

**SB**

**42**

<TARGET><BILL>SB 42</BILL><SUBJECT>SB  
42</SUBJECT><COMM>HFIN27</COMM></TARGET>

**HOUSE COMMITTEE REPORT**

(11)

Date Referred to Committee: April 19, 2011

FURTHER REFERRALS:

Date of Committee Action: 4/19/11

The FINANCE Committee considered:

CSSB 42(FIN)

**CS FOR SENATE BILL NO. 42(FIN)**

"An Act relating to the quorum of the Alaska Energy Authority; relating to the powers and duties of the Alaska Energy Authority; relating to the acquisition or construction of a Susitna River power project by the Alaska Energy Authority; relating to the definition of 'feasibility study' in the Alaska Energy Authority Act; providing legislative approval for certain loans from the power project fund; and providing for an effective date."

**SB 42-POWER PROJECT; ALASKA ENERGY AUTHORITY**

Recommends it be replaced with  HCS or  CS for \_\_\_\_\_ (\_\_\_\_\_)  
 For Senate Bills with new title:  Technical Title  New Title: HCR \_\_\_\_\_  Same Title  New Title

- attach amendments
- add new referral to \_\_\_\_\_ Committee
- Letter of Intent \_\_\_\_\_ Committee

List of Abbrev for Depts.:

- ADM
- CEC
- COR
- CRT
- EED
- DEC
- DFG
- GOV
- DHS
- LWF
- LAW
- LEG
- MVA
- DNR
- DPS
- REV
- DOT
- UA

<u>NEW FISCAL NOTES</u>				
*FN# is assigned by Chief Clerk's Office				
*FN#	List by Dept(s):	Fiscal	Indet.	Zero

<u>PREVIOUS FISCAL NOTES</u>				
FN#	List by Dept(s):	Fiscal	Indet.	Zero
8	CEC	✓		
9	CEC	✓		

<u>Signing with recommendations</u>	Printed Last Name	DP	DNP	NR	AM
	DOOGAN	✓			
	Kara				
	FAIRCLOUGH	✓			
	T. Wilson	✓			
	COSTELLO	✓			
	Edgmon				
	N. Kump				
Chair:	Stoffer	✓			
Chair:	Thomas	✓			

# FISCAL NOTE

**STATE OF ALASKA**  
**2011 LEGISLATIVE SESSION**

Fiscal Note Number 9  
 Bill Version CSSB 42(FIN)  
 (S) Publish Date 4/19/11

Identifier (file name) SB42-CCED-AEA-04-15-11 Dept. Affected DCCED  
 Title Powers of Alaska Energy Authority Appropriation Alaska Energy Authority  
 Allocation Statewide Project Development  
 Alternative Energy and Efficiency  
 Sponsor Rules by Request of the Governor  
 Requester Senate Finance Committee OMB Component Number 2888

**Expenditures/Revenues** (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

	Appropriation Required	Information						
		FY 2012	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
<b>OPERATING EXPENDITURES</b>								
Personal Services	0.0		0.0	0.0	0.0	0.0	0.0	***
Travel	0.0		0.0	0.0	0.0	0.0	0.0	***
Services	1,350.0		1,413.5	1,476.1	1,538.1	1,606.8	1,606.8	***
Commodities	0.0		0.0	0.0	0.0	0.0	0.0	***
Capital Outlay	413.0		5.0	5.0	5.0	5.0	5.0	***
Grants								
Miscellaneous								
<b>TOTAL OPERATING</b>	<b>1,763.0</b>	<b>0.0</b>	<b>1,418.5</b>	<b>1,481.1</b>	<b>1,543.1</b>	<b>1,611.8</b>	<b>1,611.8</b>	<b>***</b>

<b>CAPITAL EXPENDITURES</b>								
-----------------------------	--	--	--	--	--	--	--	--

<b>CHANGE IN REVENUES</b>								
---------------------------	--	--	--	--	--	--	--	--

**FUND SOURCE** (Thousands of Dollars)

1002 Federal Receipts								
1003 GF Match								
1004 GF								
1061 CIP Receipts	1,763.0		1,418.5	1,481.1	1,543.1	1,611.8	1,611.8	***
1037 GF/Mental Health								
Other (please identify)								
<b>TOTAL</b>	<b>1,763.0</b>	<b>0.0</b>	<b>1,418.5</b>	<b>1,481.1</b>	<b>1,543.1</b>	<b>1,611.8</b>	<b>1,611.8</b>	<b>***</b>

Estimate of any current year (FY2011) cost \_\_\_\_\_

**POSITIONS**

Full-time								
Part-time								
Temporary								

**Why this fiscal note differs from previous version (if initial version, please note as such)**

This Fiscal Note estimates employee costs for Susitna Project Office and assumes that new staff are AIDEA employees contracted to the Alaska Energy Authority.

Prepared by Amy Adler  
 Division Alaska Energy Authority  
 Approved by Susan K. Bell, Commissioner  
Commerce, Community, and Economic Development

Phone 771-3013  
 Date/Time 4/15/11 4:00 PM  
 Date 4/15/2011

STATE OF ALASKA  
2011 LEGISLATIVE SESSION**Analysis**

This legislation expands the Alaska Energy Authority's powers to allow AEA to acquire a Susitna River power project.

This fiscal note reflects the costs to AEA to establish a project office in pursuit of constructing and owning the Susitna Hydro project.

**CONTRACTUAL: \$1,350.0**

**\$1,125.0 Contractual Services** for 8 staff (AIDEA employees) for the first year as follows:

Project Manager - Rg 27  
 Environmental Manager - Rg 26  
 Administrative Assistant - Rg 12  
 Project Accountant - Rg 18  
 Financial/Budget Analyst - Rg 24  
 Public Outreach/Legislation Liaison - Rg 23  
 Procurement Manager - Rg 24  
 Data System Specialist - Rg 20

*Note: Personal Services Costs are reflected in the related Fiscal Note for the AIDEA component.*

**\$225.0 Contractual Services** for Building lease, and G&A costs for Project Office. Cost estimates include a cost associated with contract labor personnel.

\$ 189.0 Annual Lease - 4,500 sq. ft. (250'/pp x 14 + 1000') x \$3.50 per sq. ft./mo. x 12 mo.'s.  
\$ 36.0 G&A Expense: \$3.6 per person - \$3.6 x 10 (8 staff + 2 contractors).  
 \$ 225.0

**EQUIPMENT/FURNITURE: \$413.0** - Increase for first year Project Office set up costs. This cost estimate assumes all equipment and furniture purchases in the first year as well as one time only moving expenses and tenant improvements.

\$ 28.0 IT Equipment \$2.0 per person x 14 (8 staff + 6 contractors). Assumes all equipment purchases in first year for project office (including contract labor needs).  
\$ 385.0 Tenant Improvement \$315.0 (\$70 x 4,500 sq. ft.); Moving Expenses \$21.0; and Furniture \$49.0  
 \$ 413.0

*Note: Tenant Improvement costs will vary depending on building configuration and may also be negotiated as part of a long term lease.*

\*\*\* Costs for FY 2017 indeterminate

# FISCAL NOTE

**STATE OF ALASKA**  
**2011 LEGISLATIVE SESSION**

Fiscal Note Number 8  
Bill Version CSSB 42(FIN)  
(S) Publish Date 4/19/11

Identifier (file name) SB42-CCED-AIDEA-04-15-11 Dept. Affected DCCED  
Title Powers of Alaska Energy Authority Appropriation Alaska Industrial Development & Export Authority  
Allocation Alaska Industrial Development & Export Authority  
Sponsor Rules by Request of the Governor  
Requester Senate Finance Committee OMB Component Number 1234

**Expenditures/Revenues** (Thousands of Dollars)

Note: Amounts do not include inflation unless otherwise noted below.

	Appropriation Required	Information						
		FY 2012	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
<b>OPERATING EXPENDITURES</b>								
Personal Services	1,125.0		1,181.3	1,240.3	1,302.3	1,367.4	***	
Travel	0.0		0.0	0.0	0.0	0.0	***	
Services	0.0		0.0	0.0	0.0	0.0	***	
Commodities	0.0		0.0	0.0	0.0	0.0	***	
Capital Outlay	0.0		0.0	0.0	0.0	0.0	***	
Grants								
Miscellaneous								
<b>TOTAL OPERATING</b>	<b>1,125.0</b>	<b>0.0</b>	<b>1,181.3</b>	<b>1,240.3</b>	<b>1,302.3</b>	<b>1,367.4</b>	<b>***</b>	

<b>CAPITAL EXPENDITURES</b>							
-----------------------------	--	--	--	--	--	--	--

<b>CHANGE IN REVENUES</b>							
---------------------------	--	--	--	--	--	--	--

**FUND SOURCE** (Thousands of Dollars)

1002 Federal Receipts							
1003 GF Match							
1004 GF							
1005 GF/Program Receipts							
1007 I/A Receipts	1,125.0		1,181.3	1,240.3	1,302.3	1,367.4	***
Other (please identify)							
<b>TOTAL</b>	<b>1,125.0</b>	<b>0.0</b>	<b>1,181.3</b>	<b>1,240.3</b>	<b>1,302.3</b>	<b>1,367.4</b>	<b>***</b>

Estimate of any current year (FY2011) cost \_\_\_\_\_

**POSITIONS**

Full-time	8		8	8	8	8	***
Part-time							
Temporary							

Why this fiscal note differs from previous version (if initial version, please note as such)

This Fiscal Note estimates employee costs for Susitna Project Office and assumes that new staff are AIDEA employees contracted to the Alaska Energy Authority. This revised fiscal note includes, for informational purposes, the estimated Personal Services costs to AIDEA for the years noted for the eight positions.

Prepared by Amy Adler  
Division Alaska Energy Authority  
Approved by Susan K. Bell, Commissioner  
Commerce, Community, and Economic Development

Phone 771-3013  
Date/Time 4/15/11 4:00 PM  
Date 4/15/2011

FISCAL NOTE #8

STATE OF ALASKA  
2011 LEGISLATIVE SESSION

BILL NO. CSSB 42(FIN)

**Analysis**

This legislation expands the Alaska Energy Authority's powers to allow AEA to acquire a Susitna River power project.

