractive for vehicle use. Traditionally, electric alternatives are more expensive than the equivalent combustion engine vehicle but this difference is decreasing. It is expected to soon be reversing, as a result of vehicle manufacturers subsidizing the purchase cost of electric vehicles to meet fleet average emissions targets and the decrease of battery technology price. Technology in conventional internal combustion engines is also improving but these benefits do not always result in fleet fuel efficiency improvements if consumers choose heavier, higher powered vehicles.

Reducing demand for transportation fuels can be achieved with improved vehicle fuel efficiency and reduced mileage per passenger or ton of freight. The land use pattern is the biggest influence on travel demand since it determines how effective mass transit services can be and the ability of residents to walk/cycle to jobs/services/retail. Land use patterns are also the hardest to change since spatial pattern and densities have often already been determined and many years would be required for redevelopment of infrastructure configurations and buildings. Juneau's geography mandates a long linear community, making it even more challenging reduce transportation demand.

Demand management tools can encourage people to reduce their travel miles or to travel using carpools or public transit. These are often collections of incentives/disincentives regarding parking, transit provision, non-motorized infrastructure and teleworking. The use of electric transportation is growing in Juneau. According to the JEDC renewable energy cluster there are now over 50 electric vehicles.

2.4 RENEWABLE AND ALTERNATIVE ENERGY SUPPLY TECHNOLOGIES

There are a range of renewable energy technologies that provide space heat, domestic hot water, electricity, space cooling etc. Examples include

- Solar photovoltaic
- Tidal and wave energy
- Micro hydro and run of river
- Wind turbines
- Ground source and air source heat pumps
- Biomass

These technologies are technically feasible and depending on site specific factors, they may be more cost effective relative to conventional resources.

A recent summary of the cost of renewable based electricity is summarized in **Figure 20.** Based on this data, the cost of on-shore wind and utility scale solar photovoltaic- based electricity is cost competitive to current utility rates in Juneau. This information is general to the US and further analysis is required to estimate the costs and resource potential of renewable resources specific to Juneau since economic or climatic conditions which make it favorable in Lower 48 states may not exist. For example, although thought of as a windy city (e.g. Taku Winds) the variable weather of Juneau means the cost per kWh would be much higher than presented in **Figure 20**.

In addition, because of the highly green nature of the existing electricity supply there is no requirement for the local electric utility to provide for net metering[48]. Self-contained generation and use may still be cost-effective but storage is a limiting factor although as battery technology becomes cheaper this will cease to be an issue.

SPOTLIGHT: ALASKAN BREWING CO.

Most breweries sell the spent grain left over from brewing processes as cattle feed. But Juneau is a long way from such customers.

In 2013 the Alaskan Brewing Company completed the final stage of a process it calls "Beer Powered Beer," when it fired up its unique new steam boiler, fueled by the grain left over from the brewing process. The $1.8 million furnace turns a low value by-product into steam that powers much of the brewery's operations. The company is continuing to fine tune the boiler system, with a goal of saving approximately $450,000 annually and cutting the use of oil by 60%.

This is the latest in a series of steps the company has taken toward greater sustainability since 1995, when they installed a grain dryer, which allowed them to ship spent grain south for cattle feed. About half of this byproduct was used as a fuel source to heat the dryer itself, allowing them to burn grain effectively. In 2008, the brewery installed a $1.7 million mash filter press to produce a finer grain with less moisture, making it a better fuel source. This inspired them to invest in the boiler which would convert all of the waste to energy.

The value of a spent grain as a fuel versus its value just as a waste material goes from a net value of $30 per ton up to $350 per ton.

[48] Net metering is when the local electric utility purchases electricity from individual buildings as it is fed into the local distribution network.

Figure 20: Annualized, costs of delivered electricity (2013 U.S. $ per kWh-delivered)[49]

Resource	Levelized[50] Cost of Energy, 2013 [$/kWh]
Municipal Solid Waste	$0.24
On-shore Wind	$0.09
Off-shore wind	$0.16
PV Utility Scale	$0.09
PV Rooftop Scale	$0.13
Wave Power	$0.24

To put the above costs into context, two recent studies[51] have shown the levelized cost for energy efficiency measures to be ~$0.04/kWh. **Reducing energy use through efficiency measures is the cheapest form of additional electricity capacity.**

2.5 JUNEAU ENERGY BASELINE

This planning effort attempted to update the 2010 Emissions Inventory included in the Juneau Climate Action Plan. Despite significant efforts to collect the data from all vendors that had provided information in 2010, only one of the fossil fuel vendors provided information. 2013 electricity data is used to supplement the 2010 inventory.

It would appear vendors are much more guarded about releasing sales information even with guarantees the data would only be examined in an aggregate manner and no individual vendors would be identified. Without the ability to collect this data it will be nearly impossible track overall energy use and emissions in the community of Juneau. One possible alternative approach is for tracking through CBJ sales tax data.

A comparison of the community's total emissions and energy for 2007, 2010, and 2013, by source is presented in Table 2. In 2010 Juneau consumed 6.3 million MMBTU and released almost 397,000 $MTCO2_e$.

A breakdown of energy use by fuel and segment is presented in **Figure 22**, while **Figure 23** provides a breakdown by fuel. Transportation related energy consumption dominates the energy use pattern in Juneau, highlighting the significance of gasoline and diesel in Juneau's energy use patterns.

The 2010 Greenhouse Gas Emissions Inventory summarizes 2010 baseline information using Juneau's internal energy economy (energy consumed within the community's boundaries). This baseline excluded external energy consumption related to activities essential to the economy

[49] Ref Jacobson et Al, 100% clean and renewable wind water and sunlight all sector energy roadmaps for the 50 United States

[50] Levelized costs take into account the total energy saved/produced during the lifetime of the measure.

[51] Berkeley Lab Technical Brief ' The total cost of saving electricity through utility customer funded energy efficiency programs' April 2015, and American Council for Energy Efficient Economy 'The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs' March 2014.

and existence of the community such as barging of freight, some ferry travel and some air travel fuelling. [52] [53]

SPOTLIGHT: DISTRICT HEATING

The idea of a district heating system for the relatively dense Willoughby District and downtown Juneau has been a community discussion for some time. This could replace a significant portion of Juneau's total fuel oil consumption if the large buildings in the Willoughby area converted. Other areas in Juneau may also be appropriate. District heating systems can be supplied by an array of fuel sources from traditional fossil fuels, traditional renewable energy source and even geothermal or sea water heat pumps.[52] District heating depends on energy source for centralized distribution and could lower consumer costs.

Recently, Juneau District Heating (associated with Juneau Hydropower Inc.) has announced their intent to develop a seawater heat pump based district heating system for the Willoughby District. [53] The system would require permitting, construction of a central sea water pump and installation of a significant distribution network which will require excavation of some streets.

[52] Drammen, Norway is a coastal community with similar sea temperatures as Juneau that has been using sea water heat pumps as part of a district heating system since 2011.
[53] Juneau Empire Februaruy 13, 2016.

Figure 21: 2007, 2010 & 2013 Community Total Emissions and Energy, by Source

	2007		2010[54]		2013	
Source	**MMBtu**	**MTCO$_2$e**	**MMBtu**	**MTCO$_2$e**	**MMBtu**	**MTCO$_2$e**
Electricity	1,236,029	4,358	1,265,687	670	1,286,718	1,098
Petroleum	5,822,075	423,074	4,712,380	365,815	No Data	
Propane	63,800	4,032	107,293	6,652		
Wood	90,276	9,081	164,010	16,686		
Waste	0	8,194[55]	0	6,925		
Total	***7,212,180***	***436,999***	***6,249,370***	***396,748***		

[54] Some of the difference in the 2007 and 2010 figures can be attributed to changes made to emissions factors used in the two methodologies. These differences do not alter the general order of magnitude observed.

[55] This figure is based on a recalculation of the 2007 figure using the 2010 Emissions inventory methodology.

Figure 22: Energy Consumption by Fuel and Segment, 2010

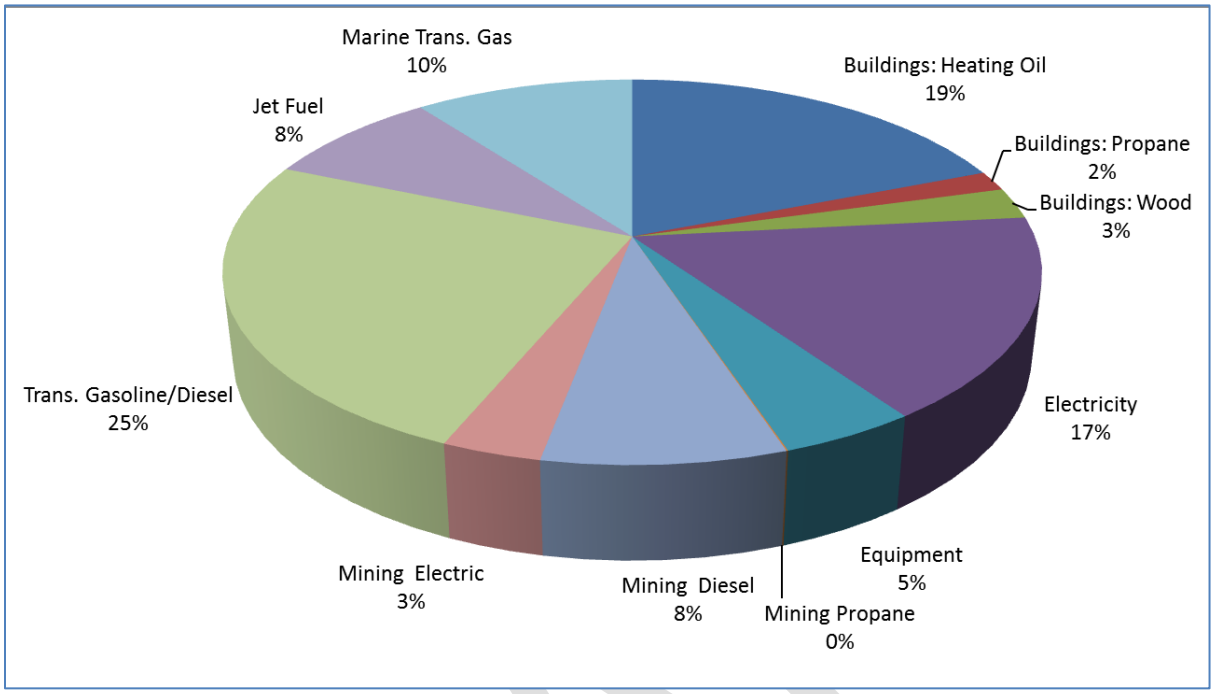
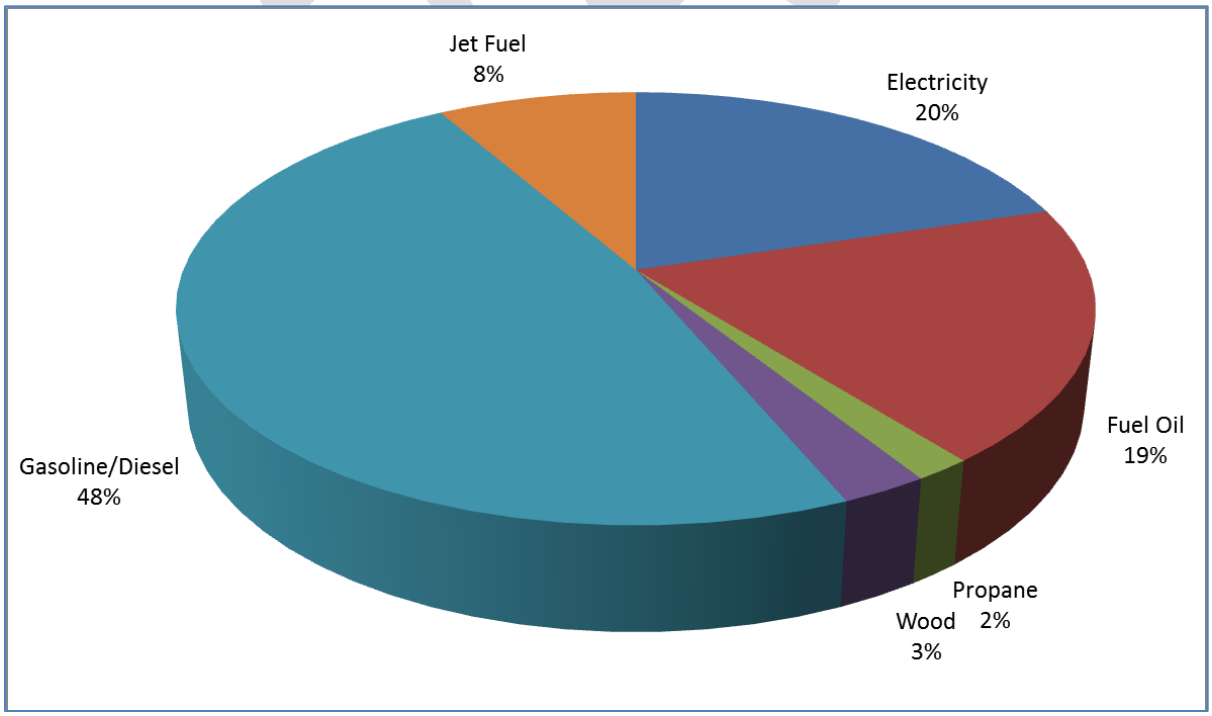


Figure 23: Energy Consumption by Fuel, 2010



2.5.1 Energy Expenditures

Energy expenditures were estimated for Juneau by combining 2010 energy consumption data with energy price data in **Figure 24**. It is estimated that Juneau spends over $181 million dollars per year on energy. Of this it is estimated that over $140 million per year leaves the community to pay for imported fuels.

In 2011, Juneau had the highest cost of living when compared to Fairbanks, Kodiak and Anchorage. Compared to the rest of the US, household expenditure on utilities was 163.7% of the national average. With electricity prices comparable to those in the lower 48, the use of petroleum fuel sources with its relatively high cost must be causing this (Anchorage's cost of utilities was slightly below the national average).

Figure 24: Energy Price by Fuel (January 2016)

Fuel	Price	
Electricity	$0.11/KWh[56]	$32.24/MMBtu
Heating Fuel Oil #1	$3.00/Gal[57]	$22.06/MMBtu
Propane	$3.03/Gal[58]	$33.18/MMBtu
Gasoline/Diesel	$3.23/Gal[59]	$28.81/MMBtu
Wood pellets	$294.75/ton[60]	$17.86/MMBtu
Jet A Fuel	$6.61/Gal[61]	~$51.60/MMBtu

[56] Electricity rate is seasonal to reflect demand and generation capacity (~$0.12/KWh in winter and ~$0.10/KWh in summer)
[57] Local heating fuel supplier, January 15 2016. Price for minimum purchase of 100 gallons.
[58] Local propane fuel supplier, January 15 2016. Price for minimum purchase of 50 gallons.
[59] Local gas station price, January 23 2016. Price per gallon of Regular Grade gasoline.
[60] Local pellet supplier, January 15 2016.
[61] Reported price for Juneau International AiportAirport, December 11 2015 (https://www.airnav.com/fuel/local.html)

3.0 WHERE ARE WE GOING?

3.1 BUSINESS AS USUAL (BAU) FORECAST

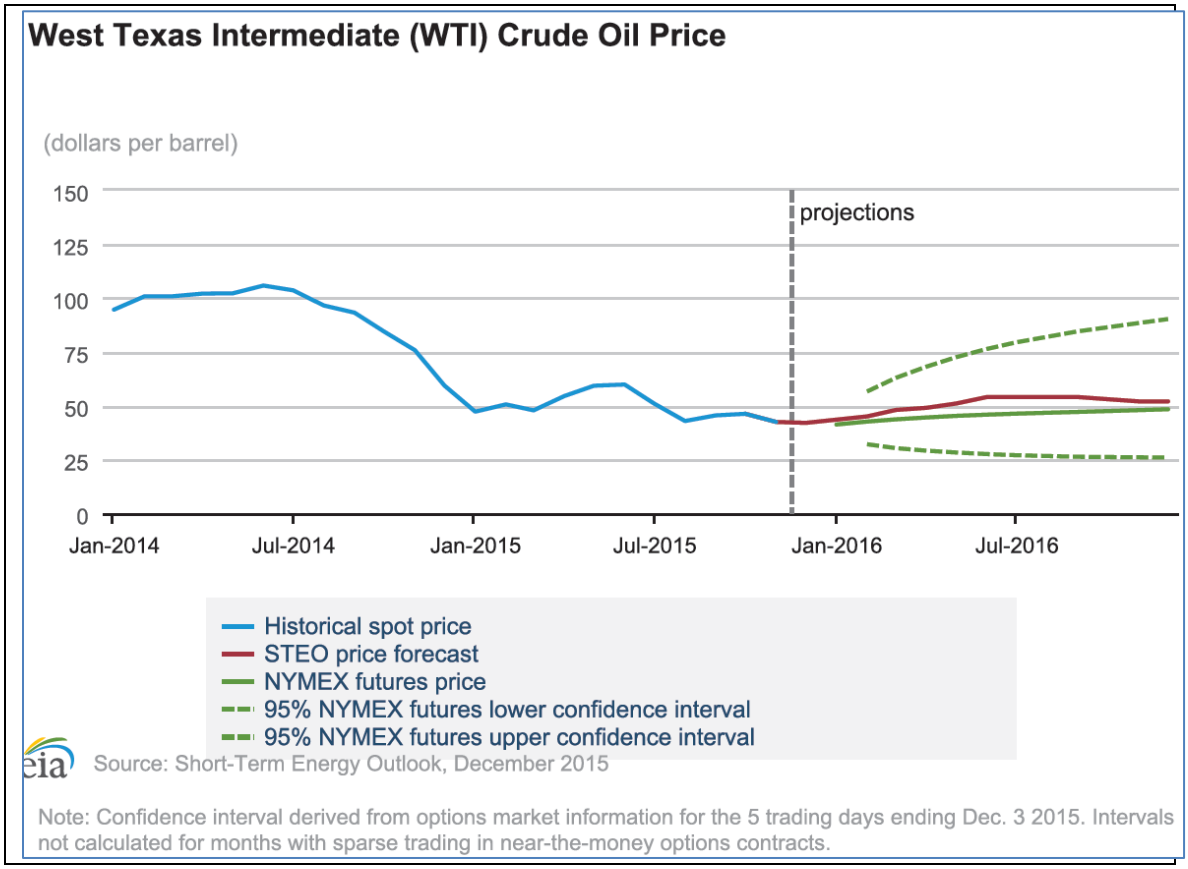
A 'business as usual' (BAU) forecast estimates energy use and GHG emissions in the City and Borough of Juneau to 2045. This analysis provides an outlook for community-wide energy use based on projected population growth, planned development and land-use patterns, expected technology advancements and anticipated legislation regarding energy efficiency. The forecast includes projections for total energy demand by energy type and provides an analysis of:

- Energy use by sector (e.g. residential, commercial, industrial, infrastructure)
- Anticipated loads by end-use (e.g. space heating / cooling, lighting, process / plug etc.)
- Anticipated loads by energy type (e.g. electricity, natural gas or other energy types)

The purpose of the Business as Usual forecast is to develop a reference case against which future scenarios can be compared. It presents the expected trend based on what has been observed in the past and estimates of how these trends may alter in the future. The vast range of influences on energy use, from energy prices to technology development, means the energy market is notoriously difficult to predict and expert agencies produce wide ranging forecasts to account for this (and even these can be wrong).