This fiscal note reflects the costs to AIDEA for the increase in personal services related to AEA's establishment of a project office in pursuit of constructing and owning the Susitna Hydro project.

**PERSONAL SERVICES: \$1,125.0** - Increased to include 8 staff for the first year as follows:

Project Manager Rg 27

Environmental Manager Rg 26

Administrative Assistant Rg 12

Project Accountant Rg 18

Financial/Budget Analyst Rg 24

Public Outreach/Legislation Liaison Rg 23

Procurement Manager Rg 24

Data System Specialist Rg 20

The funding source is an increase to I/A receipts from the Alaska Energy Authority.

See also the related Fiscal Note for the costs to AEA Statewide Project Development component to establish a project office for the Susitna Hydro project.

Alaska State Legislature  
HOUSE FINANCE COMMITTEE  
Agenda  
PM

Tuesday, April 16, 2011

SB 42-POWER PROJECT; ALASKA ENERGY AUTHORITY

2 Fiscal Notes apply:

Published #8 & 9 DCCED \$

*Bills Previously Heard or Scheduled*

*Order of bills will be determined at the beginning of Committee*

STATE CAPITOL  
PO Box 110001  
Juneau, Alaska 99811-0001  
907-465-3500  
fax: 907-465-3532



550 West 7th Avenue #1700  
Anchorage, Alaska 99501  
907-269-7450  
fax: 907-269-7463  
www.gov.alaska.gov  
Governor@alaska.gov

Governor Sean Parnell  
STATE OF ALASKA

January 14, 2011

The Honorable Gary Stevens  
President of the Senate  
Alaska State Legislature  
State Capitol, Room 111  
Juneau, AK 99801-1182

Dear President Stevens,

Under the authority of Article III, Section 18, of the Alaska Constitution, I am transmitting a bill that would authorize the Alaska Energy Authority (AEA) to move forward on pursuing a large hydroelectric project to supply much needed energy to Interior and Southcentral Alaska. The bill would authorize AEA to acquire, construct, own, and operate new power projects; create a new Alaska Railbelt energy fund as a fund of AEA; repeal the existing Railbelt energy fund (AS 37.05.520) after the balance of the existing fund is appropriated and transferred into the new fund or appropriated and expended for other purposes; address quorum requirements of the AEA board; and allow for the adoption of regulations to govern the procurement of supplies, services, professional services, and construction.

Alaska's State Energy Policy target is to reach 50 percent of its electricity generation through renewable energy by 2025. To achieve this goal, we must move aggressively and invest now to develop capacity for a major hydroelectric project on the Susitna River. This legislation allows AEA to continue with environmental and feasibility studies positioning the State to seek preliminary approval from the Federal Energy Regulatory Commission for a project that will provide half of Southcentral's electricity demand.

Alaska must invest now to create new opportunities for economic development and jobs for Alaskans. A Susitna Dam hydroelectric project will provide an important and much needed supply of renewable energy for Alaskan homes and businesses while creating jobs for Alaskans. A sectional analysis is provided with this packet.

I urge your prompt and favorable action on this important measure.

Sincerely,

A handwritten signature in black ink that reads "Sean Parnell".

Sean Parnell  
Governor

Enclosure



April 19, 2011

The Honorable Bill Stoltze  
The Honorable Bill Thomas  
Co-Chairs, House Finance Committee  
Alaska State Legislature  
State Capitol Rm 516  
Juneau, Alaska 99801-1182

RE: CSSB 42 (FIN) - Power Project: Susitna/ Alaska Energy Authority

Dear Representatives Stoltze and Thomas:

Thank you for scheduling SB 42 for the House Finance Committee during this first special session of the Twenty-Seventh Legislature. This legislation is required to allow for the Alaska Energy Authority (AEA) to move forward with the Susitna (Watana Location) Hydroelectric Power Project.

On April 19, 2011 CSSB 42 (FIN) was calendared for a vote in the Senate. Assuming no additional changes will be made by the Senate, CSSB 42 (FIN) would authorize the Alaska Energy Authority (AEA) to 1) move forward on the Sustina power project 2) increase the quorum for the AEA Board of Directors from three to four of seven members and 3) provide legislative approval for two power project fund loan projects.

The legislation will assist AEA in fulfilling its mission to support the development of energy resources in Alaska. Alaska's Energy Policy target is to reach 50 percent of its electricity generation through renewable energy by 2025. A new large hydroelectric project is needed to achieve this goal. In November 2010, AEA released its "Preliminary Decision Document" identifying the Watana hydroelectric project on the Susitna River as the recommended project to pursue. This legislation would authorize AEA to file a preliminary permit application with the Federal Energy Regulatory Commission.

The Senate Resources Committee amended SB 42 by removing AEA's ability to adopt its own procurement regulations and the Senate Finance Committee further amended the bill by:

- Deleting the creation of a new Alaska Railbelt Energy Fund and repeal of the existing Railbelt Energy Fund.
- Deleting provisions to enable AEA to hire staff in the exempt services and deleting related transitional provisions for transferring staff from the Alaska Industrial Development and Export Authority to AEA.

The Honorable Bill Stoltze  
The Honorable Bill Thomas  
April 19, 2011  
Page 2 of 2

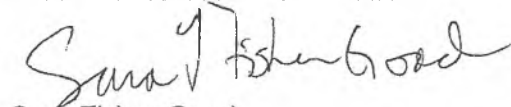
- Deleting proposed re-establishment of AEA's power to acquire and own new power projects. AEA is given authority to acquire and own one new power project located on the Susitna River.
- Amending AEA's powers by adding the ability for AEA to acquire property rights and interests by eminent domain under AS 09 specific to the Susitna River power project.
- Adding a requirement that AEA submit an annual report on the Susitna River power project to the legislature.
- Deleting provisions to enable AEA to form subsidiary corporations as a legal structure to acquire, own and operate projects and deleting related provisions which would have made any AEA subsidiary corporation subject to statutes that apply to AEA in acquiring, owning and operating power projects. The Senate Resources Committee had required legislative approval for specific subsidiaries.
- Adding legislative approval for two power project fund loans for the Haida Energy, Inc. Reynolds Creek hydroelectric project and Cordova Electric Cooperative Humpback Creek hydroelectric project.
- Minor technical corrections and edits by Legislative Legal Division were also made to the bill.

On April 12, 2011 the House Finance Committee passed HB 103 from committee; HB 103 is the companion bill to SB 42. There is one word change difference from CS HB 103 (FIN) and CS SB 42 (FIN); the House bill amended AS 44.83.080(10) by inserting the word "acquisition" on page 2, line 29; the Senate bill does not change existing language. AEA has no objection to the changes in CS SB 42 (FIN).

On behalf of AEA, thank you for scheduling SB 42 pending referral and we urge favorable action on this bill. A copy of CS SB 42 (FIN) and other related materials are included with this letter. Please let me know if you require any other information. Thank you for considering this request.

Sincerely,

ALASKA ENERGY AUTHORITY



Sara Fisher-Goad  
Executive Director

Attachments

**CS SB 42(FIN) Work Draft E**  
**April 15, 2011**  
**Sectional Analysis**

**Section 1:** Would increase from 3 to 4 the quorum requirement for meetings of the AEA board of directors in reaction to statutory amendments made in 2010. Those amendments increased the size of the AIDEA board from 5 to 7. The AIDEA board serves as the board of AEA. The proposed amendment would correct the quorum for meetings of AEA's board of directors.

**Section 2:** Would expand AEA's powers to allow AEA to apply for permits and licenses to acquire and construct new projects, to construct or otherwise acquire a power project on the Susitna River, to conduct feasibility studies of new power projects. This authority would enable AEA to initiate the FERC licensing process for the Watana hydroelectric project on the Susitna River. Authorizes AEA to acquire property rights by eminent domain under AS 09.

**Section 3:** Would require AEA to submit to the legislature an annual report summarizing the status of the Susitna River power project.

**Section 4:** Would provide that AEA must exercise for new power projects, existing statutory authority regarding the management of AEA owned power projects. AS 44.83.396 addresses how AEA administers the power project and contracts for operators, and includes provisions providing for AEA to contract with qualified utilities for the operation of a power project. The statutory provisions are currently limited to power projects from the pre-1993, "former energy program for Alaska."

**Section 5:** Would amend the definition of "feasibility study" under AS 44.83.990(3) so that the term is not limited to only pre-1993 power projects.

**Section 6:** Would provide legislative approval for AEA to make two power project loans. The first loan is for up to \$11,000,000 for the Haida Energy, Inc. Reynolds Creek hydroelectric project. This authorization would be in addition to the legislative approval given for a \$9,000,000 loan for the project under sec. 6, ch. 70, SLA 2010; for a total approved power project loan of up to \$20,000,000. The second loan is for \$5,000,000 for the Cordova Electric Cooperative Humpback Creek hydroelectric project. Under AS 42.45.010(j), the legislature must approve the project and power project loan amount if the cumulative state monetary support from loans, grants, and bonds for the project equals or exceeds \$5,000,000.

**Section 7:** Would provide for an immediate effective date.

## Public Involvement Opportunities in the FERC Licensing ILP and ALP Hydroelectric Licensing Processes

Licensing a hydroelectric project under the Federal Energy Regulatory Commission's (FERC) licensing procedures is a multi-year process that provides considerable opportunity for public input and participation. The licensing process is based on federal laws and regulations that require several years worth of extensive planning, environmental studies, resource agency and native American consultation, community meetings and opportunities for public comment. There are numerous opportunities for engaging the public in this lengthy process of studying, preparing, and evaluating a licensing proposal.

Of the Commission's three available licensing processes, both the Integrated Licensing Process (ILP) and Alternative Licensing Process (ALP) mandate specific requirements for informing and consulting with members of the public, citizen groups and other non-governmental organizations (NGOs). Increased public involvement is one of the goals of the ILP and ALP processes over the earlier "Traditional" Licensing Process (TLP) that had been in place for many decades. The ALP and TLP require written support from agencies and NGO's to get approval from FERC, while the ILP is the default process that requires no special approvals. While the TLP offers some flexibility in terms of stakeholder outreach it would not be a good fit for a Project like Watana because it would not provide the opportunities for stakeholders to participate in the study process and the ability for the public to participate are less than those of the ILP or ALP. Because the ILP provides a structured formal sequence for all licensing steps, all participants are enabled to play key roles from the very beginning of the process. The ALP is a bit more informal, but has similar steps to the ILP in allowing opportunities for public participation; the only real difference is that the timeframes for each step can vary and will not necessarily be known in advance to the public and other potential interested parties. Both the ILP and ALP were designed by the Commission to involve a wider range of participants at an earlier stage in the licensing process versus the previous TLP.

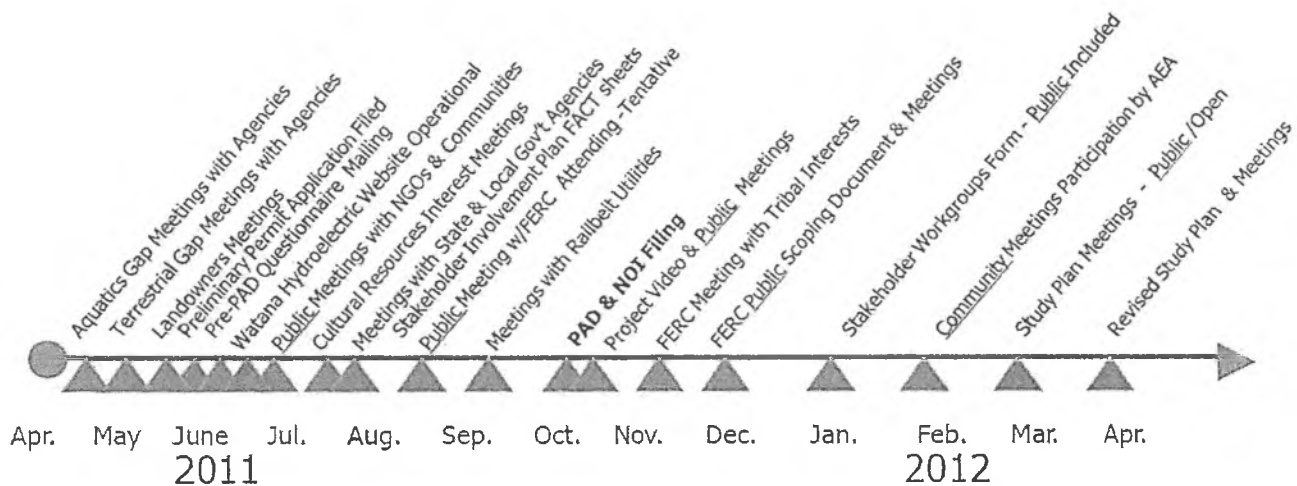
In general, the public has tremendous opportunities for input from the outset of any of the FERC licensing processes, beginning with consultation that takes place before the licensee publishes its Notice of Intent (NOI) to even file for a license. For the Watana Hydroelectric Project, some of the main pre-PAD public activities that would be important are outlined in the following timeline that assumes filing of a NOI and PAD in fall of 2011.

<u>Timeframe:</u>	<u>Activity:</u>
April – June 2011	Landowner meetings AEA Web site operational (to be update regularly) Pre-PAD Questionnaire mailings Hydro mailing list Community and interest organization informational meetings
July – September 2011	Public meetings with FERC (to describe process) Stakeholder Involvement Plan – Communication plan Project Fact Sheet AEA Web site (continually update)
October – December 2011	PAD & NOI filed Public information sheets

FERC meeting with Tribal Interests  
 FERC Public Scoping Document & Meetings  
 FERC website, mailing list, written comments  
 AEAWeb site (continually updated)

January – March 2012

Stakeholder workgroups formed  
 Community meetings  
 Study Plan meetings  
 Revised Study Plan & meetings  
 FERC website, mailing list, written comments  
 AEAWeb site (continually update)



**Public Participation Opportunities Common to all FERC Licensing Processes**

In general, all of FERC’s licensing processes involve two distinct parts: Pre-Application activities, which can be divided into other phases; and Post-Filing activities which are led by FERC. The first Pre-Application activity phase includes preparation and filing with FERC by the applicant of a NOI to file an application for a license and a Pre-Application Document (PAD). As part of the PAD, applicants are required to not only consult with the public and all interested parties, but also to develop and maintain licensing mailing lists of all interested parties who wish to receive information regarding the Project licensing. Under any of the FERC processes, anyone who wishes to be included can add their name and contact information to the mailing lists that will eventually be used for a variety of required notifications by the applicant, FERC, and other agencies. In both Pre-Application and Post-Filing phases license applicants, agencies and FERC and any member of the public can access FERC’s web-based e-library system that will hold the Commission’s complete records filed under a specific FERC Project number (or docket number). Any party can search and download documents, write and file letters and other documents themselves. Interested parties can even subscribe to an email service that will inform them of new filings as they come in. Lastly, any interested party can formally intervene in a Project proceeding through FERC’s e-library if they wish to be able to seek formal rehearing or ultimately appeal the Commission’s findings in a Federal court.

Most all modern licensing efforts also include a Project specific website hosted by the applicant where documents, meeting notices and other information are made available. AEA is currently in the final

stages of developing a new Website specifically for the Watana Project complete with listserv capabilities where interested parties can sign up for emails to stay abreast of current activities in the licensing process. Additionally, the PAD and license application filings are required to be sent to public libraries under any of the FERC licensing processes. All of FERC processes require applicants and FERC to place public notices in regional newspapers at the time of most major filings and prior to public meetings. In summary, members of the public can:

- Get placed on mailing lists and access licensing information through each stage of the process.
- Provide written comments to FERC and all other parties at any time documenting concerns with, or support for the Project.
- Provide oral comments and ask questions of Commission staff and the applicant at public scoping meetings, site visits, and in other meetings.
- Submit study requests and participate in workgroups during study plan development (varies by FERC licensing process).

### **Public Involvement Opportunities under the ILP and ALP**

The PAD provides FERC and potential interested parties with existing, relevant and reasonably available information pertaining to the Project to help identify potential impacts, issues and related information needs, to develop study requests and study plans.

Under the ILP regulations, within 120 days of the date the NOI is filed, FERC holds initial meetings with all potentially-affected tribes or other Native American interests; issues a public notice that the NOI and PAD have been filed; prepares and issues a Scoping Document 1 (SD1) that discusses the project and related issues; and holds public meetings and site visit. FERC scoping meetings are typically held over a several day period with daytime and evening meetings in several locations in the Project area. Each meeting provides the opportunity for the public to view formal presentations and learn more about the Project plans and licensing process. The meetings provide opportunities for interested parties to give verbal testimony that is transcribed by a court recorder. The transcribed comments are made available to the public on FERC's eLibrary. Written comments may also be submitted during the scoping meetings or at any time in the licensing proceeding. Thirty days after the last scoping meeting, all interested parties may file comments with FERC on the NOI, PAD, and SD1.

FERC's scoping process in an ALP will normally take place later than under the ILP unless requested by the applicant and stakeholders, in which case it would be similar to the ILP process although the requirement for meeting with the potentially-affected tribes and other Native American groups is not set on a specific timeline under the ALP regulations. The advantage of the ILP for the public is that all parties will have certainty they can participate at a set point, early in the process and that will allow them a chance to get engaged in all of the subsequent licensing stages rather than entering the process after most decisions regarding studies and other commitments have been made.

Under the ILP, within 195 days after the PAD is filed, the applicant must file a Proposed Study Plan that includes detailed plans for each study it proposes to perform. Within 90 days, the applicant must hold at least one study plan meeting open to all interested participants, and interested parties may file comments on the Proposed Study Plan. Thirty days later, the applicant must file a Revised Study Plan, and 30 days after that FERC must issue a Study Plan Determination, which orders the applicant to perform the studies described by FERC in the Determination. The process for the ALP is less formal and does not have the pre-determined, prescribed steps and timelines, so it is often more difficult for interested parties to know when they can participate. In an ALP the public can provide similar input to study plans

and get involved in the process and would have the best chance for involvement if they join into the ALP collaborative licensing groups that are set up early in the process.

The ILP and ALP generally provide for two seasons of field studies. At the conclusion of both field seasons under the ILP, the applicant files a Study Report with FERC that describes the applicant's progress in performing the studies, and identifies any variances and modifications, including new studies. All interested parties have an opportunity to meet with the applicant to discuss each report and file comments with FERC before FERC makes a determination regarding the proposed modifications. The final Pre-Application activity phase commences when the applicant files either a Draft License Application (DLA) or a Preliminary Licensing Proposal (PLP), which must be filed no later than 150 days before the applicant must file its Final License Application (FLA). The ALP follows a similar sequence but may include an applicant-prepared Environmental Assessment also available for public comment. Interested parties have 90 days to file comments on the DLA or PLP under either process. Lastly, a Final License Application is prepared under both ILP and ALP that documents how the applicant has collaborated with federal and state agencies, tribes and the public regarding the measures.

Post-Filing activities commence once the applicant files its Final License Application. During the Post-Application activities FERC will: 1) determine if the application is complete and request additional information from the applicant if needed; 2) prepare an Environmental Assessment or Environmental Impact Statement (EIS) consistent with the National Environmental Policy Act once the application is complete; and 3) make a decision on issuance of the license, including license terms and conditions. In this process the public is notified and allowed participation through direct mailings from the applicant's mailing list, through posting in FERC's e-library, and through public meetings and newspaper notices.