As an example the 2015 EIA forecast on future oil prices in 2016 is presented in **Figure 25.** This figure shows not only the forecast value but also an estimate of the region in which the actual price is expected to fall (the 95% confidence intervals). The range is relatively wide and this is only looking ahead to the next year which should offer more certainty. Long term forecasts have also been made by the US Energy Information Administration – the expected fuel price varies considerably based upon the global economic scenario.

Figure 25: Prediction of oil prices in 2016



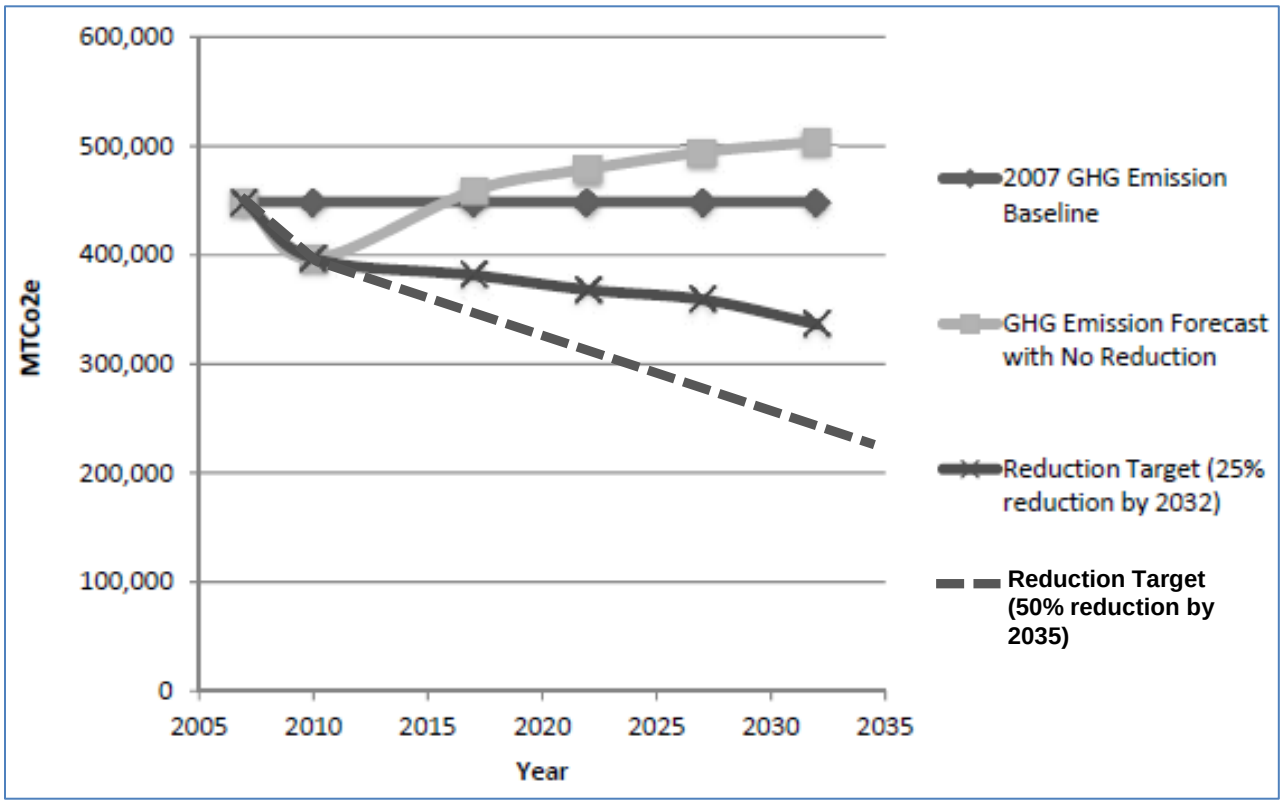
3.1.1 Assumptions

The Energy Plan Business As Usual forecast was developed as follows:

1. **Use the JCAP Business As Usual forecast by continuing the projected trend to 2045.** The JCAP forecast was based on 2010 'high' population growth forecast by ADOLWD (36,584 residents by 2032). The 2010 JCAP forecasts emissions to increase by ~25% between 2010 and 2032 (**see Figure 26**) – This trend was continued to 2045 and converted to energy equivalent. The latest 2014 population forecasts show less population growth (33,617 by 2042). A revised JCAP BAU based on the lower population growth would forecast lower emission growth and it follows energy consumption will also be lower – but the scale of energy use would be the same. The Energy Plan BAU has intentionally chosen to use the same growth rate as original JCAP forecast to allow assumed reductions from JCAP strategies to be transferred into the Energy Plan forecasts.

2. **Add further detail to the energy BAU, the total projected increase has been apportioned to different sectors and fuel types**. These growth rates are based on best estimates from the consultant team and were reviewed with JCOS. Approximated growth rates have been used that allow estimates for the potential reduction by fuel and segment that could result from the Priority Strategies discussed later in the document.

Figure 26: Juneau Community Emissions Forecast[62]



The Energy BAU forecast is presented in **Figure 29**. Energy consumption is forecast to increase from 6.2 million MMBtu in 2010 to 8.5 million MMBtu in 2045 representing a 35% increase in total energy consumption. Based on this forecast, the most significant growth is in transportation energy and electricity consumption in buildings.

[62] Source Juneau Climate Action & Implementation Plan Pg 18, 2011

4.0 WHERE DO WE WANT TO GO?

4.1 ENERGY PLAN VISION AND GOALS

Based on direction from JCOS, a central feature of this energy plan is that it builds off the Juneau Climate Action and Implementation Plan. As noted previously, the original vision of this plan was to:

"...identify and evaluate the technical and economic feasibility of renewable energy sources (including hydroelectric, biomass, solar, tidal, and wind) that will be available to meet the community's future needs. The Energy Plan will need to be flexible enough to respond to changing conditions and will need to examine the full range of renewable energy options and the relative costs. Completion of an Energy Plan would require input from other levels of government and the private sector."[63]

However, as the Energy Plan developed it became apparent that many of the goals, strategies and actions normally found in a Community Energy Plan are already included in the 2010 JCAP. A complete Community Energy Plan includes both the 2010 JCAP and this document.

The JCAP identifies goals, strategies and actions that should be used to reach the greenhouse gas emission targets established in the plan. However, the JCAP goal is outdated. The current best estimate is that at least a 50% reduction in fossil fuel use is needed in the next 20 years and 100% by 2050 if the worst effects of climate change are to be avoided. This implies a significant change in the Juneau energy economy, for example carbon taxes and other economic mechanisms. Given the strong linkage between energy and GHG emissions, this target and the impact of the individual strategies has been applied in this Energy Plan to provide a target for energy savings for Juneau.

4.2 TOWARDS ENERGY PROFILE FOR A 25% REDUCTION IN GHG

A GHG emissions target reduction of 25% of the 2007 value by 2035 was defined in the JCAP. This provided a documented target that received some degree of consensus by the community. It should be made clear that a 25% reduction in GHG does not necessarily require a comparable reduction in energy use but reduction in energy use is generally the cheapest way to achieve this.

[63] Juneau Climate Action and Implementation Plan Pg. v, Nov, 2011

When the actions recommended by the JCAP were reviewed it was apparent they were not being implemented quickly enough or as effectively as they could be to achieve the GHG targets. To be more effective in achieving the 25% GHG reduction CBJ must concentrate on a smaller number of initial actions.

4.2.1 Prioritized Strategies

Through the JCEP process a review and prioritization of relevant goals and actions that have already been identified by CBJ was undertaken. The priority strategies were developed through consultation with JCOS members. The list of two hundred actions in the JCAP was reviewed. An initial screening filtered out actions that did not directly impact reducing energy use/GHG production. Actions that passed through this screening were then rated against 5 other evaluation criteria (summarized in **Figure 27**). The prioritized goals and actions were then grouped into strategy areas. It should be noted that some actions impacted on more than one strategy area.

This plan reaffirms, and further prioritizes, goals and actions that have previously been adopted or supported by the CBJ Assembly through the JCAP. The key message is that they are not being implemented quickly enough to maximize their future benefits.

Figure 27: Energy Plan Priorities

Evaluation Criteria	Rationale
Direct Energy/GHG Savings	A primary objective for completing the energy plan was to reduce GHG emissions. Recognizing that the majority of GHG emissions in CBJ derive from consumption of fossil fuels, the connection between energy and GHG emissions is relatively direct.
Return on Investment	This evaluation criterion ensures that priority strategies are cost effective, in that the strategy reduces energy consumption, saves money, or both. This criterion provides a qualitative assessment of the economic feasibility of actions.
Reduced Vulnerability	JCOS members expressed a strong desire to increase the reliability of energy supply in CBJ. In particular the impact of price shocks from fuels imported into the community. If more local energy is used, the potential of service disruption should be minimized.
Significant energy savings	Reduced energy consumption achieved through demand side management activities was viewed to be a significant opportunity and priority of the plan.
Energy savings within reasonable timeframe	Making sure that energy savings or clean energy project provide tangible benefits in the near terms of energy and cost saving was generally endorsed.
Implemented by/with CBJ	Implementation involvement by or with CBJ was deemed to increase the potential for implementation, rather than waiting for private sector or state and federal levels of government to initiate the strategies.

JCOS participated in a work session to identify the priority strategies. A full list of the JCAP actions and their scoring is presented in **Appendix A** and a ranked list is given in **Appendix B**. The JCEP priority strategies, the relevant JCAP goals and their potential impact of the JCEP strategies is summarized in **Figure 28.** **The impact is estimated as a percentage of total 2045 community wide energy use.**

The estimated impact of the selected strategies was derived from the impacts proposed from the relevant JCAP goals. In total, the JCAP goals, if the actions were fully implemented, were expected to reduce GHG emissions by 25%. This would also achieve an approximately equal reduction in energy use (assuming additional energy was not created by renewables).

Because only a subset of actions identified in JCAP are being proposed in the Energy Plan priority strategies, the resulting impact would likely see an increase in energy consumption from 2010 levels but at a much lower rate than the BAU (see **Section 5.4** for more details of the estimated impact of the priority strategies). Drawing on this synergy, the same goals, together with their labelling have been used.

SPOTLIGHT: HEAT PUMP TECHNOLOGIES

CBJ is successfully using ground source heat pump technology at the Juneau Airport, Dimond Park Swimming Pool, Auke Bay School, and the Mendenhall Valley Public Library.

A simple explanation of a heat pump is that it takes low levels of residual heat in the air, ground or a water body and concentrates this heat using a combination of refrigerants that boil at low temperatures and compressors to output temperatures greater than the source. The effect is to produce more heat than would be produced from the electric energy used to operate the heat pump. This efficiency ratio is known as the Coefficient of Performance (COP). For example, a heat pump with a COP of 3.0 would deliver 3 kilowatt-hours of heat for every 1 kilowatt-hour of electricity consumed to run the heat pump. Efficiency of heat pumps varies due to many factors. For example, air source heat pump efficiency decreases as the outside air temperature gets colder (i.e. below freezing temperatures) until eventually a point is reached where they are no more efficient than standard resistance heating. Whether climate change effects will reduce the frequency of such events is unknown.

At a community level, electricity demand would be reduced when conventional electric heat is converted to a heat pump. This could help defer construction of electrical generation capacity. However, households switching from fuel oil heat would create an increase in demand for electricity, particularly creating impacts on peak load[64]. Additional electrical generation capacity would be needed if a large number of fuel oil heat systems were converted.

Air Source Heat Pump (ASHP) technology provides heat in Juneau for both commercial and residential buildings. For example, both the Foodland IGA center and the Tram Plaza building recently converted to air source heat pumps. A Juneau news article suggests that air source heat pump sales are increasing due to the energy savings that air source heat pumps can achieve.[65]

[64] Alaska Energy Authority 'Air Source Heat Pump Potential in Alaska', 2015
[65] Juneau Empire November 1, 2015

Figure 28: Priority Strategies, relevant JCAP Goals and estimated reduction on <u>total</u> Juneau energy use from 2045 scenario

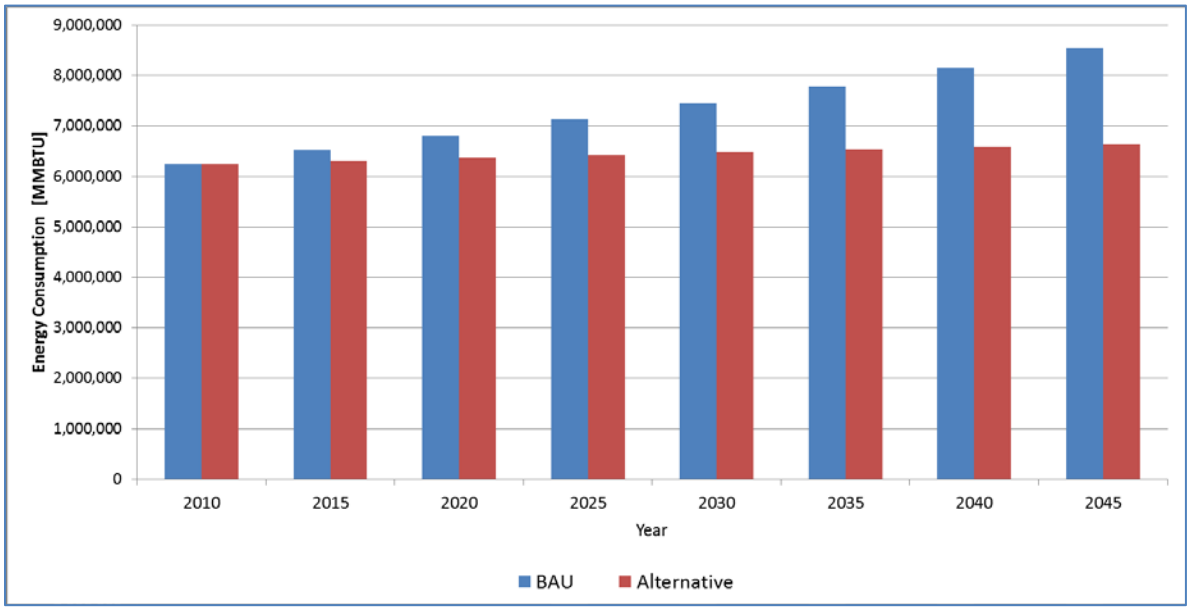
JCEP Priority Strategy and JCAP Goal	Estimated impact on 2045 scenario[66]
Support Energy efficiency measures for all buildings	~10%
• Goal B-2: Reduce energy consumption in, and GHG emissions produced by, state and federal buildings.	
• Goal B-3: Reduce energy consumption in, and GHG emissions produced by, commercial buildings.	
• Goal B-4: Reduce energy consumption in, and GHG emissions produced by, residential buildings.	
Increase use of electricity by cruise ships	~-1%[67]
• Goal T-6: Reduce emissions associated with marine transportation.	
Adopt energy efficiency best practices for the CBJ organization	~1%
• Goal B-1: Reduce energy consumption in, and GHG emission produced by, Borough government buildings.	
• Goal T-1: Reduce municipal fleet-related emissions.	
Explore and implement District heating for downtown core, and other suitable areas, preferably using renewable energy – *note the larger the district the larger the reduction in total community energy use in terms of heating input.*	~1%[68]
• Goal B-3: Reduce energy consumption in, and GHG emissions produced by, commercial buildings.	
Reduce dependence of transportation system on fossil fuels	~7%
• Goal T-2: Increase Capital Transit ridership.	
• Goal T-3: Reduce emissions per vehicle mile driven.	
• Goal T-4: Increase bicycle and pedestrian trips	
• Goal T-5: Reduce overall vehicle miles driven.	
Reduce space heating dependency on fossil fuels	~2%
• Goal B-3: Reduce energy consumption in, and GHG emissions produced by, commercial buildings.	
• Goal B-4: Reduce energy consumption in, and GHG emissions produced by, residential buildings.	
Enhance Land use regulations supporting energy efficient compact, mixed use developments	~2%
• Goal T-8: Reduce vehicle miles driven by increasing mixed-use development.	
Priority Strategy: Support electrification of mining operations using renewable energy	~2.5%[69]
• Goal MC-1: Decrease GHG emissions associated with mining operations.	
Total	***~25%***

[66] Assumes all additional electricity produced by hydroelectric sources
[67] Connecting cruise ships will actually increase electricity demand and is represented as a negative reduction. It is estimated from 2015 electricity use for cruise ships (~1.5% of all AEL&P electricity sales) for one dock (Franklin dock) and applied to an additional two docks.
[68] This is based on a pilot project scale implementation replacing 10% of Willoughby/downtown fuel oil use. The scale of the impact will depend on the size and number of buildings connected.
[69] Energy saved from switching from diesel to electricity which results in net savings because inefficiency in diesel generation compared to 100% efficient electricity at end user.

4.2.2 Impacts on Energy Baseline

Energy savings from implementation of the priority strategies was estimated by applying the energy savings of individual actions to the business as usual scenario. The reduction scenario depicted in **Figure 29.** This shows the business as usual forecast and impact of fully implementing the identified priority energy strategies. Based on the analysis, implementing the priority actions will result in energy use maintained at current levels and achieve a ~24% reduction in emissions compared to the projected BAU 2045 value. However, unless there is a shift in how some the energy is supplied, then the 2045 GHG emissions will be close to those identified in the 2007 emission inventory. The priority strategies will be a start but much more will still need to be done to deliver the target agreed to in the 2010 JCAP.

Figure 29: Energy Reduction scenario to 2045



4.3 BEYOND 2010 JCAP - 80% GHG REDUCTION SCENARIO

This scenario presents a more ambitious, longer term, choice. Under this scenario, Juneau would seek to reduce fossil fuel use 50% by 2035, and 80-100% by 2045. Juneau would lead Alaskan communities in creating a sustainable energy system. Replacing fossil fuels would reduce Juneau's vulnerability to changes in fossil fuel prices, keep dollars in the community, and create new economic development opportunities while balancing the impact of higher energy costs which may result. This scenario also recognizes the need to globally replace fossil fuel with renewable energy by mid-

century in order to reduce the risk of overshooting a 2 degree C (3.6 degrees F.) increase in global average temperature. Many US cities are adopting goals of reducing fossil fuel reliance by 80-100% by the year 2050[70].

4.3.1 Rationale

Juneau, like other Alaskan communities, is highly reliant on fossil fuels and vulnerable to price increases and supply interruptions. Fuel oil, diesel, and gasoline provide about 80% of our total "internal" energy, for heating buildings and local transportation. Additionally, we depend completely on fossil fuels for transportation of goods and people in and out of the community, including barge and ferry service, air transport, and cruise ship traffic, which are not included in the internal energy budget. This strong dependence makes Juneau vulnerable to price increases, including potential carbon taxes or regulatory mandates that may be imposed to reduce GHG emissions as has happened in other countries around the world.

Increasing energy conservation and efficiency can have substantial economic benefits. They can be the single best investment for low- and fixed-income households struggling to pay their utility bills although upfront costs can be discouraging. Further, investments in efficiency by some large customers could actually lower future rates for all customers on the system as it may delay the need to build expensive additional capacity. Conservation and efficiency increases can result in expansion of green collar jobs and careers, such as energy auditors, insulators, air sealers, heating and air conditioning mechanics, educators, carpenters, solar technicians and electricians just to name a few. Local engineers, architects, and planners may be encouraged to specialize in these fields.

Renewable resource development has economic benefits through the creation of jobs, and through import substitution, which can potentially keep more money in the local economy and create new economic opportunities. Further, locally developed resources keep energy revenue in the community.

Another benefit to the community of replacing fossil fuels would be improvements in local air quality. Cruise ship and bus emissions in the downtown area could be reduced, and Valley air quality during winter inversions could be improved.

Finally, this path would enable Juneau to do its part in helping to avoid the worst impacts of climate change. An increasing number of communities have adopted goals of 80-100% reduction in fossil fuel use by 2050. In the US these communities include places as diverse as Boston, Cleveland, Madison, Sacramento, and Portland.

[70] WWF/ICLEI, 2015 'Measuring up 2105: How US Cities are accelerating progress toward National climate goals'

4.3.2 Approach to achieving an 80% reduction

In order to achieve these reductions in fossil fuel use, Juneau would need to go significantly beyond the priority strategies identified in Scenario I, particularly increasing efficiencies in heating and transportation, and increasing the supply of local renewable energy.

Reduce energy use:

- Improve efficiency and conservation efforts - the most cost-effective routes to a renewable energy future.
- Incorporate energy efficiency and conservation into all CBJ programs. Reach out to learn from, encourage and coordinate with State and Federal agencies, as well as businesses, and homeowners.
- Reduce energy use in all buildings by 80 percent.
- Develop and re-develop to produce compact, walkable and bikeable neighborhoods.

Increase the use of renewable energy:

- Convert at least 80% of local transportation to electric vehicles.
- Replace at least 80% of the fossil fuel heating load in buildings through a combination of efficiency and renewable energy.

Increase the supply of renewable energy:

- Develop more hydropower.
- Support biomass heating.
- Develop waste to energy conversion.
- Encourage and support micro-power production. Monitor and share information on developments in wind, solar and micro-hydro power.

5.0 HOW WILL WE GET THERE?

5.1 ROLE OF CBJ

As a local government, the CBJ can use powers granted by legislation and within their mandate to help direct the future of the community to mobilize action on Energy. The City should work jointly with its partners and residents. Beyond its regulatory capabilities, CBJ is in a position to lead by example, through implementing energy efficiency actions within its own operations. Finally, in areas where CBJ has limited control but significant influence, CBJ can impact the uptake of the priority actions

In general, it is recommended that the CBJ act as the lead agency coordinating and monitoring the implementation of the Energy Plan and JCAP. While the Energy Plan identifies actions that fall within the City's authority, it also identifies actions that rely on partners to succeed. The City's role is to help coordinate various efforts and partners in the community around the issues and specific actions that fall outside of its mandate.

5.2 IMPLEMENTATION TOOLS

The tools available to the City to generate change can typically be characterized as:

- **Regulatory** – such as the 2013 Comprehensive Plan, zoning ordinances, parking management, etc., which establish policies and regulations that shape the actions of others, by setting parameters which support community objectives.
- **Incentive / Financing** – encourage a desired activity by compensation (financial) or by offering other incentives. .
- **Awareness / Outreach** – education and awareness building to foster an environment where a behavior change is possible.
- **Process / Investigative** – ongoing process for supporting and maintaining the plan and its implementation, as well as exploratory actions that require more study and investigation.

Policies and actions to reduce energy use take time to establish and even longer to take effect. CBJ will have to work towards the 2045 target through implementation of a range of strategies and policy tools across various sectors that are defined in the JCAP. Policy tools may include outreach, non-financial incentives, financial incentives, pricing and regulation. Depending on the policy tool selected, the cost of implementation and the potential for reducing emissions will vary. Generally speaking, both the cost of implementation and the potential for reducing energy use increase along the spectrum from outreach, to incentive, to regulation.

5.3 IMPLEMENTATION PLAN

For each of the strategies, a number of recommended actions have already been identified in the JCAP. Additional insight to implementing priority strategies was provided by JCOS and through follow up discussions with relevant parties. Each of these recommended actions are outlined below, indicating who would be responsible for leading implementation, the timeframe

and estimated internal budget costs (staff labor and direct expenses) and external costs (consulting fees). External costs do not include implementation. The costs and responsibilities for these actions should be reviewed annually as part of the detailed budget planning process.

While the recommended actions might change from time to time as more information becomes available, the strategies provide a more constant direction of what the City is working towards. It is therefore recommended that the strategies be used as the basis for reporting progress to the Assembly.

5.4 PROVIDE CBJ ENERGY MANAGER

While it may be possible for existing CBJ staff to support implementation of the priority strategies and associated actions, experience has taught us that progress is not being made quickly enough. As a result the key overarching recommendation is that CBJ dedicate resources to an Energy Manager whose sole focus is to directly implement, coordinate and participate in the implementation of the actions identified in this document and the JCAP.

The appointed Energy Manager will also be the key person responsible for monitoring and reporting on implementation progress of the priority strategies identified here and also those in JCAP. The annual reporting process is an opportunity to review progress on actions and to identify new action priorities for the upcoming year.

The Energy Manager would also:

- Undertake periodic energy use audits for CBJ facilities and operations
- Develop measureable energy goals for Juneau
- Assess cost-effectiveness of energy efficiency related improvements/upgrades
- Seek and win grants to support recommended actions, and potentially fund the position
- Bring together relevant CBJ divisions and organizations outside CBJ to implement recommended actions
- Promote energy conservation practices to CBJ employees
- Integrate energy and sustainability decisions into all CBJ operations

Together with savings identified (both immediate and future years) and grants won for CBJ, it is envisioned that this position would support itself although initial funding could use the CBJ energy fund to finance this position. Accordingly, the position could be for an initial two year period and reviewed annually thereafter. The Juneau School district is an excellent example of what can be achieved.

Figure 30: Priority Strategy Implementation Activities

#	Strategy	Responsibility	Timeframe to implement	Next Steps/Issues to be addressed
1	**Support energy efficiency measures for all buildings**	CBJ (CDD & Engineering), State	2 years	• Update building code for new construction • Explore policy options for retrofitting existing buildings • Convene working group to review commercial building Code • Develop case studies to demonstrate success stories • Explore funding of incentives using Federal and State resources • Leverage weatherization program to increase the number of retrofits in residential sector
2	**Increase use of electricity by cruise ships**	CBJ Docks and Harbors Local Electric Utilities, Cruise industry	1 year	• New dock has conduit, but no cabling connection infrastructure included • Clarify ownership and operation of electric infrastructure • Cost recovery opportunity through increased head tax to visitors • Concerns about current capacity of existing hydropower to service additional vessels in a cost effective way • Develop preliminary design and assess ownership and operational model.
3	**Adopt energy efficiency best practices for the CBJ organization**	CBJ	1 year	• Internally review and implement existing audits • Incorporate energy usage and efficiency at all levels of CBJ operations and decision making • Develop comprehensive energy accounting system to allow a complete picture of energy use. This should have the ability to calculate GHG emissions and be consistent with JCAP methodology. • Review procurement policies for equipment and assets to support energy efficiency • Conduct or review energy audits on all CBJ facilities • Implement recommendations with a 10 year or less payback • Apply for funding through the Energy Efficiency Revolving Loan Fund and pay the loan back through energy savings

4	**Explore and implement district heating for downtown core, and other suitable areas, preferably using renewable energy**	JEDC, Private and public entities	5 years	• Develop a business model is for a DH system. Identify economic advantages and disadvantages • Explore potential locations including Willoughby and state/federal buildings • Identify heat load and market size to determine economies of scale required to make a DH viable. • Assess the feasibility of using renewable energy resources • Develop a preliminary rate design for the system • Business model should include assessment of loads, service territory, distribution pipe network, analysis of energy options and plant setting, and analysis of ownership and operating models
5	**Reduce dependence of transportation system on fossil fuels**	CBJ, JEDC, Local Electric Utilities	10 years	• Explore active transportation and opportunities to support electric vehicles • Consider parking policies to support electric vehicles • Assess centralized fleets for CBJ including appropriate vehicle choice (including electric vehicles)
6	**Reduce space heating dependency on fossil fuels**	CBJ, Local Electric Utilities, Local Property Owners	5 years	• Assess technical and financial issues of electrification of space heat for residential market • Conduct a biomass study in CBJ • Assess building code options to support alternatives to fossil fuel space heat • Study impact of increased electrification on electricity system • Study the potential for the use (expansion) of air source heat pumps and/or biomass for CBJ and other government owned buildings.
7	**Enhance land use regulations supporting energy efficient, compact, mixed use developments**	CBJ	Ongoing	• The Comprehensive Plan has many recommended actions • Continue to implement recommended actions • Develop metrics to monitor progress and do so

8	**Support electrification of mining operations using renewable energy**	Local Electric Utilities, Local Mine Operations	5 years	• Work with mining industry, local utility and power producers to assess the cost, feasibility, development of transmission and generation required to achieve uninterruptible mine electrification

6.0 CONCLUSIONS AND NEXT STEPS

This energy plan provides a background on current energy use in Juneau and a discussion of the implications of choosing different approaches to satisfying the community's energy requirements with the hope that the public fully appreciate the implications of choosing one form of energy over another. The plan identifies prioritized actions that CBJ can directly implement which will deliver energy savings within the CBJ organization or facilitate community level solutions. The plan is designed to provide flexibility to respond to changing conditions while providing a platform to exploit energy conservation, and a range of renewable energy options.

Overall, the Energy Plan actions and recommendations are consistent with those that would be necessary to address the general aim of the 2010 Juneau Climate Action and Implementation Plan, in particular the reduction of Juneau's dependence on imported fossil fuels. The Energy Plan adds emphasis on the vulnerability of the community given its heavy reliance on fuels that are imported and are subject to external forces on supply price. However, using hydro-electricity to replace existing fossil fuels has a number of implications for electricity availability and costs, with new generation infrastructure almost certainly required. Alternative means to providing energy for uses such as space heating should be explored although this is not to say electricity should not be considered. A big question that we must consider over the coming year is: Is it better to have a diverse range of energy sources or to have a single, dominant energy source?

CBJ can undertake a number of actions within its own organization to deliver significant energy savings. It is expected there are many situations where aggressively pursuing the actions now will deliver greater lifecycle savings.

Pursuing priority strategies identified in this plan will provide changes in Juneau's energy profile that either represent best value, are most enduring or quickest to achieve the desired benefits (hopefully all three of these). However, Juneau must go much further to deliver the savings identified in the 2010 JCAP and further still to achieve the proposed 80% reduction target in 2045.

Implementation of this plan will require commitment and investment by CBJ, although resulting energy savings could offset this upfront investment. Providing an energy manager tasked with implementing with the priority strategies is an overarching, and all encompassing, recommendation.

APPENDICES

Appendix A : JCAP GOALS, STRATEGIES AND ACTIONS

The JCEP also presents community emission reduction targets for 2032, with detailed goals and strategies by sector:

Sector	2010 Emissions	2032 Reduction Target	Goals and Strategies	2015 Progress:	Direct Energy /GHG Savings	Return on Investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings vs timeframe	Score
Building	**112,000 MTCO2e**	**46,000 MTCO2e**	**pages 27 - 35**								
Goal B-1: Reduce energy consumption in, and GHG emission produced by, Borough government buildings. *Estimate: 30% emission reduction for CBJ buildings; potential GHG reduction 2,000 MTCO2e.*											
Strategy B1-A. Set energy efficiency standards for all new local government buildings, leased space, and equipment.											
Short-Term Actions			**Responsible Party**								
Set energy efficiency standards for all new local government buildings. Use specific standards that exceed the minimum baselines of such standards as the American Society of Heating, Refrigeration and Air-Conditioning Engineers Energy Efficiency Standard (ASHRAE 90.1 or 90.2), for example, the 10 BTUs per square foot of heated floor area standard. New buildings should aim to achieve a 50% reduction in energy use per square foot compared to existing buildings. GHG emissions abatement and energy efficiency need to be incorporated into the early stages of building design.			CBJ		Y	Y	N	N	Y	N	**3**
Establish a policy that sets minimum energy efficiency standards for space leased by local government. The base standard could be set at 10 BTUs per square foot of heated floor area.			CBJ		Y	N	N	N	Y	Y	**3**
Establish a policy that requires equipment purchased or leased by local government to meet specified energy efficiency standards, such as Energy Star.			CBJ		Y	Y	N	N	Y	Y	**4**
When new construction or upgrades are completed, commission the systems to ensure they are working at maximum efficiency.			CBJ		Y	Y	N	N	Y	Y	**4**
Adopt a policy requiring that all new CBJ government buildings undergo a life cycle analysis and that this information be used to make decisions about energy efficiency and alternative systems.			CBJ		Y	Y	N	N	Y	N	**3**
Strategy B1-B. Reduce energy consumed in and GHG emissions produced by local government buildings.											
Short-Term Actions			**Responsible Party**	2015							

Over the next two years, conduct energy audits on 75% of CBJ buildings (including schools and the hospital). AHFC is currently offering a program that will fund the audits in exchange for providing building data as part of their benchmarking efforts. Audits should be completed on "worst energy offenders" first, and lighting and appliances should be included. Based on the recommended energy conservation opportunities identified in the energy audits, create a schedule for increasing each building's energy efficiency. Implement identified efficiency measures, starting with high priority recommendations.	CBJ		Y	Y	N	N	Y	N	**3**
Establish a local government-wide energy efficiency policy that provides employees with guidelines and requirements for efficient use of the facility, such as by turning off unneeded lights and computers, setting thermostats appropriately, and other energy saving behaviors.	CBJ		Y	N	N	N	Y	Y	**3**
Mount a campaign to educate employees on the importance of saving energy. Give rewards to employees or departments that make quantifiable contributions toward meeting the government's energy conservation goals.	CBJ		Y	Y	N	N	Y	Y	**4**
Commit to an annual maintenance program and ongoing monitoring for local government building heating systems to ensure systems are running at optimum efficiency.	CBJ		Y	Y	N	N	Y	Y	**4**
Support CBJ staff in becoming Association of Energy Engineers Energy Managers LEED-accredited professionals. Ensure personnel responsible for maintaining systems receive the required training.	CBJ		Y	Y	N	N	Y	N	**3**
Set up a system to monitor heating oil, water, and electricity use. Determine if tracking should be done by building, division, or department, and select a system that is easy to install, wireless, and web-based (for example, www.esightenergy.com).	CBJ		Y	Y	N	N	Y	N	**3**
Long-Term Actions	**Responsible Party**	2015							
As staffing and space needs change, ensure space is not wasted in offices, workshops, garages, and storage areas. Consider setting guidelines for the amount of space in square feet required for each office.	CBJ		Y	Y	N	N	Y	N	**3**
Require departments or divisions to pay for fuel/energy out of their own budgets. Designate a staff person to be responsible for overall energy use in each department, division, or building.	CBJ		Y	N	N	N	Y	N	**2**
Continue to implement high, medium, and low-priority measures recommended by the energy audits for local government buildings.	CBJ		Y	Y	N	N	Y	N	**3**
Continue to seek funding from state, federal, and other sources for energy efficiency upgrades. Currently, loans are available for this purpose from the Alaska Energy Efficiency Revolving Loan Fund Program. Consider using Energy Savings Performance Contracts—a method of financing capital projects whereby a private contractor will guarantee a minimum level of energy cost savings resulting from capital upgrades. Make grant writing for energy efficiency-related projects a priority.	CBJ		Y	Y	N	N	Y	N	**3**
Goal B-2: Reduce energy consumed in and emissions produced by state and federal buildings *Estimate: 30% emission reduction for state and federal buildings; potential GHG reduction 3,000 MTCO2e.*									