### **Development of a Stakeholder Involvement Plan**

While not specifically required under an ALP or ILP, a stakeholder involvement plan is essential to successful licensings as it is widely known that it is better to engage potentially interested parties early, rather than have them join into the process late with their concerns. A stakeholder involvement plan is developed prior to filing of the PAD and typically addresses the following items:

- A Communications Plan that clearly describes the procedures for information sharing including:
  - Providing comments
  - Public & working meetings (notices, minutes, etc)
  - Document distribution protocols
  - Study requests procedures
- Identifies potential stakeholders early on
- Develops a Strategic/Media Relations Plan
- Provides means to get early conversations going with key stakeholders
- Provides potential "polling" opportunities (PAD questionnaire)
- Develops a framework to obtain rapport with all stakeholders
- Benchmark potential mitigation measures and highlights Project benefits
- Provides framework for how a Web page should be structured
- Lays out a plan for how public meetings, open houses, and site visits should be organized and ran.
- Describes when and how direct mailings should be used.
- Lays out a plan for engaging the media to get newspaper & other media outlet coverage
- Addresses the need and outlines how Project managers can attend and participate in other regular community or agency meetings



# **Railbelt Large Hydro Evaluation Preliminary Decision Document**

November 23, 2010

Prepared By  
Alaska Energy Authority



November 23, 2010

Executive Director's Statement:

The Alaska Energy Authority (AEA) has been appropriated \$10 million in State funds to start planning and designing a large hydroelectric project. Our first goal has been to identify the project to pursue that would give the State the best chance of success to be built and meet the State's goal to produce 50% of Alaska's electrical energy from renewable resources by 2025. It has been generally understood that a multi-billion dollar hydroelectric project will require State participation and financial assistance.

In the Preliminary Decision Document AEA has focused its efforts on the Susitna River and Chakachamna hydroelectric projects. This document provides a risk analysis comparison of the two projects by summarizing the known information and risks of the two projects and identifies the Susitna Hydroelectric project as the recommended primary project for the State to pursue. The Chakachamna project is recommended to be studied as an alternative to Susitna. Alternative projects need to be evaluated as part of the FERC licensing process, unless or until it is determined that there is reason to reject it as an alternative. As an alternative project, AEA recommends allocating the minimum necessary State funds to study the Chakachamna project thereby using the maximum amount available to further advance the Susitna project.

AEA will hold public workshops in February to educate and receive input from the public on the Preliminary Decision Document and the recommended approach to meet the Alaska's 50% renewable energy goal by 2025. After December, please refer to our webpage, [www.akenergyauthority.org](http://www.akenergyauthority.org) for workshop schedule. In the meantime, I encourage interested parties to submit written comments to AEA by the any of the following methods:

Email: [largehydro@aldea.org](mailto:largehydro@aldea.org)

Fax: 907-771-3044 Attn: Large Hydro Project

Address: Large Hydro Project  
Alaska Energy Authority  
813 West Northern Lights Blvd  
Anchorage, AK 99503

AEA looks forward to your comments on the Preliminary Decision Document.

Sincerely,

ALASKA ENERGY AUTHORITY

A handwritten signature in black ink that reads "Michael C. Harper".

Michael C. Harper  
Acting Executive Director

# **Railbelt Large Hydro Evaluation**

## **Preliminary Decision Document**

---

November 23, 2010

# Table of Contents

<b>Executive Summary .....</b>	<b>1</b>
<b>Chapter 1    Project Descriptions .....</b>	<b>1-1</b>
1.1    Susitna River Hydroelectric Project (Low Watana Non-expandable Alternative) .....	1-1
1.2    Chakachamna Hydroelectric Project.....	1-2
<b>Chapter 2    Engineering Issues .....</b>	<b>2-1</b>
2.1    Access .....	2-1
2.1.1    Susitna Project .....	2-1
2.1.2    Chakachamna Project .....	2-1
2.1.3    Access Comparison .....	2-1
2.2    Transmission.....	2-1
2.2.1    Susitna Project .....	2-1
2.2.2    Chakachamna Project .....	2-2
2.2.3    Transmission Comparison .....	2-2
2.3    Geologic Hazards.....	2-2
2.3.1    Susitna Project .....	2-2
2.3.2    Chakachamna Project .....	2-2
2.3.3    Geologic Hazards Comparison .....	2-3
2.4    Estimates of Probable Project Development Costs.....	2-3
2.4.1    Susitna Project .....	2-3
2.4.2    Chakachamna Project .....	2-4
2.4.3    Cost Comparison .....	2-5
<b>Chapter 3    Environmental Issues .....</b>	<b>3-1</b>
3.1    Fisheries.....	3-1
3.1.1    Susitna Project .....	3-1
3.1.2    Chakachamna Project .....	3-2
3.1    Wildlife Impacts .....	3-3

3.1.1	Susitna Project .....	3-3
3.1.2	Chakachamna Project .....	3-4
3.2	Environmental Flow .....	3-4
3.2.1	Susitna Project .....	3-4
3.2.2	Chakachamna Project .....	3-5
3.2.3	Environmental Flow Analysis .....	3-6
<b>Chapter 4</b>	<b>Preliminary Energy Estimate.....</b>	<b>4-1</b>
4.1	Evaluation of Average Annual Energy and Firm Winter Capacity .....	4-1
4.1.1	Susitna Model Assumptions and Data Sources .....	4-1
4.1.2	Chakachamna Model Assumptions and Data Sources.....	4-1
4.2	Results.....	4-2
<b>Chapter 5</b>	<b>Permitting.....</b>	<b>5-4</b>
5.1	Overview – Regulatory Processes .....	5-4
5.2	Regulatory Issues – Chakachamna Project .....	5-4
5.2.1	Licensing Schedule .....	5-5
5.3	Regulatory Issues – Susitna / Low Watana Project .....	5-5
5.3.1	Licensing Schedule .....	5-5
5.4	Total Project Development Timeline.....	5-6
<b>Chapter 6</b>	<b>Development Schedule.....</b>	<b>6-1</b>
<b>Chapter 7</b>	<b>Financial .....</b>	<b>7-1</b>
<b>Chapter 8</b>	<b>Cost of Power.....</b>	<b>8-1</b>
<b>Chapter 9</b>	<b>Operational Uncertainty .....</b>	<b>9-1</b>
<b>Chapter 10</b>	<b>Summary and Conclusions .....</b>	<b>10-1</b>

<b>Chapter 11</b>	<b>Recommendations</b> .....	<b>11-1</b>
<b>Chapter 12</b>	<b>References</b> .....	<b>12-1</b>
	12.1 Reference Lists .....	12-1

**Tables**

Table 2-1	Susitna, Low Watana Project Cost Summary .....	2-3
Table 2-2	Chakachamna Project Cost Summary Table.....	2-4
Table 3-1	Potential Environmental Impacts of the Low Watana Hydroelectric Project on the Susitna River.....	3-3
Table 3-2	Estimate of Probable Environmental Flows.....	3-6
Table 3-3	Comparison of Potential Environmental Impacts Resulting from Chakachamna Lake Hydro Alternatives.....	3-7
Table 4-1	Firm Capacity and Average Annual Energy Estimates .....	4-2
Table 5-1	Development Schedule Comparison.....	5-6
Table 6-1	Considerations / Assumptions .....	6-1
Table 6-2	Licensing, Engineering, and Construction Schedule Comparison.....	6-2
Table 8-1	Cost of Power Comparison .....	8-1
Table 9-1	Operational Uncertainties Issue Comparison.....	9-1
Table 10-1	Comparison Summary .....	10-1

**Figures**

Figure 1-1	Locations of the Susitna Project (Low Watana Alternative) and the Chakachamna Project .....	1-3
Figure 1-2	Vicinity of the Chakachamna Project .....	1-4
Figure 3-1	Susitna River monthly mean flow at Gold Creek .....	3-5
Figure 3-2	Chakachamna Lake Elevation by Month.....	3-8
Figure 3-3	Chakachamna River Flows (Downstream of Lake) by Month .....	3-1
Figure 4-1	Energy Distribution by Month.....	4-2

## Terms and Acronyms

AEA	Alaska Energy Authority
ALP	Alternative License Process
APA	Alaska Power Authority
cfs	cubic feet per second
Chakachamna Project	Chakachamna Hydroelectric Project
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
GWhrs	Gigawatt hours
HB	House Bill
ILP	Integrated License Process
IRP	Integrated Resource Plan
KWhrs	Kilowatt hours
MW	Megawatt
NOI	Notice of Intent
NP	National Park
PAD	Preliminary Application Document
Railbelt	The region of Alaska served by the railroad, stretching from Seward to Fairbanks
RIRP	Regional Integrated Resource Plan
SNW	Seattle Northwest Securities
Susitna Project	Susitna Hydroelectric Project, Low Watana Non-expandable Alternative
TBM	tunnel boring machine
TLP	Traditional License Process

# Executive Summary

---

There are two proposed major hydroelectric projects in the Alaska Railbelt Region: the Susitna Hydroelectric Project, Low Watana Non-expandable Alternative (Susitna Project) and the Chakachamna Hydroelectric Project (Chakachamna Project). The purpose of this document is to identify which of these is most likely to successfully meet the long term energy needs of the railbelt at reasonable cost. This preliminary evaluation also considers the possibility to permit a project in its presently proposed configuration and to be able to do so in a reasonable time frame.

The 2010 AEA Regional Integrated Resource Plan (RIRP) is a 50-year long range plan that identifies combinations of generations and transmission capital improvement projects in the railbelt region (Black and Veatch 2010). The RIRP documented the need for a large amount of new annual generation for the railbelt within the next 10 to 15 years. The type of generation constructed will be influenced by declining Cook Inlet natural gas production, legislative environment, financing, and ability to permit or license and construct a project in a timely manner.

The 2010 Alaska legislature passed House Bill (HB) 306 which declares a State energy policy. This bill directs the State to receive 50 percent of its electrical generation from renewable and alternative energy sources by 2025. The only way to achieve this goal is for a new large hydroelectric project to be built in the railbelt region. The project sites, one on the Susitna River at Watana and one at Lake Chakachamna, are shown on Figure 1-1. The energy generated by one of these two projects would provide roughly one fourth (Chakachamna) to roughly one half (Susitna) of the current electrical energy demand.