Strategy B2-A. Reduce energy use in and GHG emissions from new and existing State buildings.									
Short-Term Actions	**Responsible Party**	2015							
Encourage the State to continue to update energy efficiency standards for new State buildings. New buildings should show a 50% reduction in energy requirements per square foot compared to existing buildings.	Local and state governments		Y	Y	N	Y	N	N	**3**
Encourage the State to update policies regarding leased buildings to set minimum enclosure energy efficiency standards for leased space.	Local and state governments		Y	N	N	N	N	N	**1**
Encourage the State to continue to make energy upgrades to existing buildings by securing funding and considering the use of Energy Savings Performance Contracts.	Local and state governments		Y	Y	N	N	N	N	**2**
Consider ways to reduce energy used by the State's computer network. (Examples include purchasing Energystar machines and using virtualization to reduce the number of physical servers, thus reducing the energy required to power and cool them.)	Local and state governments		Y	Y	N	N	N	N	**2**
Long-Term Actions	**Responsible Party**								
Encourage the State to continue to update energy efficiency standards for new State buildings.	Local and state governments		Y	Y	Y	Y	N	Y	**5**
Strategy B2-B. Increase collaboration among the CBJ, State, and Federal Governments.									
Short-Term Actions	**Responsible Party**	2015							
Set up regular meetings with representatives from local, state, and federal government to share ideas, resources, strategies, and innovations for decreasing energy use in public buildings.	Local, state, and federal governments		Y	N	N	N	N	N	**1**
Goal B-3: Reduce energy consumption in, and GHG emissions produced by, commercial buildings (private sector non-residential buildings). *Estimate: 30% emission reduction for state and federal buildings; potential GHG reduction 14,000 MTCO2e.*									
Strategy B3-A. Reduce energy use and GHG emissions in new commercial and industrial buildings.									
Short-Term Actions	**Responsible Party**	2015							
Update the building code to increase energy efficiency requirements for new commercial and industrial buildings. Code should look to exceed minimum standards, such as those laid out by the American Society of Heating, Refrigeration and Air-Conditioning Engineers Energy Efficiency Standard (ASHRAE 90.1 and 90.2).	CBJ		Y	Y	Y	Y	Y	Y	**6**
Strategy B3-B. Reduce energy use and GHG emissions in existing commercial and industrial buildings.									

Short-Term Actions	**Responsible Party**	2015							
Launch a community awareness campaign to promote energy efficiency. Actions could include the installation and use of programmable thermostats, weatherization strategies, and new and/or alternative heating systems. Connect businesses and nonprofits with information on state, federal, or other resources that provide financing for energy efficiency improvements.	CBJ/Community		Y	N	Y	N	Y	N	**3**
Identify largest local energy/heating fuel consumers and work with them to establish and meet energy efficiency targets.	CBJ/Community		Y	Y	N	Y	Y	N	**4**
Set up an award program for business/building owners that have implemented innovative measures to reduce energy consumption. Organize annual tour of award winners to showcase changes local businesses are making.	CBJ/Community		Y	N	Y	N	Y	N	**3**
Encourage real estate agents to include information about energy usage and energy efficiency upgrades when selling commercial buildings.	Private Sector		Y	N	N	N	N	N	**1**
Research financing options to support an incentive program to encourage building owners to undertake energy retrofits. Incentives could include low interest/no interest loans, property tax breaks, or one-time grants. Consider adding new tax on fuel/electricity and using revenue to fund energy efficiency incentives. (Note: Changes to taxes may need to be supported by state statute.)	CBJ		Y	N	N	N	Y	N	**2**
Long-Term Actions	**Responsible Party**	2015							
Implement ongoing financial incentives for energy efficiency measures taken by commercial and industrial building owners.	CBJ/Community		Y	N	Y	N	Y	N	**3**
Goal B-4: Reduce energy consumption in, and GHG emissions produced by, residential buildings. *Estimate: 30% of existing houses completed AFHC-type weatherization; 25% of new houses super-insulated; 75% of new houses meet new energy efficiency standards; potential GHG reduction 27,000 MTCO2e).*									
Strategy B4-A. Reduce energy use and GHG emissions in new residential buildings.									
Short-Term Actions	**Responsible Party**	2015							
Update the building code to increase energy efficiency requirements for new residential buildings. Code should include specific standards, such as those laid out by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE 90.1). New buildings should show 50% reduction in energy requirements per square foot as compared to existing buildings.	CBJ		Y	Y	Y	N	Y	Y	**5**
Promote energy savings technologies by incorporating them into CBJ projects and disseminating information to the public.	CBJ		Y	N	Y	N	Y	Y	**4**
Long-Term Actions	**Responsible Party**	2015							

Work with the State to update the Alaska Building Energy Efficiency Standard (BEES) to require more energy efficient buildings. The BEES is the standard that must be met for a new home to qualify for financing through the Alaska Housing and Finance Corporation. (Current standard is the 2006 International Energy Conservation Code (IECC) with Alaska Specific Amendments).	Local and state governments		Y	N	Y	N	N	N	**2**
Strategy B4-B. Reduce energy use and GHG emissions in existing residential buildings.									
Short-Term Actions	**Responsible Party**	2015							
Educate the community on measures with the most potential to reduce energy consumption and save on heating costs including weatherization, thermostat management, renewable sources, micro-energy production systems, efficient electrical heating, and other new technology. Increase citizens' awareness of Energy Star products. Work with community partners, such as hardware stores, Alaska Energy Authority, and community groups on energy education. Hold annual workshop on how to get homes ready for winter. Sponsor a "button up your home" weekend around the second weekend in September. Include information on how to reduce electrical energy and water use. Participate in Energy Awareness Month (designated as October by the State of Alaska). Participate in the home show or create a new energy home show. Develop a forum for home owners to exchange information.	CBJ/Community		Y	N	Y	N	N	N	**2**
Provide homeowners with information about State and Federal funding opportunities. Actively support continued funding of energy efficiency incentive programs.	CBJ/Community		Y	N			N		**1**
Evaluate possible incentives local government could offer for home energy and heating efficiency improvements. (Incentives could include no/low interest loans, property tax reduction, waiving permit fees for innovative projects, using a Property Assessed Clean Energy program where the City offers a loan that is paid back through property taxes over 15 to 20 years.) Include incentives aimed at low-income residents and landlords.	CBJ		Y	N	N	N	Y	N	**2**
Lobby the State to continue the Alaska Housing Finance Corporation's Home Energy Rebate program. Investigate and come up with plan to get through the long waiting list and inertia that occurs with current program, where actions taken by owners prior to acceptance into the program have no rebate value.	Local and state governments		Y	Y	N	N	N	N	**2**
Develop an annual award for homeowners who complete innovative energy projects involving both retrofits and new construction and organize a tour of worthy projects.	CBJ		Y	N	N	N	Y	N	**2**
Evaluate ways to provide incentives to home owners to carry out innovative energy projects (including solar hot water, micro-hydro, etc). Consider an annual competitive granting process.	CBJ		Y	N	Y	N	Y	N	**3**
Long-Term Actions	**Responsible Party**	2015							
Implement energy efficiency incentive packages for homeowners.	CBJ		Y	N	Y	N	Y	N	**3**
Strategy B4-C. Support training in energy efficient systems, installation, and maintenance for local builders, electricians, and other tradespersons									

Short-Term Actions	**Responsible Party**	2015							
Set up award program from local companies that excel at completing energy efficiency upgrades and building very energy efficient houses.	CBJ/community partners		Y	N	Y	N	N	N	**2**
Consider local government incentives to encourage local energy-related training courses.	CBJ		Y	N	N	N	Y	N	**2**

Sector	2010 Emissions	2032 Reduction Target	JCAP Goals and Strategies	2015 Progress:	GHG Savings	Bang for buck	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings vs timeframe	Score
Transportation & Land Use	8,500 MTCO2e	2,300 MTCO2e	pages 47 - 55								
Goal T-1: 25% reduction in emissions from CBJ fleet. *Estimate: 25% emission reduction from CBJ fleet; potential GHG reduction 900 MTCO2e.*											
Strategy T1-A. Expand local government fleet with the most energy efficient vehicles practicable.											
Short-Term Actions			Responsible Party	2015							
Add minimum fuel efficiency standards to criteria for purchasing bids for new vehicles so that lowest bid alone does not win the contract. Standards could include mileage, emissions, and noise.			CBJ		Y	N	Y	N	Y	Y	4
Purchase low or zero-emission vehicles or renewable fuel vehicles to test for fleet use.			CBJ		Y	N			Y		2
Revise the surplus system within city government so that older less fuel efficient vehicles are no longer shifted from one department to another but removed from the fleet.			CBJ		Y	N	N	N	Y	N	2
Ensure fleet is expanded only for essential purposes.			CBJ		Y	N	N	N	Y	N	2
Long-Term Actions			Responsible Party	2015							
Consider using vehicles from a car sharing organization to reduce the Borough fleet size.			CBJ		Y	N	N	N	Y	N	2
Modify transportation contracts to incentivize alternative/renewable fuel use (school buses, construction contracts, etc.).			CBJ		Y	N	Y	N	Y	N	3
Strategy T1-B. Reduce emissions associated with existing CBJ fleet.											
Short-Term Actions			Responsible Party	2015							
Improve and increase training for fleet mechanics, especially in newer energy efficient vehicles and technologies, such as hybrids and electric vehicles, and ensure required vehicle tune-ups and maintenance occur in a timely manner.			CBJ		Y	Y	Y	N	Y	N	4
Work with the ADEC, Juneau School Board, and school bus service providers to retrofit school bus fleet with equipment (such as oxidate catalysts) that reduces emissions.			CBJ		N	N	N	N	Y	N	0
Implement and enforce an anti-idling campaign to restrict idling of CBJ municipal vehicles, allowing flexibility for cold conditions or other situations where increasing the number of starts would be counterproductive.			CBJ		Y	Y	N	N	Y	N	3

Goal T-2: Increase Capital Transit ridership. *Estimate: 40% increase in ridership; potential GHG reduction 4,300 MTCO2e.*									
Strategy T2-A. Expand transit service using most energy efficient vehicles practical.									
Short-Term Actions	**Responsible Party**	**2015**							
Update and work to secure funding needed to implement the "optimum scenario" in the Transit Development Plan. Focus on the actions that will have the biggest impact on reducing GHG emissions and energy use.	CBJ		Y	Y	Y	Y	Y	N	5
Long-Term Actions	**Responsible Party**	**2015**							
Purchase only alternative/renewable fuel or hybrid transit vehicles in the future.	CBJ		Y	N	Y	N	Y	N	3
Implement all recommendations for the "optimum scenario" in the Transit Development Plan.	CBJ		Y	Y	Y	N	Y	N	4
Build a new maintenance facility to house expanding hybrid/electrical fleet.	CBJ		Y	N	N	N	Y	N	2
Strategy T2-B. Increase public education and provide incentives to increase transit ridership.									
Short-Term Actions	**Responsible Party**	**2015**							
Increase public education about the benefits of public transit.	CBJ		Y	Y	N	N	Y	N	3
Offer incentives for CBJ employees to use Capital Transit. Could include discounted bus passes, prizes for individuals or departments with highest rate of transit use, etc.	CBJ		Y	N	N	N	Y	N	2
Encourage employers to offer incentives for employees to use transit (e.g., discount on bus pass, etc.).	Community/Federal State/UAS/CBJ		Y	Y	N	N	N	N	2
Work with large employers to set flexible and/or staggered work hours to coordinate with transit schedule and/or reduce crowding on buses.	Community/Federal State/UAS/CBJ		Y	Y	N	N	N	N	2
Goal T-3: Reduce emissions per vehicle mile driven. *Estimate: 750 electric vehicles replace existing vehicles and 25% of people switch to cars with at least 14mpg efficiency; potential GHG reduction 900 MTCO2e.*									
Strategy T3-A. Reduce emissions associated with existing vehicles.									
Short-Term Actions	**Responsible Party**	**2015**							
Pass an ordinance to restrict idling of all vehicles, mount public education campaign, and enforce the ordinance. Students at JDHS launched an anti-idling campaign, and there are now anti-idling signs posted in school pick-up areas; work with students to place signs at all schools.	CBJ/Community		Y	Y	N	N	N	Y	3
Implement city-sponsored driver training program to improve driving habits in order to reduce fuel consumption and emissions.	CBJ		Y	N	N	Y	Y	Y	4
Hold free public workshops on climate friendly driving and vehicle maintenance techniques (e.g., correcting tire pressure).	CBJ/Community		Y	N	N	N	N	N	1

Work with local tour companies to ensure that tour buses are properly equipped and maintained to run as efficiently and cleanly as possible.	CBJ/Tour Companies		Y	N	N	N	N	N	1
Long-Term Actions	Responsible Party	2015							
Set vehicle emissions standards similar to those in California.	CBJ/State		N	Y	N	N	N	N	0
Strategy T3-B. Encourage the use of low-carbon emitting vehicles.									
Short-Term Actions	Responsible Party	2015							
Create free or designated parking spaces and metered charging stations for electric and plug-in hybrid vehicles.	CBJ		Y	N	Y	N	Y	N	3
Develop local incentives for the purchase of fuel efficient vehicles. Examples include free parking for hybrid electric vehicles (Los Angeles), a rebate for purchase of new hybrid electric vehicles (City of Riverside, CA, and an exemption from local sales tax for purchase of new fuel efficient vehicle (many communities).	CBJ		Y	Y	Y	N	Y	N	4
Require every public building to have a minimum number of vehicle plug-ins in each parking lot and parking garage.	CBJ		Y	N	Y	N	Y	N	3
Reduce parking fees in government-owned garages for vehicles that reach a certain high threshold of fuel-efficiency.	CBJ		Y	Y	Y	N	Y	N	4
Long-Term Actions	Responsible Party	2015							
Make some convenient parking areas only usable by small cars, forcing large vehicles to find parking further away.	CBJ		Y	N	N	N	Y	N	2
Work with tour companies to replace tour buses with more energy efficient models. Consider the feasibility and economic viability of replacing existing fleet with electric buses.	CBJ/Private Sector		Y	Y	N	N	N	N	2
Add low-speed vehicle corridor from Downtown to the Valley by filling in the gaps at Salmon Creek and McNugget intersections	CBJ/State		Y	N	N	N	N	N	1
Goal T-4: Increase bicycle and pedestrian trips. *Estimate: 1000 weekly trips switched from driving to walking, 1000 weekly trips switched from driving to biking, 10% of students walk or bike to and from school 25% emission reduction from CBJ fleet; potential GHG reduction 200 MTCO2e.*									
Strategy T4-A. Implement the Juneau Non-Motorized Transportation Plan.									
Short-Term Actions	Responsible Party	2015							
Work to secure funding for high priority non-motorized transportation projects outlined in the Non-Motorized Transportation Plan.	CBJ/ State DOT		Y	Y	Y	N	N	N	3
Continue to implement recommendations in Non-Motorized Transportation Plan. CBJ government Long-Term Actions.	CBJ		Y	Y	Y	N	Y	N	4
Long-Term Actions	Responsible Party	2015							

Implement the recommendations from the Safe Routes to Schools Plan.	CBJ/ State DOT/School District		Y	N	Y	N	N	N	2
Begin with implementing high priority infrastructure recommendations from the Non-Motorized Transportation Plan. Once completed, work to implement medium and low priority recommendations from the Plan.	CBJ		Y	Y	Y	N	Y	N	4
Strategy T4-B. Use public education and incentives to encourage residents to walk and bike.									
Short-Term Actions	Responsible Party	2015							
Work with employers to establish incentives for employees to commute via nonmotorized transportation.	State/UAS/ Community		Y	Y	Y	N	N	N	**3**
Install bicycle racks, showers, and other amenities at City facilities to promote bicycle use by agency employees and visitors.	CBJ		Y	N	Y	N	Y	N	**3**
Host or support bike rodeos, bike to work, and other events to promote nonmotorized transportation.	CBJ/ Community Partners		Y	N	Y	N	N	N	**2**
Implement community enforcement, education, and encouragement programs to promote bicycling and walking.	CBJ/ Community Partners		Y	N	Y	N	N	N	**2**
Goal T-5: Reduce overall vehicle miles driven *Estimate: Car pooling incentives offered to 1000 employees, with a 15% reduction in vehicle trips, 100 people join a car sharing organization, public education results in an 8% decrease in vehicle miles driven; potential GHG reduction 16,200 MTCO2e.*									
Strategy T5-A. Develop a car sharing and ride sharing programs.									
Short-Term Actions	Responsible Party	2015							
Designate free on-street parking and convenient spaces in commercial and workplace parking lots for van pool and car pool vehicles.	CBJ/major employers		Y	Y	N	N	N	N	2
Work with community partners to set up a website for car pool networking.	CBJ/ Community		N	Y	N	N	N	N	0
Work with community partners to bring a car sharing program to Juneau.	CBJ/ Community		N	Y	N	N	N	N	0
Work with the community's largest employers to develop van pooling and car pooling programs.	CBJ		N	Y	N	N	Y	N	0
Strategy T5-B. Encourage vehicle trip consolidation.									
Short-Term Actions	Responsible Party	2015							
Educate the public to plan ahead and consolidate vehicle trips in order to reduce vehicle miles driven.	CBJ/Community		Y	Y	N	N	N	N	2
Goal T-6: Reduce emissions associated with marine transportation. *Estimate: 22% decrease in marine emissions; potential GHG reduction 15,700 MTCO2e.*									
Strategy T6-A. Work with recreational and commercial boaters to reduce emissions and energy use associated with marine transportation.									

Short-Term Actions	Responsible Party	2015							
Work with community partners to hold annual workshops to teach boaters to maintain engines and boats properly for enhanced energy efficiency.	CBJ/ Community Partners		Y	Y	N	N	N	N	2
Work with community partners to hold workshops to inform boaters of enhanced energy efficiency engine maintenance and new technologies.	CBJ/ Community Partners		Y	Y	N	N	N	N	2
Develop a program to encourage the replacement of 2-stroke engines with 4-stroke engines.	CBJ/ Community		Y	Y	N	N	N	N	2
Long-Term Actions	Responsible Party	2015							
Discourage use of 2-stroke engines within the Borough. (Alaska Department of Natural Resources has prohibited 2-stroke engines on the Kenai River.)	CBJ/ Community		Y	Y	N	N	N	N	**2**
Require all cruise ships and other large commercial ships to have the capacity to plug in to Juneau's electric energy supply when in port.	State and local governments/ Cruise Ship Companies		Y	Y	Y	Y	Y	Y	**6**
Mandate new commercial docks to provide electric plug-ins for cruise ships and other commercial vessels, and require that ships use electric power whenever it is available.	CBJ		Y	Y	Y	Y	Y	Y	**6**
Select energy efficient designs when choosing new vessels for the Alaska Marine Highway System	State		Y	Y	N	Y	N	Y	**4**
Goal T-7: Reduce emissions associated with air transportation *Estimate: 30% emission reduction in aviation emissions; potential GHG reduction 13,200 MTCO2e.*									
Strategy T7-A. Work with the aviation industry to reduce emissions and energy use.									
Short-Term Actions	Responsible Party	2015							
Work with local aviation companies to reduce fuel consumption in aviation.	CBJ/ Air service providers		Y	Y	N	Y	N	Y	**4**
Bring local aviation companies, and possibly airplane manufacturers, together to share ideas to reduce fuel use in jets and small aircraft.	CBJ/ Air service providers		Y	Y	N	Y	N	Y	**4**
Goal T-8: Reduce vehicle miles driven by increasing mixed-use development. *Estimate: 550 new transit-oriented dwelling units; potential GHG reduction 400 MTCO2e.*									
Strategy T8-A. Plan compact, mixed-use neighborhoods.									
Short-Term Actions	Responsible Party	2015							
Review the zoning ordinance to determine if updates are needed to promote compact, mixed-use, higher density development and provide realistic green belts or transition areas to reduce impacts from neighborhoods.	CBJ		Y	Y	Y	Y	Y	Y	**6**
Consider increasing building height minimums or minimum residential density in transit served areas.	CBJ		Y	Y	Y	Y	Y	Y	**6**
Provide extra assistance, and possibly an expedited permitting process, for transit oriented development	CBJ		Y	Y	Y	Y	Y	Y	**6**

Long-Term Actions	Responsible Party	2015							
Continue to support development of mixed-use, walkable neighborhoods in Downtown Juneau and Douglas, West Juneau, and Lemon and Switzer Creeks, around schools, Mendenhall Mall, Auke Bay and UAS. Invest in public infrastructure that will support residential development in these areas.	CBJ		Y	Y	Y	Y	Y	Y	6
Strategy T8-B. Manage parking effectively to minimize driving demand and to encourage alternative modes of transportation.									
Short-Term Actions	Responsible Party	2015							
Evaluate the fee structure for public on-street and off-street parking in Downtown Juneau and support efforts to account for and capture the true and market rate for parking.	CBJ		Y	Y	Y	N	Y	Y	5
Update zoning regulations to set parking maximums instead of parking minimums only.	CBJ		Y	Y	Y	N	Y	Y	5
Long-Term Actions	Responsible Party	2015							
Continue to reduce parking requirements, consider car-lite or car-free development in certain transit served areas; set parking maximums.	CBJ		Y	Y	Y	N	Y	N	4
Strategy T8-C. Improve the pedestrian environment to encourage people to take more trips on foot.									
Short-Term Actions	Responsible Party	2015							
Update the land use code to require better streetscaping and pedestrian amenities with new development. Changes could include requiring landscaping within parking lots, street trees, crosswalks, and pedestrian routes within parking lots, and requiring parking to be located behind, beside, in, or under new buildings so that buildings front the sidewalk.	CBJ		N	Y	Y	N	Y	N	0
Update road and street standards to include wider sidewalks, traffic calming measures in high-pedestrian areas, and shortened pedestrian crossing distances.	CBJ		Y	N	Y	N	Y	N	3
Long-Term Actions	Responsible Party	2015							
Implement recommendations from the Juneau Non-Motorized Transportation Plan to improve the pedestrian environment, including crosswalk and streetscape improvements at specific locations.	CBJ		Y	N	Y	N	Y	N	**3**
Strategy T8-D. Include evaluation of projected GHG emissions in the development review process.									
Short-Term Actions	Responsible Party	2015							
Incorporate an analysis and evaluation of the potential GHG emissions from proposed projects undergoing a development review process. Applicants wishing to develop a building or operation over a certain size threshold could be required to include potential GHG emissions for Planning Commission consideration. Update the land use code appropriately.	CBJ		Y	Y	Y	Y	Y	N	5

Sector	2010 Emissions	2032 Reduction Target	JCAP Goals and Strategies	2015 Progress:	GHG Savings	Bang for buck	Resilience	Significant energy	Implemented	Energy savings	Score
Utilities (CBJ lights, water, wastewater, solid waste)	38,000 MTCO2e	7,600 MTCO2e	page 57								
Goal U-1: Reduce energy consumption and GHG emissions from wastewater treatment. *Estimate: 25% emission reduction from wastewater treatment; potential GHG reduction 600 MTCO2e.*											
Strategy U1-A. Reduce GHG emissions and energy use associated with disposal of sewage sludge.											
Short-Term Actions			Responsible Party	2015							
Evaluate the feasibility of composting all sewage sludge. Consider adding other compostables, such as fish or brewery waste.			CBJ		N	y	y	n	Y	n	0
Long-Term Actions			Responsible Party	2015							
If feasible, develop a system for composting sewage sludge.			CBJ		N	y	y	n	Y	n	0
Strategy U1-B. Reduce GHG emissions and energy use associated with existing wastewater system.											
Short-Term Actions			Responsible Party	2015							
Install Supervisory Control Data Acquisition System in lift stations, to eliminate the need for a staff person to visit on a daily basis.			CBJ		Y	y	n	n	Y	y	4
Complete the high priority Energy Conservation Opportunities outlined in the 2009 Juneau-Douglas and Mendenhall Treatment Plant Energy Audits			CBJ		Y	y	n	n	Y	y	4
Long-Term Actions			Responsible Party	2015							
Complete the medium priority Energy Conservation Opportunities outlined in the 2009 Juneau-Douglas and Mendenhall Treatment Plant Energy Audits.			CBJ		Y	y	n	n	Y	y	4
Goal U-2: Reduce GHG emissions and energy use related to the water system.											
Strategy U2-A: Implement the recommendations of the 2008 energy audit to reduce energy use and emissions related to the existing water system.											
Short-Term Actions			Responsible Party	2015							
Implement the High Priority actions listed in the 2008 Water System Energy Audit.			CBJ		Y	y	n	n	Y	y	4
Long-Term Actions			Responsible Party	2015							
Implement the Low priority actions listed in the 2008 Water System Energy Audit.			CBJ		Y	n	n	n	Y	y	3
Goal U-3: Reduce overall water use in Juneau											
Strategy U3-A. Implement education programs and incentives to encourage residents to conserve water.											

Short-Term Actions	Responsible Party	2015							
Expand public awareness of the importance of conserving water, including detecting and repairing leaks.	CBJ		N	y	y	n	Y	n	0
Long-Term Actions	Responsible Party	2015							
Adopt incentive program to encourage installation of water conservation measures in existing businesses and homes.	CBJ		N	y	y	n	Y	n	0
Strategy U3-B. Carry out ongoing maintenance and repairs to minimize leaks in the water system.									
Short-Term Actions	Responsible Party	2015							
Expand leak detection and ongoing maintenance and repairs to the water distribution system.	CBJ		N	y	y	n	Y	n	0
Long-Term Actions	Responsible Party	2015							
Upgrade and retrofit CBJ plumbing systems with water conserving technology.	CBJ		N	y	y	n	Y	n	0
Assess, maintain, and repair existing plumbing fixtures and pipes in all government buildings and facilities, including building and parking lot landscaping, public restrooms, and parks and other recreational facilities, to reduce borough-wide water consumption.	CBJ		N	y	y	n	Y	n	0
Strategy U3-C. Consider water metering and increasing charges to encourage water conservation.									
Long-Term Actions	Responsible Party	2015							
Consider introducing a residential water metering program.	CBJ		N	y	y	n	Y	n	0
Goal U-4: Reduce GHG emissions and energy use related to street lighting									
Strategy U4-A. Install energy efficient street lamps.									
Short-Term Actions	Responsible Party	2015							
Work with AEL&P to maximize the number of energy efficient lights in Juneau. Research what lighting technology is the best for this climate, is economical from a lifecycle perspective, and provides good lighting (Sitka has recently completed a similar study).	CBJ		Y	y	n	y	Y	y	5
For new CBJ fixtures, install only energy efficient fixtures and bulbs.			Y	y	n	n	Y	y	4
Encourage the state DOT&PF to adopt a policy requiring all new bulbs and fixtures to be energy efficient.			Y				N		1
Goal U-5: Reduce GHG emissions and energy use from solid waste processing. *Estimate: Reduce material entering landfill by 25%; potential GHG reduction 1,700 MTCO2e.*									
Strategy U5-A. Reduce the amount of solid waste generated in Juneau.									
Short-Term Actions	Responsible Party	2015							

Mount a campaign to educate residents about the importance of waste reduction. Campaign could encourage use of reusable bags, coffee cups, and plastic water bottles.	CBJ/Community		N				N		0
Promote the utilization of reuse and repair businesses in outreach to businesses and residents.	CBJ		N				Y		0
Work with businesses to reduce/eliminate use of disposable containers or increase use of compostable containers if composting facilities are provided.	CBJ		N				Y		0
Discourage use of single-use plastic bags.	CBJ/Community		N				N		0
Strategy U5-B. Reduce waste associated with local government facilities and operations.									
Short-Term Actions	Responsible Party	2015							
Work with CBJ departments to identify strategies for increasing recycling at Borough facilities.	CBJ/ Friends of Recycling		N				N		0
Complete an audit of waste from various departments and use results to make changes that will reduce waste.	CBJ		N				Y		0
Increase reuse of surplus items. Use freecycle or other giveaway processes for non-salable surplus items.	CBJ		N				Y		0
Consider updating procurement policies to promote purchasing of fewer disposable and more durable items	CBJ		N				Y		0
Adopt a sustainable procurement policy that seeks to procure all supplies, services, maintenance, construction, and architect-engineer services in a manner that promotes increased energy efficiency and reduced GHG emissions.	CBJ		N				Y		0
Strategy U5-C. Increase the rate of recycling in Juneau and expand capacity to process recycled material.									
Short-Term Actions	Responsible Party	2015							
Educate the public about opportunities for waste reduction and recycling.	CBJ/ Friends of Recycling/Waste Contractor		N				N		0
Make recycling a condition of permits issued by local government for special use and festivals and other events. Increase awareness around best practices and resources for waste reduction at events.	CBJ/Community		N				N		0
Support efforts to increase recycling in public spaces such as the airport and Centennial Hall.	CBJ		N				Y		0
Target commercial operations and institutions to increase participation in waste reduction and recycling efforts.	CBJ/ Friends of Recycling		N				N		0
Keep clothing and fabric out of the landfill by encouraging residents to recycle clothes. Consider innovative options for cloth recycling.	CBJ/Community		N				N		0
Place recycling collection bins in neighborhoods throughout the community, e.g., at schools, shopping centers, or publicly-owned buildings.	CBJ/Recycling Contractor		N				N		0

Add a free store or take-it-or-leave-it location at the landfill where reusable items can be dropped off and picked up.	CBJ/ Waste Contractor		N				N		0
Extend recycling contract from 3 years to 10 years to allow bidder to invest in new infrastructure, increase space, etc.	CBJ		N				Y		0
Implement a curb-side recycling service in Juneau.	CBJ/Recycling Contractor		N				N		0
Encourage businesses to use "deconstruction" services when undertaking demolition and renovation projects, including selective dismantlement of building components for reuse and recycling.	CBJ		N				Y		0
Long-Term Actions	Responsible Party	2015							
Increase capacity of the recycling center and expand the types of items that are recycled, especially plastics.	CBJ/Recycling Contractor		N				N		0
Support local efforts to recycle paper or glass. Update the recycling contract to require contractor to use recyclables locally where possible.	CBJ/Recycling Contractor		N				N		0
Support a Re-Build facility where construction materials can be salvaged and recycled. Could include construction materials, glass jars, etc. CBJ could donate land or provide an old warehouse or provide land for a building or use a portion of an existing warehouse.	CBJ/Community Partners		N				N		0
Strategy U5-D. Develop a municipal composting system.									
Short-Term Actions	Responsible Party	2015							
Research and develop a municipal composting facility in a central location. Consider composting sewage sludge, fish waste, brewery waste, wood scraps, yard waste, and household compostables, drawing on the composting experiences of other communities in the region, e.g., Gustavus, Haines, and Whitehorse.	CBJ		N				Y		0
Long-Term Actions	Responsible Party	2015							
Consider the feasibility of developing a commercial biomass recovery facility that could accept various biomass waste streams such as sewage sludge, landscape/tree residue, waste/recycled paper and cardboard, and cooking grease, for energy recovery.	CBJ		N				Y		0
Strategy U5-E. Consider a waste-to-energy system for Juneau.									
Long-Term Actions	Responsible Party	2015							
Consider the economic feasibility of developing a waste-to-energy facility in Juneau.	CBJ/Waste Contractor		Y				N		1

Sector	2010 Emissions	2032 Reduction Target	JCAP Goals and Strategies	2015 Progress:	GHG Savings	Bang for buck	Resilience	Significant energy	Implemented	Energy savings	Score
Mining Non-highway equipment goals	20,477 MTCO2e	5,200 MTCO2e	page 58	2015 Progress: no action ongoing completed							
Goal MC-1: Decrease GHG emissions associated with mining operations. *Estimate: 20% in emissions associated with mining operations; potential GHG reduction 7,600 MTCO2e.*											
Strategy MC1-A. Work with local mines to reduce GHG emissions and energy use.											
Short-Term Actions			Responsible Party	2015							
Support/provide incentives to encourage the use of renewable energy sources for local industrial operations.			CBJ / Private sector		Y	Y	N	Y	N	Y	4
Incentivize and reward companies that reduce energy use, GHG emissions, and waste.			CBJ		Y	N	N	Y	N	Y	3
Encourage local operations to implement best energy management practices to reduce energy use (e.g. turning off equipment when not in use, keeping motors in good repair, etc.).			CBJ / Private sector		Y	Y	N	Y	N	Y	4
Long-Term Actions			Responsible Party	2015							
When evaluating proposals for new mines or other large industrial projects, consider the potential impact on the community's GHG emissions.			CBJ		Y	N	N	N	Y	N	2
Work with Coeur Alaska to bring a source of renewable energy to the Kensington mine site.			CBJ/Coeur Alaska		Y	Y	Y	Y	N	Y	5
Goal MC-2: Decrease GHG emissions associated with non-highway equipment. *Estimate: 30% emission reduction from non-highway equipment; potential GHG reduction 5,200 MTCO2e.*											
Strategy MC2-A. Work with local companies to reduce GHG emissions and energy use from non-highway equipment.											
Short-Term Actions			Responsible Party	2015							
Support/provide incentives to encourage the use of renewable energy sources for local construction and related operations.			CBJ/Private sector		Y	N	Y	N	N	Y	3
Incentivize and reward companies that reduce energy use, GHG emissions, and waste.			CBJ		Y	N	N	N	Y	Y	3
Encourage local operations to implement best energy management practices to reduce energy use (e.g. turning off equipment when not in use, keeping motors in good repair, etc.).			CBJ/Private sector		Y	Y	N	N	N	Y	3

Long-Term Actions	Responsible Party	2015							
When evaluating proposals for road building or other large industrial projects, consider the potential impact on the community's GHG emissions of both construction and ongoing operation of a project.			Y	N	N	N	N	N	1

Sector	2010 Emissions	2032 Reduction Target	JCAP Goals and Strategies	2015 Progress:	GHG Savings	Bang for buck	Resilience	Significant energy	Implemented	Energy savings	Score
Renewable Energy	20,477 MTCO2e	5,200 MTCO2e	page 59-61	2015 Progress: no action ongoing completed							
Goal RE-1: Increase the use of alternative forms of renewable energy for residential and commercial development. *Estimate: 5% emission reduction from buildings; potential GHG reduction 6,900 MTCO2e.*											
Strategy RE1-A. Add incentives for and remove barriers to renewable energy projects.											
Short-Term Actions			Responsible Party	2015							
Update land use code and permitting regimens to allow for micro-hydroelectric and wind projects in all districts.			CBJ		Y	Y	Y	Y	Y	Y	6
Work with AEL&P and the State to implement net metering or energy buy back systems that will allow owners of small renewable systems to receive a credit for energy they produce.			Community partners/ AEL&P		Y	Y	Y	Y	Y	Y	6
Develop a competitive grant process to assist businesses in installing renewable energy systems.			CBJ/Community Partners		Y	Y	Y	Y	Y	Y	6
Long-Term Actions			Responsible Party	2015							
Consider property tax exemption for buildings with renewable energy pilot projects. (Note: Changes to taxes may require changes to state statute.)			CBJ		Y	Y	Y	Y	Y	Y	6
Explore commercial use of energy produced by solid waste treatment.			CBJ/Community Partners		Y	Y	Y	Y	Y	Y	6
Goal RE-2: Develop district heating projects in Juneau.											
Strategy RE2-A. Develop district heating pilot projects.											
Short-Term Actions			Responsible Party	2015							
Evaluate subdivision and other permitting and development codes to ensure that there are no barriers to the use of district heating.			CBJ		Y	Y	Y	Y	Y	Y	6