Alaska Energy Authority received funding from the Alaska Legislature in 2010 for the preliminary planning, design, permitting and field work for the Susitna and Chakachamna Projects, as well as Glacier Fork Hydroelectric Project and other hydroelectric projects along the Railbelt. Most of the funds were allocated to the Susitna and Chakachamna Projects. There are a variety of alternatives on the Susitna River as documented in the HDR Report (2009). The Susitna Project chosen for this comparison is the Low Watana Non-expandable alternative. It was chosen because it offers a combination of greater winter storage capacity while still maintaining a low overall cost and low cost of power generated.

Permitting and licensing of a large hydroelectric project is regulated by the Federal Energy Regulatory Commission (FERC) and is a lengthy, complex and costly process. For this reason, the two projects must be evaluated at an early stage to determine if either has a fault that would prevent it from being licensed and constructed. As substantial research has already been done on each project, this document summarizes existing information on the projects, and uses this information for evaluation and comparison. Additional detailed information is available in the referenced documents. By using existing information to choose a primary project, resources can be concentrated on its development, with the goal of satisfying future railbelt energy demand and compliance with the legislative intent that the State receives 50 percent of its electric generation from renewable and alternative energy sources by 2025.

The ultimate goal of developing a project is to provide a cost-effective and long-term energy source to the railbelt region. Therefore, the cost, potential environmental impact, engineering issues and energy production potential of both projects were evaluated. This evaluation highlights key elements of each project that affect the cost of resulting energy, timeliness of energy contribution, and long term environmental and the projects' socioeconomic operational effects.

The results of this comparison show that the Susitna Project should be the Alaska's primary hydroelectric project; the Chakachamna Project should be considered as an alternative. Although the design, permitting and construction of the Susitna Project would cost approximately 50 percent more than it would for the Chakachamna Project the Susitna Project would produce more than twice the annual amount of energy as the Chakachamna Project. In addition, risk of cost overruns with the Chakachamna Project would be much greater than with the Susitna Project because of the extensive underground work required and its location in steep terrain.

The environmental impact of the Chakachamna Project would also be greater because it would require a cross-basin water transfer in a river system with salmon migration. Significant salmon runs travel to and through Lake Chakachamna. To allow enough environmental flow to protect fisheries, energy from the Project would have to be substantially reduced.

Additional conclusions that can be drawn from the comparison of the two projects include:

- As indicated above, in terms of energy production, the Susitna Project would produce more than two times the amount of the Chakachamna Project. The Susitna Project would have the added advantage of sufficient storage for significant energy production in the winter.
- The licensing, permitting and construction process for the Chakachamna Project would take roughly 3.5 years longer than for the Susitna Project because of the complex environmental studies required for the cross basin transfer and the time for the tunnel construction.
- The State would need to contribute substantial equity and be the licensee for either project. The ability to finance the projects is equal in either case.
- There are relatively less long term operational uncertainties for the Susitna Project.
- Both projects have some seismic risk; however the dams and powerhouses could be designed to withstand major seismic events as long as a fault does not pass through the structure. The Chakachamna Project has a relatively greater risk of damage to the power tunnel or fish passageway during a seismic event or volcanic eruption.
- The Susitna Project would be a larger construction project and have greater impacts on electrical rates than the Chakachamna Project along the railbelt and Statewide, in the form of lower rates in the long term.

- The Susitna Project would allow the State to achieve the State Energy policy goal of 50 percent renewable by 2025. The Chakachamna Project would not accomplish this goal by itself.

Overall, the Susitna Project would have a relatively lower cost of energy, fewer likely environmental effects, could start sooner, a reduced licensing/permitting schedule, less construction and long term operational risk, and greater positive impacts on the Alaskan economy than the Chakachamna Project.

A year of field studies at Lake Chakachamna would not be sufficient to determine an definitive environmental flow, would not predict project energy outcomes, or substantially change the economic factors that make the Susitna Project more desirable. Thus, Chakachamna Project field work should not proceed in 2011. Instead it may be prudent to perform some additional studies to confirm conceptual size optimization and cost.

Much of the information in this document came from reports prepared by HDR (HDR 2010), R&M Consultants/Hatch Associates Consultants (R&M Consultants/Hatch Associates Consultants 2010), and Seattle-Northwest Securities Corporation (SNW 2010). In addition, R&M Consultants/Hatch Associates provided Operational Uncertainty evaluation in Chapter 9. The referenced documents should be read for the full assumptions. Referenced documents and other important documents regarding these projects are available on the Alaska Energy Authority's Railbelt Large Hydro webpage.

## Chapter 1

# Project Descriptions

---

Each of the potential projects is described in the following section.

### 1.1 Susitna River Hydroelectric Project (Low Watana Non-expandable Alternative)

A two dam scheme was developed for the Susitna River Hydroelectric Project initially by the Corps of Engineers in the late 1970's for which a feasibility study was completed by Acres American Inc. for the Alaska Power Authority (APA) in 1982 (Acres 1982) and a license application was filed with FERC. An amended license was prepared in 1985 (Harza Ebasco 1985) and the project was cancelled in early 1986. Extensive site work including surveying, deep rock drilling as well as soil drilling and sampling was conducted at the Watana site. In addition environmental studies including fish and wildlife studies were conducted throughout the basin and included instream flow studies in the side channel sloughs downstream of Portage Creek.

In the two dam scheme developed in the Acres feasibility study (Acres 1982) the upper dam was at Watana (Figure 1-1) and was to be an 885 foot high earthfill embankment with a 1040 MW underground powerhouse. It was to be constructed first. The amended license (Harza Ebasco 1985) proposed to develop the project in three stages instead of two with an expandable 700 foot high embankment at Watana as the first phase with an installed capacity of less than 500 MW.

A number of hydroelectric generation alternatives were studied recently on the Susitna River (HDR 2009), of which the Low Watana Non-Expandable Alternative is the selected Susitna Project discussed in this document. The Low Watana Alternative, a 700 foot high dam with a 600 MW powerhouse was chosen because the best combination of winter storage, less environmental impact and low overall cost in addition to meeting the 50 percent renewable goal by 2025. The expandable version of a dam at this location was not chosen because it is more expensive initially relative to power output and the ultimate raised dam would have more environmental impacts related to terrestrial habitat as well as other technical challenges. The location of the Susitna Project as chosen for this review is the same location as the Watana dam in the two dam scheme as proposed in the 1980's (Acres 1982, Harza Ebasco 1985).

The Susitna Project would be located approximately half-way between Anchorage and Fairbanks. It would create a dam on the Susitna River at river mile 184 above the mouth of the Susitna River. The dam would be located within a steep sided river valley approximately 15 miles upstream of Devil's Canyon. The 700 foot high dam would have a 557 foot difference between tail water and maximum pond elevation, with a maximum pond level of 2014 feet. The reservoir would be 39 miles long and a maximum of 2 miles wide. Installed capacity would be 600 MW with the average annual generation determined to be 2600 GWhrs (HDR 2009). A final decision has not been made on the type of dam or the type of powerhouse (underground or surface) that would be used. The location of the Project is shown in Figure 1-1.

## 1.2 Chakachamna Hydroelectric Project

The Chakachamna Project was studied in detail in the 1980's as reported in the Bechtel report (Bechtel 1983). The project developed in that report consisted of an intake under the lake, and a 12 mile tunnel to an underground powerhouse on the McArthur River. At that location, the best alternative had a small regulating dam on the Chakachamna River and was estimated to produce 1,300 GWhrs of electricity annually although the report indicated that the maximum power could be generated by eliminating environmental flows and producing 1664 GWhrs of electricity annually with an installed capacity of 400MW. This latter alternative was identified to have adverse impacts on the fishery resources which use the Chakachamna River. Chapter 4 of this document; Preliminary Energy Estimate, further addresses the energy potential of the Chakachamna Project in light of environmental flows in the Chakachamna River.

The 1983 report (Bechtel 1983) also included an extensive environmental study which included environmental hydrology, aquatic biology, terrestrial vegetation and wildlife as well as human resources.

The Chakachamna Hydroelectric Project (Chakachamna Project) currently has a Preliminary Application before FERC (FERC No. 12660). In its Pre-Application Document (PAD) filed with FERC, the applicant, TDX Power described the Project to have 300 MW installed capacity and generate 1300 GWhrs hours of annual energy (TDX Power 2009).

The Chakachamna Project is located approximately 85 miles west of Anchorage at the south base of Mt. Spurr. Chakachamna Lake drains into the Chakachamna River, which flows downstream through a complicated system, ultimately flowing into Cook Inlet. That flow is partially joined to the McArthur River flow by way of the Noaukta Slough. The Chakachamna Project is essentially the same as the original scheme in the Bechtel study and involves diverting water from Chakachamna Lake through an 11 mile tunnel to an underground power plant near the McArthur River. The power plant would discharge its tailrace flow to the McArthur River and the flow would not rejoin the Chakachamna River until a point much further downstream, reducing flow in a portion of the Chakachamna River, and the Noaukta Slough and Middle River as well. The location of the Project is shown in Figure 1-1. The Project and vicinity are shown in Figure 1-2. The current scheme does not have a dam on the Chakachamna River as it exits the lake.