Evaluate options for implementing a district heating system (possibly using a seawater heat pump) in the Willoughby District. This area would be good for a pilot project as there is a high density of publically owned properties and several properties that are ready for redevelopment.	Local, state, federal governments/ Private Sector Partners		Y	Y	Y	Y	Y	Y	6
Perform a city-wide study investigating district heating options for such complexes as UAS, Vintage Park, the prison complex, the Hospital area, etc.	Local, state, federal governments/ Private Sector Partners		Y	Y	Y	Y	Y	Y	6
Long-Term Actions	Responsible Party	2015							
If feasible, implement a district heating system in the Willoughby District.	Local, state, federal governments/ Private Sector Partners		Y	Y	Y	Y	Y	Y	6
Pursue funding to implement other feasible district heating projects in Juneau.	CBJ		Y	Y	Y	Y	Y	Y	6
Goal RE-3: Increase Juneau's supply of renewable energy.									
Strategy RE3-A. Develop an energy plan for Juneau to ensure sufficient renewable energy resources for future growth that reduce/eliminate GHG emissions.									
Short-Term Actions	Responsible Party	2015							
Develop an Energy Plan for the community to identify and evaluate the economics of renewable energy sources (including hydroelectric, biomass, solar, tidal, and wind) that will be able to meet the community's needs in the future. The Energy Plan will need to be flexible enough to respond to changing conditions and will need to examine the full range of renewable energy potential and relative costs.	Local, state, federal governments/ Private Sector Partners		Y				N		1
Long-Term Actions	Responsible Party	2015							
Consider the feasibility of other potential hydroelectric sources to meet future needs such as Phase 2 Lake Dorothy (capacity of 94 GWh) and Sweetheart Lake (136 GWh).	AEL&P/Juneau Hydropower Inc/Other Private Sector		Y	Y	Y	Y	N	Y	5
Implement the recommendations of the Energy Plan to identify and develop local renewable energy sources.	Local, state, federal governments/ Private Sector Partners		Y				N		1

Sector	2010 Emissions	2032 Reduction Target	JCAP Goals and Strategies	2015 Progress:	GHG Savings	Bang for buck	Resilience	Significant energy	Implemented	Energy savings	Score
Food Production	(no estimate, minimal GHG emission reduction)		page 62-63	2015 Progress: no action ongoing completed							
Goal F-1: Increase local food production.											
Strategy F1-A. Increase access to locally produced organic food for the community by supporting efforts to build more complete and sustainable local food production and distribution systems.											
Short-Term Actions			Responsible Party	2015							
Promote and continue to expand the Juneau farmers market. Consider developing an outdoor covered space that could be used as a market and for other uses.			CBJ/ Community partners		N				N		0
Support/promote commercial agriculture at a scale that the available land in Juneau can support. Focus on agriculture that does not require large land areas.			CBJ/ Community partners		N				N		0
Update land use codes to allow for increased personal use animal husbandry, agriculture, and community gardens.			CBJ		N				Y		0
Encourage and support existing community gardens as well as neighborhood initiatives to launch additional community gardens. Consider avalanche chutes as possible locations.			CBJ/ Community partners		N				N		0
Support local efforts to provide training to residents in farming and gardening techniques.			CBJ/ Community partners		N				N		0
Support local seafood sales on or near the downtown waterfront.			CBJ/ Community partners		N				N		0
Provide gardening information to residents. This could include information on techniques, seeds, local tips and other resources. Work with local partners such as 4H, UAS agriculture, and the Jensen-Olson Arboretum.			CBJ/ Community partners		N				N		0
Long-Term Actions			Responsible Party	2015							
Partner with other Southeast Alaska communities to develop a regional food production plan.			CBJ		N				Y		0
Increase the amount of local food (including local or regional fish) served in school lunches. (Examples of school greenhouses found in Barrow and Sitka school lunch programs.)			CBJ/Community Partners		N				N		0
Consider planting edible plants instead of ornamentals on CBJ lands.			CBJ		N				Y		0

Consider innovative techniques, such as using waste heat for greenhouses or growing vegetables in old mine shafts	CBJ/Community Partners		N				N		0

Finally, the 2011 plan clearly established the need and scope for the JEP:
Develop an Energy Plan for Juneau. *This plan would identify and evaluate the technical and economic feasibility of renewable energy sources (including hydroelectric, biomass, solar, tidal, and wind) that will be available to meet the community's future need. The Energy Plan will need to be flexible enough to respond to changing conditions and will need to examine the full range of renewable energy options and the relative costs. Completion of an Energy Plan would require input from other levels of government and the private sector (page 26).*

APPENDIX B

Appendix B: RANKED JCAP ACTIONS THAT FORMED ENERY PLAN PRIORITY STRATEGIES

The following table presents the ranked list of JCAP actions according to the criteria described in **Section 3.1.2**.

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
B3	B3-A	Update the building code to increase energy efficiency requirements for new commercial and industrial buildings. Code should look to exceed minimum standards, such as those laid out by the American Society of Heating, Refrigeration and Air-Conditioning Engineers Energy Efficiency Standard (ASHRAE 90.1 and 90.2).	y	Y	y	y	Y	y	**6**
T6	T6-A	Require all cruise ships and other large commercial ships to have the capacity to plug in to Juneau's electric energy supply when in port.	y	y	y	y	y	y	**6**
T6	T6-A	Mandate new commercial docks to provide electric plug-ins for cruise ships and other commercial vessels, and require that ships use electric power whenever it is available.	y	y	y	y	Y	y	**6**
T8	T8-A	Review the zoning ordinance to determine if updates are needed to promote compact, mixed-use, higher density development and provide realistic green belts or transition areas to reduce impacts from neighborhoods.	y	y	y	y	Y	y	**6**
T8	T8-A	Consider increasing building height minimums or minimum residential density in transit served areas.	y	y	y	y	Y	y	**6**
T8	T8-A	Provide extra assistance, and possibly an expedited permitting process, for transit oriented development	y	y	y	y	Y	y	**6**
T8	T8-A	Continue to support development of mixed-use, walkable neighborhoods in Downtown Juneau and Douglas, West Juneau, and Lemon and Switzer Creeks, around schools, Mendenhall Mall, Auke Bay and UAS. Invest in public infrastructure that will support residential development in these areas.	y	y	y	y	Y	y	**6**
RE1	RE1-A	Update land use code and permitting regimens to allow for micro-hydroelectric and wind projects in all districts.	Y	y	y	y	Y	y	**6**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
RE1	RE1-A	Work with AEL&P and the State to implement net metering or energy buy back systems that will allow owners of small renewable systems to receive a credit for energy they produce.	Y	y	y	y	y	y	6
RE1	RE1-A	Develop a competitive grant process to assist businesses in installing renewable energy systems.	Y	y	y	y	y	y	6
RE1	RE1-A	Consider property tax exemption for buildings with renewable energy pilot projects. (Note: Changes to taxes may require changes to state statute.)	Y	y	y	y	Y	y	6
RE1	RE1-A	Explore commercial use of energy produced by solid waste treatment.	Y	y	y	y	y	y	6
RE2	RE2-A	Evaluate subdivision and other permitting and development codes to ensure that there are no barriers to the use of district heating.	Y	y	y	y	Y	y	6
RE2	RE2-A	Evaluate options for implementing a district heating system (possibly using a seawater heat pump) in the Willoughby District. This area would be good for a pilot project as there is a high density of publically owned properties and several properties that are ready for redevelopment.	Y	y	y	y	y	y	6
RE2	RE2-A	Perform a city-wide study investigating district heating options for such complexes as UAS, Vintage Park, the prison complex, the Hospital area, etc.	Y	y	y	y	y	y	6
RE2	RE2-A	If feasible, implement a district heating system in the Willoughby District.	Y	y	y	y	y	y	6
RE2	RE2-A	Pursue funding to implement other feasible district heating projects in Juneau.	Y	y	y	y	Y	y	6

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
B2	B2-A	Encourage the State to continue to update energy efficiency standards for new State buildings.	y	Y	y	y	N	y	**5**
B4	B4-A	Update the building code to increase energy efficiency requirements for new residential buildings. Code should include specific standards, such as those laid out by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE 90.1). New buildings should show 50% reduction in energy requirements per square foot as compared to existing buildings.	y	Y	y	n	Y	y	**5**
T2	T2-A	Update and work to secure funding needed to implement the "optimum scenario" in the Transit Development Plan. Focus on the actions that will have the biggest impact on reducing GHG emissions and energy use.	y	Y	y	y	Y	n	**5**
T8	T8-B	Evaluate the fee structure for public on-street and off-street parking in Downtown Juneau and support efforts to account for and capture the true and market rate for parking.	y	y	y	n	Y	y	**5**
T8	T8-B	Update zoning regulations to set parking maximums instead of parking minimums only.	y	y	y	n	Y	y	**5**
T8	T8-D	Incorporate an analysis and evaluation of the potential GHG emissions from proposed projects undergoing a development review process. Applicants wishing to develop a building or operation over a certain size threshold could be required to include potential GHG emissions for Planning Commission consideration. Update the land use code appropriately.	y	y	y	y	Y	n	**5**
U4	U4-A	Work with AEL&P to maximize the number of energy efficient lights in Juneau. Research what lighting technology is the best for this climate, is economical from a lifecycle perspective, and provides good lighting (Sitka has recently completed a similar study).	Y	y	n	y	Y	y	**5**
MC1	MC1-A	Work with Coeur Alaska to bring a source of renewable energy to the Kensington mine site.	Y	y	y	y	N	y	**5**
RE3	RE3-A	Consider the feasibility of other potential hydroelectric sources to meet future needs such as Phase 2 Lake Dorothy (capacity of 94 GWh) and Sweetheart Lake (136 GWh).	Y	y	y	y	N	y	**5**
B1	B1-A	Establish a policy that requires equipment purchased or leased by local government to meet specified energy efficiency standards, such as Energy Star.	Y	Y	N	N	Y	y	**4**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
B1	B1-A	When new construction or upgrades are completed, commission the systems to ensure they are working at maximum efficiency.	y	Y	N	N	Y	Y	**4**
B3	B3-B	Identify largest local energy/heating fuel consumers and work with them to establish and meet energy efficiency targets.	y	Y	n	y	Y	n	**4**
B4	B4-A	Promote energy savings technologies by incorporating them into CBJ projects and disseminating information to the public.	y	N	y	n	Y	y	**4**
T1	T1-A	Add minimum fuel efficiency standards to criteria for purchasing bids for new vehicles so that lowest bid alone does not win the contract. Standards could include mileage, emissions, and noise.	y	N	y	n	Y	y	**4**
T1	T1-B	Improve and increase training for fleet mechanics, especially in newer energy efficient vehicles and technologies, such as hybrids and electric vehicles, and ensure required vehicle tune-ups and maintenance occur in a timely manner.	y	Y	y	n	Y	n	**4**
T2	T2-A	Implement all recommendations for the "optimum scenario" in the Transit Development Plan.	y	Y	y	n	Y	n	**4**
T3	T3-A	Implement city-sponsored driver training program to improve driving habits in order to reduce fuel consumption and emissions.	y	N	n	y	Y	y	**4**
T3	T3-B	Develop local incentives for the purchase of fuel efficient vehicles. Examples include free parking for hybrid electric vehicles (Los Angeles), a rebate for purchase of new hybrid electric vehicles (City of Riverside, CA, and an exemption from local sales tax for purchase of new fuel efficient vehicle (many communities).	y	y	y	n	Y	n	**4**
T3	T3-B	Reduce parking fees in government-owned garages for vehicles that reach a certain high threshold of fuel-efficiency.	y	y	y	n	Y	n	**4**
T4	T4-A	Continue to implement recommendations in Non-Motorized Transportation Plan. CBJ government Long-Term Actions.	y	y	y	n	Y	n	**4**
T4	T4-A	Begin with implementing high priority infrastructure recommendations from the Non-Motorized Transportation Plan. Once completed, work to implement medium and low priority recommendations from the Plan.	y	y	y	n	Y	n	**4**
T6	T6-A	Select energy efficient designs when choosing new vessels for the Alaska Marine Highway System	y	y	n	y	N	y	**4**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
T7	T7-A	Work with local aviation companies to reduce fuel consumption in aviation.	y	y	n	y	N	y	**4**
T7	T7-A	Bring local aviation companies, and possibly airplane manufacturers, together to share ideas to reduce fuel use in jets and small aircraft.	y	y	n	y	N	y	**4**
T8	T8-B	Continue to reduce parking requirements, consider car-lite or car-free development in certain transit served areas; set parking maximums.	y	y	y	n	Y	n	**4**
U1	U1-B	Install Supervisory Control Data Acquisition System in lift stations, to eliminate the need for a staff person to visit on a daily basis.	Y	y	n	n	Y	y	**4**
U1	U1-B	Complete the high priority Energy Conservation Opportunities outlined in the 2009 Juneau-Douglas and Mendenhall Treatment Plant Energy Audits	Y	y	n	n	Y	y	**4**
U1	U1-B	Complete the medium priority Energy Conservation Opportunities outlined in the 2009 Juneau-Douglas and Mendenhall Treatment Plant Energy Audits.	Y	y	n	n	Y	y	**4**
U2	U2-A	Implement the High Priority actions listed in the 2008 Water System Energy Audit.	Y	y	n	n	Y	y	**4**
U4	U4-A	For new CBJ fixtures, install only energy efficient fixtures and bulbs.	Y	y	n	n	Y	y	**4**
MC1	MC1-A	Support/provide incentives to encourage the use of renewable energy sources for local industrial operations.	Y	y	n	y	N	y	**4**
MC1	MC1-A	Encourage local operations to implement best energy management practices to reduce energy use (e.g. turning off equipment when not in use, keeping motors in good repair, etc.).	Y	y	n	y	N	y	**4**
B1	B1-A	Set energy efficiency standards for all new local government buildings. Use specific standards that exceed the minimum baselines of such standards as the American Society of Heating, Refrigeration and Air-Conditioning Engineers Energy Efficiency Standard (ASHRAE 90.1 or 90.2), for example, the 10 BTUs per square foot of heated floor area standard. New buildings should aim to achieve a 50% reduction in energy use per square foot compared to existing buildings. GHG emissions abatement and energy efficiency need to be incorporated into the early stages of building design.	Y	Y	N	N	Y	N	**3**
B1	B1-A	Establish a policy that sets minimum energy efficiency standards for space leased by local government. The base standard could be set at 10 BTUs per square foot of heated floor	Y	N	N	N	Y	Y	**3**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
		area.							
B1	B1-A	Adopt a policy requiring that all new CBJ government buildings undergo a life cycle analysis and that this information be used to make decisions about energy efficiency and alternative systems.	Y	Y	N	N	Y	N	**3**
B1	B1-B	Over the next two years, conduct energy audits on 75% of CBJ buildings (including schools and the hospital). AHFC is currently offering a program that will fund the audits in exchange for providing building data as part of their benchmarking efforts. Audits should be completed on "worst energy offenders" first, and lighting and appliances should be included. Based on the recommended energy conservation opportunities identified in the energy audits, create a schedule for increasing each building's energy efficiency. Implement identified efficiency measures, starting with high priority recommendations.	y	Y	n	n	Y	n	**3**
B1	B1-B	Commit to an annual maintenance program and ongoing monitoring for local government building heating systems to ensure systems are running at optimum efficiency.	y	Y	n	n	Y	n	**3**
B1	B1-B	Set up a system to monitor heating oil, water, and electricity use. Determine if tracking should be done by building, division, or department, and select a system that is easy to install, wireless, and web-based (for example, www.esightenergy.com).	y	Y	n	n	Y	n	**3**
B1	B1-B	As staffing and space needs change, ensure space is not wasted in offices, workshops, garages, and storage areas. Consider setting guidelines for the amount of space in square feet required for each office.	y	Y	n	n	Y	n	**3**
B1	B1-B	Continue to implement high, medium, and low-priority measures recommended by the energy audits for local government buildings.	y	Y	n	n	Y	n	**3**
B1	B1-B	Continue to seek funding from state, federal, and other sources for energy efficiency upgrades. Currently, loans are available for this purpose from the Alaska Energy Efficiency Revolving Loan Fund Program. Consider using Energy Savings Performance Contracts—a method of financing capital projects whereby a private contractor will guarantee a minimum level of energy cost savings resulting from capital upgrades. Make grant writing for energy efficiency-related projects a priority.	y	Y	n	n	Y	n	**3**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
B2	B2-A	Encourage the State to continue to update energy efficiency standards for new State buildings. New buildings should show a 50% reduction in energy requirements per square foot compared to existing buildings.	y	Y	n	y	N	n	3
B3	B3-B	Launch a community awareness campaign to promote energy efficiency. Actions could include the installation and use of programmable thermostats, weatherization strategies, and new and/or alternative heating systems. Connect businesses and nonprofits with information on state, federal, or other resources that provide financing for energy efficiency improvements.	y	N	y	n	Y	n	3
B3	B3-B	Set up an award program for business/building owners that have implemented innovative measures to reduce energy consumption. Organize annual tour of award winners to showcase changes local businesses are making.	y	N	y	n	Y	n	3
B3	B3-B	Implement ongoing financial incentives for energy efficiency measures taken by commercial and industrial building owners.	y	N	y	n	Y	n	3
B4	B4-B	Evaluate ways to provide incentives to home owners to carry out innovative energy projects (including solar hot water, micro-hydro, etc). Consider an annual competitive granting process.	y	N	y	n	Y	n	3
B4	B4-B	Implement energy efficiency incentive packages for homeowners.	y	N	y	n	Y	n	3
T1	T1-A	Modify transportation contracts to incentivize alternative/renewable fuel use (school buses, construction contracts, etc.).	y	N	y	n	Y	n	3
T1	T1-B	Implement and enforce an anti-idling campaign to restrict idling of CBJ municipal vehicles, allowing flexibility for cold conditions or other situations where increasing the number of starts would be counterproductive.	y	Y	n	n	Y	n	3
T2	T2-A	Purchase only alternative/renewable fuel or hybrid transit vehicles in the future.	y	N	y	n	Y	n	3
T2	T2-B	Increase public education about the benefits of public transit.	y	Y	n	n	Y	n	3
T3	T3-A	Pass an ordinance to restrict idling of all vehicles, mount public education campaign, and enforce the ordinance. Students at JDHS launched an anti-idling campaign, and there are now anti-idling signs posted in school pick-up areas; work with students to place signs at all schools.	y	Y	n	n	N	y	3