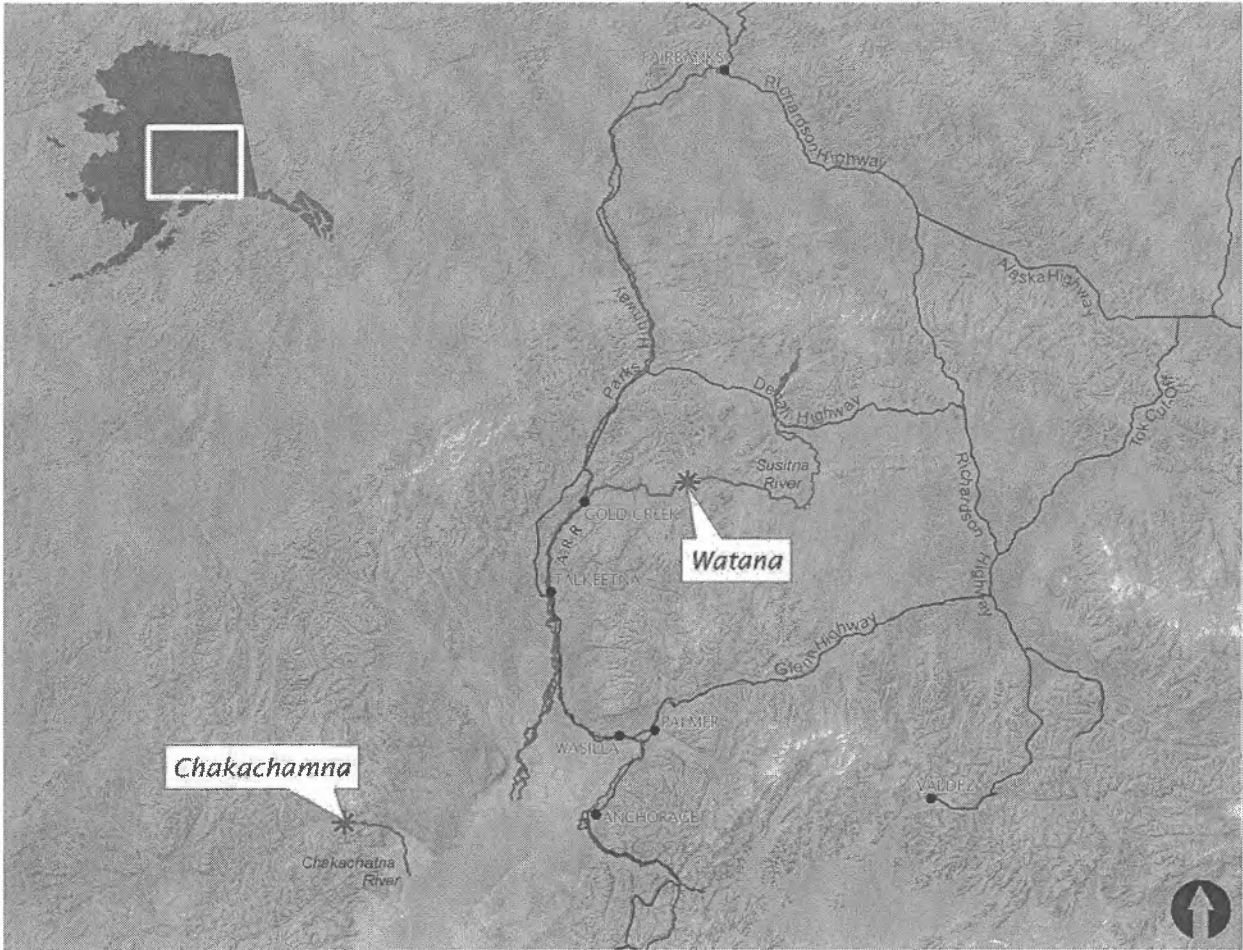


Figure 1-1 Locations of the Susitna Project (Low Watana Alternative) and the Chakachamna Project

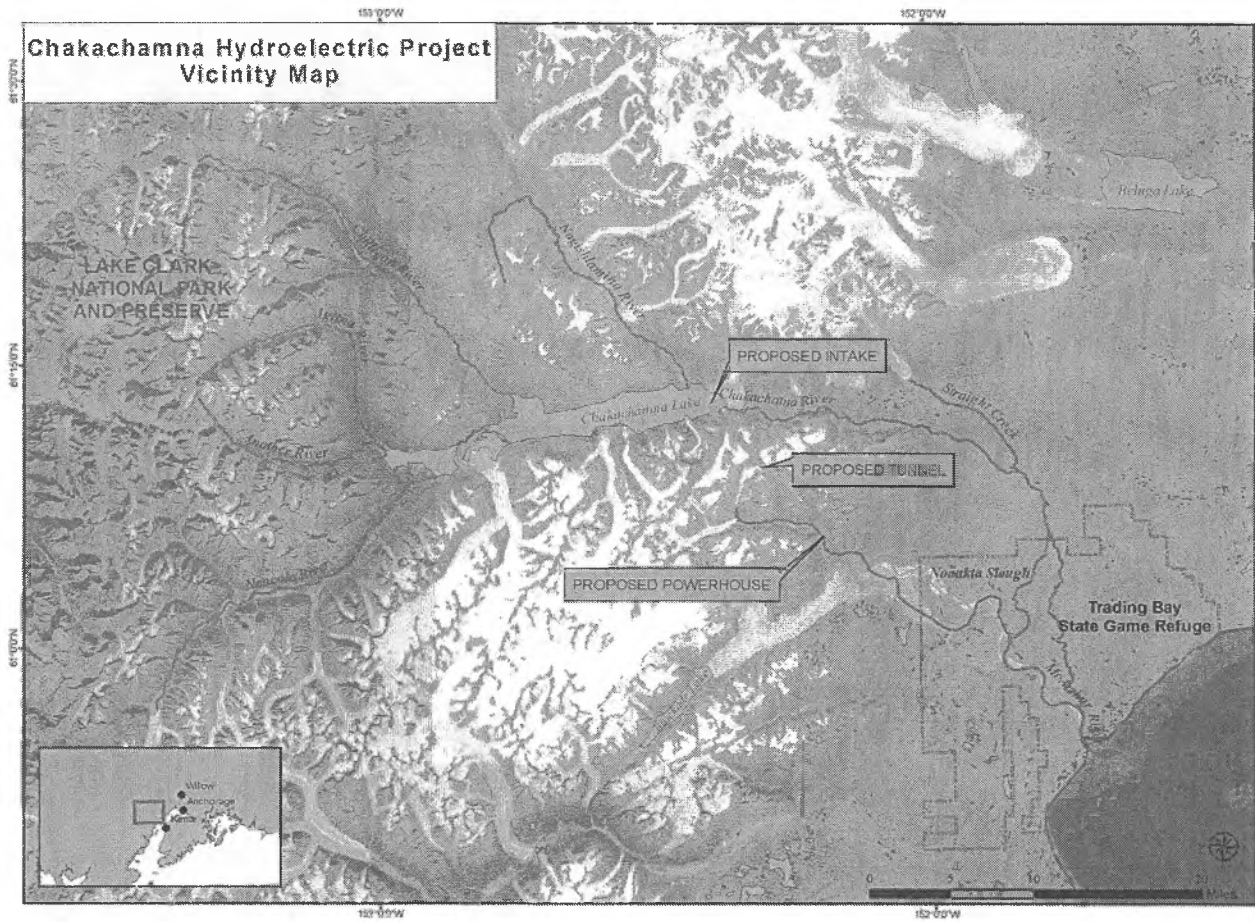


Figure 1-2 Vicinity of the Chakachamna Project

## Chapter 2

# Engineering Issues

---

Engineering issues associated with each potential project are discussed in the following section.

## 2.1 Access

### 2.1.1 Susitna Project

The Susitna Project could be accessed both from the Denali Highway by a new road and from Gold Creek (existing railroad bridge over the Susitna River) by a new rail line. Access via two modes of transportation provides the Project with advantages; the most significant of which is that the road could be built quickly, allowing early on site construction work. The rail link would allow materials from outside the State to be transported directly to the site by rail without having to off load to trucks.

### 2.1.2 Chakachamna Project

The Chakachamna site requires access from tidewater to the lake, the tunnel adits, and the McArthur River powerhouse location. Construction of a large dock to handle heavy equipment at Tyonek would be necessary. Access routes needed for construction and operation would be challenging. The construction access road could not cross the Trading Bay Game Refuge, and would therefore require crossing the braided Chakachatna River delta and wetland, as well as traversing high on steep mountain slopes to access the area near the lake

### 2.1.3 Access Comparison

Both projects would require roads and/or railroad to be constructed to handle very large and heavy equipment. Constructing access into both projects is likely to require two years. The advantages of access to the Susitna Project are that a major bridge is not required and that the routes cross less steep terrain compared to the Chakachamna Project. The bridge (or two) over the Chakachatna River will be large, expensive structure(s) with capacity to handle the heavy equipment. It is questionable whether a road built to handle heavy equipment could be constructed to the fish passageway location. If a road could not be constructed to handle a tunnel boring machine, drill and blast construction of the fish passageway would be required.

## 2.2 Transmission

### 2.2.1 Susitna Project

The Susitna Project would connect to the north-south intertie near Gold Creek. The cost of that transmission from the Susitna power plant to the intertie is included in the Susitna Project cost

estimate. A conceptual study of the transmission needs in the railbelt if the Susitna Project was constructed was completed by EPS (EPS 2009). Upgrades to the existing intertie and substations would be required to transmit energy to Anchorage and Fairbanks.

### **2.2.2 Chakachamna Project**

The Chakachamna Project transmission costs were estimated in today's dollars based on the original 1980's scheme. The cost of the transmission from the power plant to the Beluga Power plant was included in the cost estimate. It is believed a triple circuit would be required for the segment of the powerplant to Beluga, as well as additional changes in the railbelt transmission system. If the Chakachamna Project was constructed, transmission upgrades from Beluga plant to the intertie and an upgrade of the intertie upgraded would likely be necessary.

### **2.2.3 Transmission Comparison**

Transmission line construction beyond the two projects will be needed. Because the Susitna Project will be located centrally between Anchorage and Fairbanks, it will require less total length of new line construction, but because of the larger power output will require more actual circuits. Chakachamna Project will likely require some new line construction from Beluga to Anchorage and changes if energy is to be transmitted north to Fairbanks. Overall there is not a significant difference between the two projects due to transmission needs.

## **2.3 Geologic Hazards**

### **2.3.1 Susitna Project**

The design earthquake for the Susitna Project would likely be based on consideration of a Denali fault event somewhere in the range of magnitude 8.0, a local crustal earthquake and a subduction zone earthquake with a magnitude of roughly 8.5. The original Project design considered all of these earthquakes in the design. Excellent recent data exist on the Magnitude 7.9, 2002 Denali fault earthquake. A review of the earthquake design requirements for a Susitna Project was made by R&M Consultants (R&M 2009).

Subsurface conditions at the Susitna Project site are well known due to considerable rock drilling in the 1980's at the site. At the time, it was considered feasible to construct both diversion tunnels, power tunnels and an underground powerhouse.

There have been recent earthfill dams designed for large earthquakes, the most significant being the Seven Oaks Dam in Orange County, California, which is designed for a magnitude 8 earthquake from a distance of 1.2 miles away.

### **2.3.2 Chakachamna Project**

The design earthquake for the Chakachamna Project would likely be from the Castle Mountain fault, which is approximately 6 miles from the power plant location. Proximity to the fault would likely mean that smaller connecting faults would be encountered during tunneling, which

could cause delays and increased cost during construction. Subsurface geologic conditions along the tunnel alignment are not known. The frequency of any significant faulting and associated zones of fractured rock are not known, and could affect tunnel construction.

The Chakachamna Project also has other geologic hazards due to its proximity to Mount Spurr and Barrier Glacier. The most recent eruption at Mount Spurr was in 1992. If the volcano were to erupt again, ash fall and mud flows have the potential to block or partially block the powertunnel intake, fish passageway, or natural outflow of the lake. Facilities would need to be located or designed to minimize risk from an eruption. Also, at Lake Chakachamna, Barrier Glacier, which partially dams the lake, is a geologic risk. The glacier does not appear to be currently moving, is covered with debris, and has an ice core. A partial release of the lake occurred in 1971 when the outlet was eroded. The lake level dropped 10 to 15 feet. Facilities would need to be designed to accommodate a change in the glacier, which could cause the lake level to go up or down and substantially affect Project energy production and fish passage.

### 2.3.3 Geologic Hazards Comparison

Overall geologic hazards are somewhat greater at the Chakachamna site due to the close proximity of the castle Mountain fault and Mount Spurr.

## 2.4 Estimates of Probable Project Development Costs

A comparison of cost estimates for development of both project are provided in the following Section.

### 2.4.1 Susitna Project

#### 2.4.1.1 *Cost Estimate History*

In 1982 to 1983, a detailed cost estimate to develop the complete Watana/Devil Canyon project was prepared. This estimate was revised in 1985 to 1986, and again in March 2009. The latest estimate, prepared in November, 2009, is for a Low Watana Non-Expandable alternative. The estimate for this project in 2008 dollars is \$4.5 billion as detailed in Table 2-1 below.

Table 2-1 Susitna, Low Watana Project Cost Summary

FERC Line #	Line Item Name	Low Watana (2008 Dollars Millions)
71A	Engineering, Environment, and Regulatory (7%)	\$ 236
330	Land and Land Rights	\$ 121
331	Power Plant Structure Improvements	\$ 115
332.1-.4	Reservoir, Dams and Tunnels	\$ 1,538
332.5-.9	Waterways	\$ 590

Table 2-1 Susitna, Low Watana Project Cost Summary

FERC Line #	Line Item Name	Low Watana (2008 Dollars Millions)
333	Waterwheels, Turbines and Generators	\$ 297
334	Accessory Electrical Equipment	\$ 41
335	Misc Power Plant Equipment	\$ 21
336	Roads, Rails and Air Facilities	\$ 232
350-390	Transmission Features	\$ 224
399	Other Tangible Property	\$ 16
63	Main Construction Camp	\$ 180
71B	Construction Management, 4%	\$ 135
<b>Total Subtotal</b>		<b>\$ 3,746</b>
<b>Total Contingency</b>		<b>\$ 749</b>
<b>Total (Millions of Dollars, rounded)</b>		<b>\$ 4,500</b>

## 2.4.2 Chakachamna Project

### 2.4.2.1 Cost Estimate History

In 1982, a detailed cost estimate was prepared for developing the Chakachamna Project. In 2008 and 2009, re-evaluations of this original estimate were made to take into account potential new alternative arrangements. In 2010, the detailed 1982 was updated with unit prices modified to be consistent with the estimated costs for the Susitna Project. The estimate for the Chakachamna Project in 2008 dollars is \$2.9 billion, as detailed in Table 2-2 below.

Table 2-2 Chakachamna Project Cost Summary Table

FERC Line #	Line Item Name	Chakachamna (2008 Dollars Millions)
71A	Engineering, Environment, and Regulatory (7%)	\$ 151
330	Land and Land Rights	\$ 75
331	Power Plant Structure Improvements	\$ 105
332.1-.4	Reservoir, Dams and Tunnels	\$ 1,147
332.5-.9	Waterways	\$ 123
333	Waterwheels, Turbines and Generators	\$ 181
334	Accessory Electrical Equipment	\$ 20

Table 2-2 Chakachamna Project Cost Summary Table

FERC Line #	Line Item Name	Chakachamna (2008 Dollars Millions)
335	Misc Power Plant Equipment	\$ 15
336	Roads, Rails and Air Facilities	\$ 172
350-390	Transmission Features	\$ 232
399	Other Tangible Property	\$ 0
63	Main Construction Camp	\$ 90
71B	Construction Management, 4%	\$ 86
<b>Total Subtotal</b>		<b>\$ 2,400</b>
<b>Total Contingency</b>		<b>\$ 480</b>
<b>Total (Millions of Dollars, rounded)</b>		<b>\$ 2,880</b>

### 2.4.3 Cost Comparison

Although capital cost is greater for the Susitna Project, the evaluation in Chapter 9 will show that the cost to repay the financing of the project relative to energy production will be lower for the Susitna Project. Since the financing cost is a major portion of the energy cost, and since operation and maintenance and utility cost will be roughly equal regardless of the power source, overall, the Susitna Project cost per unit of energy will be relatively lower.

Detailed Susitna costs can be found at Susitna Hydroelectric Project Alternatives Design Report 2009 located on the AEA Railbelt Large Hydro webpage.

Detailed Chakachamna costs can be found at Susitna and Chakachamna – Preliminary Decision Document 2010 located on the AEA Railbelt Large Hydro webpage.

## Chapter 3

# Environmental Issues

---

Development of a hydroelectric project would face a variety of issues over the design lifetime. The design lifetime for a modern hydroelectric facility is anticipated to be greater than 100 years. The following discussion is not all inclusive but highlights the likely major areas of concern regarding both projects. Botanical and cultural resource issues are not discussed in this document since they have not been fully explored and tend to have less overall impact on whether a project is licensed and constructed.

### 3.1 Fisheries

#### 3.1.1 Susitna Project

Fish resources have the highest potential to be impacted by the project. Most of the potential impacts would occur in the reservoir and the middle Susitna River downstream of the reservoir. There would be impacts due to changes in water quality, thermal regime, suspended sediment load, reservoir draw-down fluctuations, impoundment zone inundation, flow regime, and fish habitat. Not all impacts to fish populations would be negative. For example, an increase in winter water temperatures could lead to the enhancement of overwintering habitat and thus greater fish survival; however, the cooler spring water temperatures could slow fish growth.

The majority of the salmon production occurs in tributaries outside the area of anticipated effects. Devil Canyon acts as an effective passage barrier to upstream migration of salmon. Radio telemetry studies of Susitna drainage conducted by ADF&G (Yanusz et. al., 2007) observed no sockeye salmon moving above Portage Creek near the entrance to Devils Canyon. A few (less than 100) adult Chinook salmon have been observed above the Devil Canyon dam site (FERC Amend Nov 1985). Electrofishing surveys conducted by ADF&G in 2003 (Johnson, 2010) documented Chinook salmon rearing in Kosina Creek and the Oshetna River, both located above the Watana Dam site.

In the Watana impoundment zone, approximately 40 river miles of the Susitna River would be inundated and transformed into reservoir habitat. An additional 15 miles of four named tributary streams (including Kosina Creek) and numerous smaller unnamed tributaries and eight small lakes would be inundated. There are nine species of fish occurring in the proposed impoundment zones: Arctic grayling would lose approximately nine miles of spawning habitat and would not likely populate the impoundment zone (ENTRIX 1985). River habitat would be transformed into lake/reservoir habitat that may be occupied by a different array of fish species. Lake drawn down may limit spawning of species dependent upon these areas for reproduction. Table 3-1 shows the possible fisheries impact of the Susitna Project.

### **3.1.2 Chakachamna Project**

Chakachamna Project has fish issues of concern to resource agencies. Since this document is a summary, only the three that most affect project economics and licensing ability will be discussed.

#### **3.1.2.1 Lake Level Fluctuations**

Chakachamna Lake and the surrounding tributaries support abundant salmon and freshwater fisheries resources. Five significant tributaries and numerous minor drainages empty from the surrounding mountains into Kenibuna and Chakachamna Lakes. Of these, the Chilligan and Igitna Rivers provide significant sockeye salmon spawning habitat. The lake tributary streams also provide habitat for Dolly Varden.

Studies in 1982 showed significant numbers of adult sockeye salmon milling along the north shore of Chakachamna Lake and spawning was suspected but not confirmed. Chakachamna Lake also provides habitat for resident lake trout, Dolly Varden, and round whitefish. Life histories of lake trout, Dolly Varden, and whitefish have not been investigated in Chakachamna Lake.

Under the proposed operational structure (base case), the lake level would fluctuate approximately 60 feet from the normal maximum pool elevation of 1,142 feet to the normal minimum pool elevation of 1,082 feet. If sockeye salmon spawn along lake shoals, it is likely that their spawning timing would coincide with the maximum pool elevation. The resulting eggs might subsequently be exposed and killed when the lake level drops to the minimum pool elevations in March or April. Similarly, lake trout spawning areas may be affected by the winter lake drop in lake level.