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
T3	T3-B	Create free or designated parking spaces and metered charging stations for electric and plug-in hybrid vehicles.	y	n	y	n	Y	n	**3**
T3	T3-B	Require every public building to have a minimum number of vehicle plug-ins in each parking lot and parking garage.	y	n	y	n	Y	n	**3**
T4	T4-A	Work to secure funding for high priority non-motorized transportation projects outlined in the Non-Motorized Transportation Plan.	y	y	y	n	N	n	**3**
T4	T4-B	Work with employers to establish incentives for employees to commute via nonmotorized transportation.	y	y	y	n	N	n	**3**
T4	T4-B	Install bicycle racks, showers, and other amenities at City facilities to promote bicycle use by agency employees and visitors.	y	n	y	n	Y	n	**3**
T8	T8-C	Update road and street standards to include wider sidewalks, traffic calming measures in high-pedestrian areas, and shortened pedestrian crossing distances.	y	n	y	n	Y	n	**3**
T8	T8-C	Implement recommendations from the Juneau Non-Motorized Transportation Plan to improve the pedestrian environment, including crosswalk and streetscape improvements at specific locations.	y	n	y	n	Y	n	**3**
U2	U2-A	Implement the Low priority actions listed in the 2008 Water System Energy Audit.	Y	n	n	n	Y	y	**3**
MC1	MC1-A	Incentivize and reward companies that reduce energy use, GHG emissions, and waste.	Y	n	n	y	N	y	**3**
MC2	MC2-A	Support/provide incentives to encourage the use of renewable energy sources for local construction and related operations.	Y	n	y	n	N	y	**3**
MC2	MC2-A	Incentivize and reward companies that reduce energy use, GHG emissions, and waste.	Y	n	n	n	Y	y	**3**
MC2	MC2-A	Encourage local operations to implement best energy management practices to reduce energy use (e.g. turning off equipment when not in use, keeping motors in good repair, etc.).	Y	y	n	n	N	y	**3**
B1	B1-B	Establish a local government-wide energy efficiency policy that provides employees with guidelines and requirements for efficient use of the facility, such as by turning off unneeded lights and computers, setting thermostats appropriately, and other energy saving behaviors.	y	N	n	n	Y	n	**2**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
B1	B1-B	Mount a campaign to educate employees on the importance of saving energy. Give rewards to employees or departments that make quantifiable contributions toward meeting the government's energy conservation goals.	y	N	n	n	Y	n	**2**
B1	B1-B	Support CBJ staff in becoming Association of Energy Engineers Energy Managers LEED-accredited professionals. Ensure personnel responsible for maintaining systems receive the required training.	y	N	n	n	Y	n	**2**
B1	B1-B	Require departments or divisions to pay for fuel/energy out of their own budgets. Designate a staff person to be responsible for overall energy use in each department, division, or building.	y	N	n	n	Y	n	**2**
B2	B2-A	Encourage the State to continue to make energy upgrades to existing buildings by securing funding and considering the use of Energy Savings Performance Contracts.	y	Y	n	n	N	n	**2**
B2	B2-A	Consider ways to reduce energy used by the State's computer network. (Examples include purchasing Energystar machines and using virtualization to reduce the number of physical servers, thus reducing the energy required to power and cool them.)	y	Y	n	n	N	n	**2**
B3	B3-B	Research financing options to support an incentive program to encourage building owners to undertake energy retrofits. Incentives could include low interest/no interest loans, property tax breaks, or one-time grants. Consider adding new tax on fuel/electricity and using revenue to fund energy efficiency incentives. (Note: Changes to taxes may need to be supported by state statute.)	y	N	n	n	Y	n	**2**
B4	B4-A	Work with the State to update the Alaska Building Energy Efficiency Standard (BEES) to require more energy efficient buildings. The BEES is the standard that must be met for a new home to qualify for financing through the Alaska Housing and Finance Corporation. (Current standard is the 2006 International Energy Conservation Code (IECC) with Alaska Specific Amendments).	y	N	y	n	N	n	**2**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
B4	B4-B	Educate the community on measures with the most potential to reduce energy consumption and save on heating costs including weatherization, thermostat management, renewable sources, micro-energy production systems, efficient electrical heating, and other new technology. Increase citizens' awareness of Energy Star products. Work with community partners, such as hardware stores, Alaska Energy Authority, and community groups on energy education. Hold annual workshop on how to get homes ready for winter. Sponsor a "button up your home" weekend around the second weekend in September. Include information on how to reduce electrical energy and water use. Participate in Energy Awareness Month (designated as October by the State of Alaska). Participate in the home show or create a new energy home show. Develop a forum for home owners to exchange information.	y	N	y	n	N	n	**2**
B4	B4-B	Evaluate possible incentives local government could offer for home energy and heating efficiency improvements. (Incentives could include no/low interest loans, property tax reduction, waiving permit fees for innovative projects, using a Property Assessed Clean Energy program where the City offers a loan that is paid back through property taxes over 15 to 20 years.) Include incentives aimed at low-income residents and landlords.	y	N	n	n	Y	n	**2**
B4	B4-B	Lobby the State to continue the Alaska Housing Finance Corporation's Home Energy Rebate program. Investigate and come up with plan to get through the long waiting list and inertia that occurs with current program, where actions taken by owners prior to acceptance into the program have no rebate value.	y	Y	n	n	N	n	**2**
B4	B4-B	Develop an annual award for homeowners who complete innovative energy projects involving both retrofits and new construction and organize a tour of worthy projects.	y	N	n	n	Y	n	**2**
B4	B4-C	Set up award program from local companies that excel at completing energy efficiency upgrades and building very energy efficient houses.	y	N	y	n	N	n	**2**
B4	B4-C	Consider local government incentives to encourage local energy-related training courses.	y	N	n	n	Y	n	**2**
T1	T1-A	Purchase low or zero-emission vehicles or renewable fuel vehicles to test for fleet use.	y	N			Y		**2**
T1	T1-A	Revise the surplus system within city government so that older less fuel efficient vehicles are no longer shifted from one department to another but removed from the fleet.	y	N	n	n	Y	n	**2**
T1	T1-A	Ensure fleet is expanded only for essential purposes.	y	N	n	n	Y	n	**2**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
T1	T1-A	Consider using vehicles from a car sharing organization to reduce the Borough fleet size.	y	N	n	n	Y	n	2
T2	T2-A	Build a new maintenance facility to house expanding hybrid/electrical fleet.	y	N	n	n	Y	n	2
T2	T2-B	Offer incentives for CBJ employees to use Capital Transit. Could include discounted bus passes, prizes for individuals or departments with highest rate of transit use, etc.	y	N	n	n	Y	n	2
T2	T2-B	Encourage employers to offer incentives for employees to use transit (e.g., discount on bus pass, etc.).	y	Y	n	n	N	n	2
T2	T2-B	Work with large employers to set flexible and/or staggered work hours to coordinate with transit schedule and/or reduce crowding on buses.	y	Y	n	n	N	n	2
T3	T3-B	Make some convenient parking areas only usable by small cars, forcing large vehicles to find parking further away.	y	n	n	n	Y	n	2
T3	T3-B	Work with tour companies to replace tour buses with more energy efficient models. Consider the feasibility and economic viability of replacing existing fleet with electric buses.	y	y	n	n	N	n	2
T4	T4-A	Implement the recommendations from the Safe Routes to Schools Plan.	y	n	y	n	N	n	2
T4	T4-B	Host or support bike rodeos, bike to work, and other events to promote nonmotorized transportation.	y	n	y	n	N	n	2
T4	T4-B	Implement community enforcement, education, and encouragement programs to promote bicycling and walking.	y	n	y	n	N	n	2
T5	T5-A	Designate free on-street parking and convenient spaces in commercial and workplace parking lots for van pool and car pool vehicles.	y	y	n	n	N	n	2

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
T5	T5-B	Educate the public to plan ahead and consolidate vehicle trips in order to reduce vehicle miles driven.	y	y	n	n	N	n	2
T6	T6-A	Work with community partners to hold annual workshops to teach boaters to maintain engines and boats properly for enhanced energy efficiency.	y	y	n	n	N	n	2
T6	T6-A	Work with community partners to hold workshops to inform boaters of enhanced energy efficiency engine maintenance and new technologies.	y	y	n	n	N	n	2
T6	T6-A	Develop a program to encourage the replacement of 2-stroke engines with 4-stroke engines.	y	y	n	n	N	n	2
T6	T6-A	Discourage use of 2-stroke engines within the Borough. (Alaska Department of Natural Resources has prohibited 2-stroke engines on the Kenai River.)	y	y	n	n	N	n	2
MC1	MC1-A	When evaluating proposals for new mines or other large industrial projects, consider the potential impact on the community's GHG emissions.	Y	n	n	n	Y	n	2
B2	B2-A	Encourage the State to update policies regarding leased buildings to set minimum enclosure energy efficiency standards for leased space.	y	N	n	n	N	n	1
B2	B2-B	Set up regular meetings with representatives from local, state, and federal government to share ideas, resources, strategies, and innovations for decreasing energy use in public buildings.	Y	N	n	n	N	n	1
B3	B3-B	Encourage real estate agents to include information about energy usage and energy efficiency upgrades when selling commercial buildings.	y	N	n	n	N	n	1
B4	B4-B	Provide homeowners with information about State and Federal funding opportunities. Actively support continued funding of energy efficiency incentive programs.	y	N			N		1
T3	T3-A	Hold free public workshops on climate friendly driving and vehicle maintenance techniques (e.g., correcting tire pressure).	y	n	n	n	N	n	1
T3	T3-A	Work with local tour companies to ensure that tour buses are properly equipped and maintained to run as efficiently and cleanly as possible.	y	n	n	n	N	n	1

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
T3	T3-B	Add low-speed vehicle corridor from Downtown to the Valley by filling in the gaps at Salmon Creek and McNugget intersections	y	n	n	n	N	n	1
U4	U4-A	Encourage the state DOT&PF to adopt a policy requiring all new bulbs and fixtures to be energy efficient.	Y				N		1
U5	U5-E	Consider the economic feasibility of developing a waste-to-energy facility in Juneau.	Y				N		1
MC2	MC2-A	When evaluating proposals for road building or other large industrial projects, consider the potential impact on the community's GHG emissions of both construction and ongoing operation of a project.	Y	n	n	n	N	n	1
RE3	RE3-A	Develop an Energy Plan for the community to identify and evaluate the economics of renewable energy sources (including hydroelectric, biomass, solar, tidal, and wind) that will be able to meet the community's needs in the future. The Energy Plan will need to be flexible enough to respond to changing conditions and will need to examine the full range of renewable energy potential and relative costs.	Y				N		1
RE3	RE3-A	Implement the recommendations of the Energy Plan to identify and develop local renewable energy sources.	Y				N		1
T1	T1-B	Work with the ADEC, Juneau School Board, and school bus service providers to retrofit school bus fleet with equipment (such as oxidate catalysts) that reduces emissions.	n	N	n	n	Y	n	0
T3	T3-A	Set vehicle emissions standards similar to those in California.	n	y	n	n	N	n	0
T5	T5-A	Work with community partners to set up a website for car pool networking.	n	y	n	n	N	n	0
T5	T5-A	Work with community partners to bring a car sharing program to Juneau.	n	y	n	n	N	n	0
T5	T5-A	Work with the community's largest employers to develop van pooling and car pooling programs.	n	y	n	n	Y	n	0

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
T8	T8-C	Update the land use code to require better streetscaping and pedestrian amenities with new development. Changes could include requiring landscaping within parking lots, street trees, crosswalks, and pedestrian routes within parking lots, and requiring parking to be located behind, beside, in, or under new buildings so that buildings front the sidewalk.	n	y	y	n	Y	n	**0**
U1	U1-A	Evaluate the feasibility of composting all sewage sludge. Consider adding other compostables, such as fish or brewery waste.	N	y	y	n	Y	n	**0**
U1	U1-A	If feasible, develop a system for composting sewage sludge.	N	y	y	n	Y	n	**0**
U3	U3-A	Expand public awareness of the importance of conserving water, including detecting and repairing leaks.	N	y	y	n	Y	n	**0**
U3	U3-A	Adopt incentive program to encourage installation of water conservation measures in existing businesses and homes.	N	y	y	n	Y	n	**0**
U3		**Strategy U3-B.** Carry out ongoing maintenance and repairs to minimize leaks in the water system.					N		**0**
U3	U3-B	Expand leak detection and ongoing maintenance and repairs to the water distribution system.	N	y	y	n	Y	n	**0**
U3	U3-B	Upgrade and retrofit CBJ plumbing systems with water conserving technology.	N	y	y	n	Y	n	**0**
U3	U3-B	Assess, maintain, and repair existing plumbing fixtures and pipes in all government buildings and facilities, including building and parking lot landscaping, public restrooms, and parks and other recreational facilities, to reduce borough-wide water consumption.	N	y	y	n	Y	n	**0**
U3	U3-C	Consider introducing a residential water metering program.	N	y	y	n	Y	n	**0**
U5	U5-A	Mount a campaign to educate residents about the importance of waste reduction. Campaign could encourage use of reusable bags, coffee cups, and plastic water bottles.	N				N		**0**
U5	U5-A	Promote the utilization of reuse and repair businesses in outreach to businesses and residents.	N				Y		**0**
U5	U5-A	Work with businesses to reduce/eliminate use of disposable containers or increase use of compostable containers if composting facilities are provided.	N				Y		**0**

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
U5	U5-A	Discourage use of single-use plastic bags.	N				N		0
U5	U5-B	Work with CBJ departments to identify strategies for increasing recycling at Borough facilities.	N				N		0
U5	U5-B	Complete an audit of waste from various departments and use results to make changes that will reduce waste.	N				Y		0
U5	U5-B	Increase reuse of surplus items. Use freecycle or other giveaway processes for non-salable surplus items.	N				Y		0
U5	U5-B	Consider updating procurement policies to promote purchasing of fewer disposable and more durable items	N				Y		0
U5	U5-B	Adopt a sustainable procurement policy that seeks to procure all supplies, services, maintenance, construction, and architect-engineer services in a manner that promotes increased energy efficiency and reduced GHG emissions.	N				Y		0
U5	U5-C	Educate the public about opportunities for waste reduction and recycling.	N				N		0
U5	U5-C	Make recycling a condition of permits issued by local government for special use and festivals and other events. Increase awareness around best practices and resources for waste reduction at events.	N				N		0
U5	U5-C	Support efforts to increase recycling in public spaces such as the airport and Centennial Hall.	N				Y		0
U5	U5-C	Target commercial operations and institutions to increase participation in waste reduction and recycling efforts.	N				N		0
U5	U5-C	Keep clothing and fabric out of the landfill by encouraging residents to recycle clothes. Consider innovative options for cloth recycling.	N				N		0
U5	U5-C	Place recycling collection bins in neighborhoods throughout the community, e.g., at schools, shopping centers, or publicly-owned buildings.	N				N		0

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
U5	U5-C	Add a free store or take-it-or-leave-it location at the landfill where reusable items can be dropped off and picked up.	N				N		0
U5	U5-C	Extend recycling contract from 3 years to 10 years to allow bidder to invest in new infrastructure, increase space, etc.	N				Y		0
U5	U5-C	Implement a curb-side recycling service in Juneau.	N				N		0
U5	U5-C	Encourage businesses to use “deconstruction” services when undertaking demolition and renovation projects, including selective dismantlement of building components for reuse and recycling.	N				Y		0
U5	U5-C	Increase capacity of the recycling center and expand the types of items that are recycled, especially plastics.	N				N		0
U5	U5-C	Support local efforts to recycle paper or glass. Update the recycling contract to require contractor to use recyclables locally where possible.	N				N		0
U5	U5-C	Support a Re-Build facility where construction materials can be salvaged and recycled. Could include construction materials, glass jars, etc. CBJ could donate land or provide an old warehouse or provide land for a building or use a portion of an existing warehouse.	N				N		0
U5	U5-D	Research and develop a municipal composting facility in a central location. Consider composting sewage sludge, fish waste, brewery waste, wood scraps, yard waste, and household compostables, drawing on the composting experiences of other communities in the region, e.g., Gustavus, Haines, and Whitehorse.	N				Y		0
U5	U5-D	Consider the feasibility of developing a commercial biomass recovery facility that could accept various biomass waste streams such as sewage sludge, landscape/tree residue, waste/recycled paper and cardboard, and cooking grease, for energy recovery.	N				Y		0
F1	F1-A	Promote and continue to expand the Juneau farmers market. Consider developing an outdoor covered space that could be used as a market and for other uses.	N				N		0

Appendix B : Ranked JCAP Actions that Formed Enery plan Priority Strategies

JCAP Goal	JCAP Strategy	JCAP ACTION	Direct Energy/GHG Savings	Return on investment	Resilience	Significant energy savings	Implemented by/with CBJ	Energy savings within reasonable timeframe	Score
F1	F1-A	Support/promote commercial agriculture at a scale that the available land in Juneau can support. Focus on agriculture that does not require large land areas.	N				N		0
F1	F1-A	Update land use codes to allow for increased personal use animal husbandry, agriculture, and community gardens.	N				Y		0
F1	F1-A	Encourage and support existing community gardens as well as neighborhood initiatives to launch additional community gardens. Consider avalanche chutes as possible locations.	N				N		0
F1	F1-A	Support local efforts to provide training to residents in farming and gardening techniques.	N				N		0
F1	F1-A	Support local seafood sales on or near the downtown waterfront.	N				N		0
F1	F1-A	Provide gardening information to residents. This could include information on techniques, seeds, local tips and other resources. Work with local partners such as 4H, UAS agriculture, and the Jensen-Olson Arboretum.	N				N		0
F1	F1-A	Partner with other Southeast Alaska communities to develop a regional food production plan.	N				Y		0
F1	F1-A	Increase the amount of local food (including local or regional fish) served in school lunches. (Examples of school greenhouses found in Barrow and Sitka school lunch programs.)	N				N		0
F1	F1-A	Consider planting edible plants instead of ornamentals on CBJ lands.	N				Y		0
F1	F1-A	Consider innovative techniques, such as using waste heat for greenhouses or growing vegetables in old mine shafts	N				N		0

APPENDIX C

Appendix C : COMPREHENSIVE PLAN OF THE CITY AND BOROUGH OF JUNEAU, ADOPTED 2013 (ORDINANCE 2013-26)

Juneau's Comprehensive Plan directly addresses the community's future energy needs, vulnerabilities, and strategic priorities in Chapter 6, which is fully devoted to Energy. The plan presents a nuanced, community-based approach for addressing energy issues based on extensive public dialogue. The JCEP will treat this document as a community mandate, and incorporate its framework as a clear vision for Juneau's energy future.

Key sections of the chapter's narrative and its twelve policies are inserted below for reference:

Introduction and Narrative (excerpts, page 67, 68, and 71)
The increased use of renewable energy needs to be encouraged to offset energy consumption of non-renewable sources. This should be accomplished in two manners: conservation of energy consumption with more efficient application and reduced need; and increased development of renewable resources. Programs to reduce energy consumption including building envelope heat loss reduction; application of heat pump technology, biomass and other technologies; and LED lighting application, all of which should be supported. Renewable energy producers should be encouraged to continue planning for development, and ultimately the implementation of renewable energy sources, including hydropower, to offset the consumption of non-renewable energy sources.

There is ultimately limited, although substantial, hydroelectric generation potential in the Juneau area, and associated costs of extending transmission lines to remote sites well suited for hydropower development are high. Users should consider taking steps to conserve available energy or private industry will need to speed up the pace of developing and constructing new hydropower facilities based on market forces.

It would be beneficial to the community for the CBJ government to work with utility providers and energy developers to examine these emerging sources, technologies, and funding sources for potential use in the community and as a revenue source when sold to ratepayers such as cruise ships, Greens Creek Mine, the Couer Kensington Gold Mine, and other future large load users.

Energy Planning. Understanding where energy is used in the community (internal and external uses), its sources, and the financial and social implications of energy use is fundamental to establishing a sound policy for energy development and use. In order to implement the policies outlined in this chapter it is necessary to establish a plan for the future use of energy resources in the borough. The Juneau Climate Action and Implementation Plan of 2011 (CAP) contains much more detailed analysis of energy use than is included in this Plan.

Juneau's fossil fuel supply is subject to disruption due to a variety of reasons: embargoes, price hikes, shipping disputes, or disasters, among others. Use of local energy resources reduces these risks. As the Snettisham avalanches of 2008 and 2009 showed, however, dependence on exposed, remote transmission lines for delivering electricity to users exposes the electrical system to unforeseen disruption. Most of the money used to purchase fossil fuels leaves the community.

Juneau can have a much healthier local economy if we develop and encourage the use of our own energy resources that are adequately protected from disruption by relatively predictable natural disasters such as avalanches.

Support State Capital Functions Through Energy Efficiency. As the availability of fossil fuels decreases throughout the world, it will be increasingly important to identify energy-efficient means of assuring cost-effective electronic and physical access to the capital city.

Energy Efficient CBJ Buildings and Projects. In addition to keeping costs to Juneau taxpayers as low as possible and conserving energy in general, it is the role of the CBJ government to set an example for businesses and individuals in adopting cost-effective energy saving technologies and operating procedures.

Maximize Efficient Use of Renewable Energy Resources. In 1995, about 85% of the energy used in Juneau was provided by fossil fuels. By 2010, fossil fuels accounted for only 77% of the total energy consumed in the borough. Conservation and renewable resources could displace much of this fossil fuel and greatly reduce both the dependence on these fuels and the export of capital from Juneau and Alaska.

Full-Cost Analysis. The very real environmental and social costs, now and in future generations, of relying completely on fossil fuels are not included in the prices paid for fossil fuel-based energy. Wise local and global energy production and use requires that external costs be internalized into energy prices, in order to conserve energy and to encourage its production from renewable, low-impact sources. Additionally, federal, state, and municipal budgets are strained with fewer funds trickling down to the city. Working capital or funds available for investment are therefore a scarce resource not unlike energy. Therefore, careful consideration of impact on the local citizenry must include how redirecting scarce dollars to renewable energy or conservation may have a very real impact. Because national and state policies have not been implemented to do this, the CBJ government should take the initiative to protect the long-term interests of its residents. The exact dollar value of these costs is hard to determine, yet they must not be ignored since they ultimately have a major economic impact on the quality of life.

Minimize Utility Investment. The peak rate of energy use (peak load) determines the size of generators, transformers, wires, backup generators, and other equipment needed. The cost of these capital investments has a major impact on rates and can be reduced by leveling out energy use on a daily and seasonal basis. Although these improvements are the responsibility of the utility provider and are in response to market forces, the costs of the improvements are paid by rate payers, including the CBJ government. Accordingly, it is the CBJ government's responsibility to support efforts that encourage non-utility private energy investments which reduce the community's financial investment in the electrical system.

Energy Efficient Buildings. Juneau's maritime climate and comparatively cold winters mean that keeping living spaces warm excessively consume energy if efficient heating, insulating and ventilating practices, materials, equipment and design are not used in the construction of new buildings and in remodeling existing buildings.

Industrial Energy Use. The design and operation of industrial developments can be managed to reduce, transfer, or minimize energy waste and to maximize use of renewable energy. Mining projects tend to be energy intensive and short-lived (tens of years). Within Juneau mining projects could have a great effect on the community's energy economy and be greatly affected by the CBJ energy policy. For industries with large amounts of fuel material by-products (e.g., wood waste), or with high temperature energy by-products (e.g., steam), the generation

of electrical energy for sale to the utility grid can be useful and increase overall community energy efficiency. Similarly, there are industries that produce large amounts of heat as a by-product, e.g., over one megawatt thermal, and that could use this energy resource to displace fossil fuel energy in nearby structures for space heating or other low temperature processes. The CBJ government could play a role in making such projects viable, saving considerable energy dollars for use in the community, rather than for export to pay fossil fuel energy costs.

Public Education on Energy. Individual consumer decisions and behavior are significant in governing the extent of required energy development. Nationally, there is a trend toward using rate incentives to further community energy goals. The effect of these incentives is maximized by advising consumers on how to take advantage of them. Only a well-educated citizenry is able to make well-informed decisions.

Policy 6.1 (page 29)

To work with utility and energy providers to analyze the local energy system, potential renewable energy sources, and emerging technologies; to establish a long-term energy plan; and to implement that plan for the affordable and sustainable use of energy in the community.

#	Action	2015 Progress: no action ongoing completed
6.1 - IA1	Analyze Juneau's internal and external energy economies and systems throughout system life-cycles.	
6.1 - IA2	Develop and implement a long range energy plan for Juneau that addresses both private-sector, public-sector, and CBJ government energy conservation and management goals, objectives, and an action plan. The plan should consider renewable energy sources, emerging technologies, and other plans being developed within the region and the state.	
6.1 - IA3	Host research projects that identify energy sources that use renewable resources such as hydro, tidal, solar, wind, and energy from organic waste (e.g., cellulosic ethanol) that can be used by households, businesses, and the public sector.	
6.1 - IA4	(i) Develop and examine scenarios for alternative long-term energy plans, including a risk management plan.	
6.1 - IA4	(ii) Based on alternative scenarios, identify courses of action for each scenario.	
6.1 - IA4	(iii) Implement actions that maintain flexible energy strategies that best meet Juneau's future energy needs.	
6.1 – IA5	Conduct public meetings to explain and develop the community's long-range energy plan.	
6.1 – IA6	Once an energy plan is developed, undertake an immediate reconsideration and rewrite of the policies and actions in this chapter for approval by the CBJ Assembly.	
6.1 – IA7	Assign a CBJ staff member to work with the Commission on Sustainability and provide them resources as necessary to ensure that Implementing Actions 6.1 – IA1, 2, and 4 are implemented in the near-term.	

Policy 6.2 (page 70)

To support the development of renewable energy resources in Juneau and in the Southeast Alaska region.

#	Action	2015 Progress: no action ongoing completed
6.2 - IA1	Work with the State of Alaska, Southeast Conference, Tlingit Haida Central Council, Douglas Indian Association, AEL&P, independent energy producers, and other interested entities toward the planning, funding, and development of renewable resources in Juneau and within the region.	
6.2 – IA2	Promote conversion from fossil fuel heating systems to geothermal, thermal, heat pump, biomass, or biofuel systems.	
6.2 – IA3	Promote the development and use of renewable energy sources to help meet the goals, strategies, and objectives of the Juneau Climate Action and Implementation Plan of 2011.	

Policy 6.3 (page 70)

To support the development of a Southeast Alaska intertie.

#	Action	2015 Progress: no action ongoing completed
6.3 – IA1	Work with the State of Alaska, Southeast Conference, Tlingit Haida Central Council, Douglas Indian Association, AEL&P, independent energy producers, and other interested entities toward the planning, funding, and development of a regional electrical intertie.	
6.3 – IA2	Support State of Alaska projects to extend electrical power along Glacier Highway to Cascade Point to improve highway safety, provide emergency services, reduce electrical costs and carbon emissions, and facilitate economic development.	

Policy 6.4 (page 70)

To provide cost-effective and energy-efficient facilities, systems and infrastructure that strengthens Juneau's role as the state capital.

#	Standard Operating Procedure	2015 Progress: no action ongoing completed
6.4 - SOP1	Invest in energy-efficient technologies and equipment that provide affordable electronic and physical access to state legislative, courts and other governmental agencies for Alaskan residents.	
6.4 - SOP2	The CBJ government must weigh the additional costs of public investment up front with long-term savings over the life of the improvement, and the improvement must at least generate a positive return over its life to be implemented.	

Policy 6.5 (page 71)

To incorporate technologies and operating practices that will promote efficient and cost effective energy use into all of its new and existing buildings and energy-using projects.

#	Standard Operating Procedure	2015 Progress: no action ongoing completed
6.5 -	Replace inefficient street lighting and lighting in CBJ-owned buildings and	

SOP1	facilities with efficient fixtures upon replacement cycle.	
#	Implementing Actions	2015 Progress: no action ongoing completed
6.5 - IA1	Establish and fund a revolving energy conservation investment fund to invest in energy-saving public projects that meet CBJ government return-on-investment criteria.	
6.5 - IA2	Invest in necessary metering equipment to produce monthly project energy reports.	
6.5 - IA3	Conduct energy audits and establish energy management goals for CBJ-owned buildings.	
6.5 - IA4	Develop and implement a system for rewarding CBJ employee initiative and responsibility in good energy management.	
6.5 - IA5	Continue to incorporate LEED-Juneau principles and standards when designing public structures and facilities, with appropriate fuel cost sensitivity analyses over the long term life of the Project.	
6.5 - IA6	When designing new facilities or major renovation of CBJ-owned facilities, analyze life-cycle costs of energy applications, and use that analysis to guide future development. [see also 6.7 - IA2]	
6.5 - IA7	Analyze the workings of CBJ water and wastewater facilities and incorporate energy-saving methods and technologies where appropriate.	
6.5 – IA8	CBJ government is to set an example for businesses and individuals in adopting cost-effective energy-saving technologies and operating procedures. Conduct post-improvement analysis of the energy savings. These results should be published as a learning and development tool for the building community.	

POLICY 6.6 (page 71 - 72)

To maximize the ratio of local, renewable-source energy to imported fossil-source energy in Juneau's internal energy economy.

#	Standard Operating Procedure	2015 Progress: no action ongoing completed
6.6 - SOP1	Encourage energy conservation to reduce the amount of money leaving the community to pay for fuels.	
#	Implementing Actions	2015 Progress: no action ongoing completed
6.6 - IA1	Seek federal and state funding to convert the CBJ fleet and, particularly, public transit vehicles, to dual-fuel, hybrid, or other fuel technologies with reduced carbon footprints and enhanced sustainability over fossil-fuel burning vehicles.	
6.6 - IA2	Where practicable in large industrial operations, encourage co-generation processes to transform by-product heat to electrical energy for use by the operation and adjacent uses or for transmission to a nearby electrical grid.	
6.6 - IA3	Where practicable and where there are no significant adverse impacts to marine or other ecosystems, encourage the use of tidal, geothermal, wind, heat pump technologies and other renewable energy sources to	

	generate energy for adjacent uses or for transmission to the electrical grid.	
6.6 - IA4	Encourage dual-fuel systems that are cost effective for buildings.	
6.6 - IA5	Coordinate with the University of Alaska, other research organizations, and companies to identify potential renewable energy sources to power vehicles, vessels, aircraft, and structures. Analyze both the short- and long-term costs and environmental impacts of energy production and distribution systems giving preference to dependable, cost-competitive, and renewable sources that do not adversely affect natural resources and wildlife habitat when choosing a source of energy.	

POLICY 6.7 (page 72-73)

To maximize the efficient use of renewable energy resources.

#	Implementing Actions	2015 Progress: no action ongoing completed
6.7 - IA1	Coordinate efforts with the University of Alaska and other research organizations and entities to identify potential renewable energy sources to fuel vehicles, vessels, aircraft, structures, and utilities and to heat structures. Analyze both the short- and long-term costs and environmental impacts of energy production and distribution systems and give preference to dependable, cost-competitive, renewable sources that do not adversely impact natural resources and ecosystems when choosing a source of energy.	
6.7 - IA2	When designing new facilities or major renovation of CBJ-owned facilities, analyze life-cycle costs of energy applications with consideration of renewable sources given priority. [see also 6.5 IA6]	

POLICY 6.8 (page 73)

To include the full costs (direct and indirect) of energy use in its economic analyses.

#	Standard Operating Procedure	2015 Progress: no action ongoing completed
6.8 - SOP1	Use quantifiable external and indirect costs in establishing the cost of energy when conducting life-cycle cost analyses of CBJ-owned facilities, projects, and operations.	
#	Implementing Actions	2015 Progress: no action ongoing completed
6.8 - IA1	Incorporate energy costs, fuel cost volatility, and inflation into scenario analyses conducted as part of long-term energy planning.	

POLICY 6.9 (page 73)

To encourage electrical energy use patterns that minimize utility investment.

#	Implementing Actions	2015 Progress: no action ongoing completed
6.9 - IA1	Work with electrical utility providers and energy developers to develop programs and educational materials promoting energy conservation.	

POLICY 6.10 (page 73)

To encourage cost effective energy efficient building and remodeling practices.

#	Implementing Actions	2015 Progress: no action ongoing completed
6.10 – IA1	Encourage the installation of energy-efficient heating systems in new construction.	
6.10 – IA2	Encourage participation in current residential energy efficient mortgage programs and other energy efficiency programs for both new and existing homes and businesses. Encourage favorable lending rate programs for energy efficient multifamily housing and commercial construction or renovation.	
6.10 – IA3	Establish energy efficient standards for new and existing buildings and adopt into local building Code, CBJ 19.	
6.10 - IA4	Encourage the conversion of existing heating systems from fossil fuel to renewable sources of energy.	
6.10 – IA5	Consider enacting water conservation ordinances that lead to significant energy savings for the CBJ government, and in turn to utility customers, in pumping water and in treating wastewater.	
6.10 – IA6	Encourage consideration of "life cycle" costs, the use of energy efficient construction techniques, materials, and equipment that are consistent with acceptable health and safety standards and that are appropriate for local climatic conditions, while keeping project costs low.	
6.10 – IA7	Consider providing incentives supporting 6.10 – IA6.	

POLICY 6.11 (page 74)

To encourage industrial and commercial users to be as efficient as possible in their use of energy, to use renewable energy sources, and to make energy by-products available for use elsewhere in the community.

#	Implementing Actions	2015 Progress: no action ongoing completed
6.11 – IA1	Encourage energy intensive projects to follow adopted CBJ energy policy.	
6.11 – IA2	Assist those proposing energy intensive projects in understanding, at the earliest point in their projects, the adopted CBJ energy policy.	
6.11 – IA3	Require the use of renewable and environmentally-sensitive energy sources for energy intensive projects, where cost effective.	
6.11 – IA4	Encourage the development of co-generated electrical energy at avoided cost.	
6.11 – IA5	Encourage appropriate land use patterns of development close to potential sources of surplus by-product heat.	

POLICY 6.12 (page 75)

To increase public understanding of how individual and CBJ government energy decisions affect individual consumer costs, as well as the livability and sustainability of the community.

#	Implementing Actions	2015 Progress: no action ongoing completed
6.12 –	The CBJ Commission on Sustainability and the Juneau School District	

IA1	should work together to improve energy education in K-12 public school educational curriculum within the Juneau Douglas School District, including: energy as a fundamental human need; historical perspective of energy; understanding our local energy system, and how it fits within the regional, state, federal, and world systems; helping students become smart consumers; informing future voters on the need to establish and maintain an energy system that is high quality, secure, equitable, and sustainable; and a multi-disciplinary approach to energy.	
6.12 – IA2	Encourage the private sector, with financial assistance from the CBJ government and support from the Commission on Sustainability, to conduct a public education program to explain the benefits of conservation of energy.	
6.12 – IA3	Conduct public meetings to explain and discuss the Energy Chapter of this Plan.	
6.12 – IA4	Suggest that the Regulatory Commission of Alaska consider allowing utility providers to charge rate payers for the company's investment in conservation efforts and education on a cost benefit basis.	