An additional impact relating to lake level drop is the potential for down-cutting of the channel between Kenibuna and Chakachamna Lakes and the fluvial fans of lake tributaries such as the Chilligan River. If down cutting occurs and as a result effects the level of Kenibuna lake (within Lake Clark National Park) then project can not be licensed by FERC. Down cutting may also effect fish passage into the tributaries particularly during periods of low lake level.

#### **3.1.2.2 Reduced Flows into the Chakachatna River**

The proposed operation of the Chakachamna Hydroelectric Project involves diverting a portion of the natural flow out of Lake Chakachamna to the powerhouse located in the McArthur River valley. In the base case, the average flow in the Chakachatna River will be reduced by approximately 50 to 80 percent from June through November.

The Chakachatna River provides a migration corridor, spawning habitat, and rearing habitat for salmon. The lower Chakachatna River splits into three branches: Middle River, which flows southeast to Cook Inlet, the Chakachatna River, which flows south and joins the McArthur River near its mouth, and a third braided section called Noaukta Slough which joins the middle part of the McArthur River. Hydrologic ties to the Chakachatna and McArthur rivers appear important in supporting the lower elevation wetlands north of Noaukta Slough and in the Trading Bay State

Game Refuge. Reduced river flow may cause floodplains, wetlands, and riparian habitats to dry. Drying of these wetland would effect fish populations in the Trading Bay State Game Refuge.

### 3.1.2.3 False Attraction

Transfer of water from Chakachamna Lake to the upper McArthur River may cause false attraction of adult salmon to the powerhouse tailrace during their spawning migration. The tailrace is proposed to be located approximately 15 miles up the McArthur River from the Noaukta Slough (Chakachatna River) confluence. The mixture of Chakachamna Lake water from the tailrace may confuse salmon migration and could prevent or delay the movement of salmon to spawning areas in Chakachamna Lake and its tributaries.

Critical months for salmon passage into and out of the lake occur between May and September, when a majority of the lake's discharge will be diverted to the upper McArthur River. Adult salmon return to their natal spawning areas by using olfactory cues (chemical "smells"). For Lake Chakachamna sockeye salmon, these cues are imprinted at the smolt stage when juvenile salmon migrate from spawning and rearing areas in the lake out the Chakachatna River to salt water. Because the majority of the Lake Chakachamna water is being discharged from the powerhouse into the McArthur River a substantial number of the adult salmon may be falsely attracted to the powerhouse in the McArthur River.

## 3.1 Wildlife Impacts

### 3.1.1 Susitna Project

There are currently no known listed endangered species in the project area. The most significant effect on wildlife would be on the species that live in the spruce forested valley walls. Impacts on each species would be different based on species abundance and use of the habitat; however, major threats common to most species have been identified. Downstream of the Watana reservoir there may be an increase in preferred moose browse, thus increasing the moose population (Harza Ebasco 1985b). The Susitna Project development would impact mink and otter in the middle river by increasing the winter turbidities which would reduce the value of the mainstem as feeding habitat. Open water in the winter would have a positive effect on mink and otter (Harza Ebasco 1985b). Other impacts to animals downstream of the reservoir would be negligible (Harza Ebasco 1985b).

A summary of the potential environmental impacts of the Susitna Project is provided in Table 3.1 below.

Table 3-1 Potential Environmental Impacts of the Low Watana Hydroelectric Project on the Susitna River	
Impacts	Issues
<b>Reservoir - Impacts</b>	
River Habitat & Fisheries Impacts	Approximately 40 river miles of the main stem of the Susitna River and 15 miles of tributary streams will be converted from riverine to reservoir environment.  Arctic grayling are the most abundant fish species in the impound zone and will have the greatest

	<p>impacts with the loss of approximately nine miles of spawning habitat.</p> <p>A significant portion of lower Kosina Creek used by rearing Chinook salmon will be lost to inundation.</p>
Fish passage	Fish passage may be blocked for a small number of Chinook salmon that travel above the site.
Drawdown impacts	The annual drawdown and refilling of the reservoir will affect an estimated 10 miles of river that will alternate between river and reservoir habitat.
Terrestrial Impacts	An estimated 20,000 acres of habitat will be flooded. Reservoir may alter traditional migration routes.
<b>Downstream Impacts</b>	
Flow change impacts to fish	<p>Lower summer flows may reduce access to side channel fish habitats and reduce the amount of rearing habitat for salmonids.</p> <p>Increased winter time flows may provide more rearing habitat benefiting overwinter survival.</p> <p>Dampening of flows may alter streambed movement and affect side channel habitats.</p>
Temperature impacts to fish	<p>Lower than natural water temperatures in spring/early summer may cause a delay in the onset of favorable summer rearing conditions for salmonids.</p> <p>Warmer than normal fall water temperatures may extend the summer rearing period later into fall.</p> <p>Overwinter survival for salmonids may be benefited by warmer water temperatures and a delay in ice formation.</p> <p>Higher main stem discharges in winter may maintain higher rates of warm groundwater upwelling in side sloughs affecting incubation of salmon eggs.</p>

### 3.1.2 Chakachamna Project

Wildlife impacts from the Chakachamna Project have not been studied in detail. Reduction of salmon traveling to Lake Chakachamna tributaries would reduce the food source for bears and eagle in Lake Clark National Park. Drying of Trading Bay State Game Refuge would potentially alter wildlife habitat effecting birds and mammals in the refuge.

Increased flow down the McArthur River may cause some increased flooding and wetlands south of Trading Bay State Game Refuge. The net effect of the changes in food source and habitat over a large area (Lake Clark NP, Trading Bay, and McArthur River) has not been studied.

## 3.2 Environmental Flow

### 3.2.1 Susitna Project

Environmental flow requirements are met by water being used for energy production passing through the generating units and then being released into the natural stream channel. The effect of environmental flows is to change the timing of the energy production but not necessarily the average annual amount of generation.

A preferred environmental flow regime in the 1980's was developed to have high late summer flows for maintenance of rearing habitat for Chinook salmon juveniles. However, peak summer flows would be reduced and winter flows (within limits) would be increased to generate more power. A comparison of the 1980 selected environmental flow and of the existing Susitna River flows are shown in Figure 3-1 below.

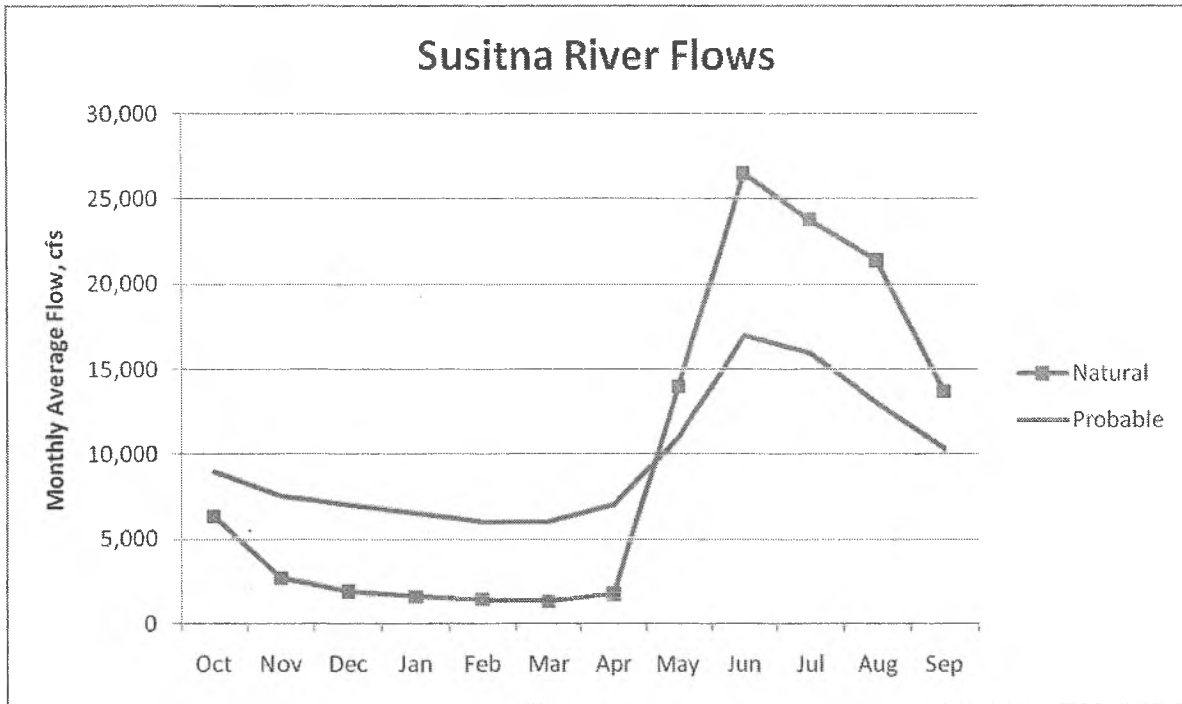


Figure 3-1. Susitna River monthly mean flow at Gold Creek.

### 3.2.2 Chakachamna Project

The preliminary environmental flow recommendations suggested for the Chakachamna River in the PAD are based on the Montana Method (Tennant 1972) as presented in the Bechtel report on the project in 1983. The Bechtel report assumed environmental flows during the months of April to September of 1094 cfs or lake inflow, whichever was less. During the months of October through March, the minimum environmental flow was assumed to be 365 cfs or lake inflow, whichever was less. These amounts of discharge are rated as “fair to degrading” flows in the Montana Method. This method was developed for and has primarily been used on rivers in the lower 48 states, which show little similarity to the glacially driven and highly seasonal flows of the Chakachamna River. Winter time flows using this method drop below historic average monthly flows, potentially resulting in freeze-out of spawning beds located outside the main river or in side channel areas. Summertime flows provided may not be sufficient to attract adult spawners confused by the discharges into the McArthur drainage or to provide for upstream passage through the canyon area located below Chakachamna Lake. Additionally, this environmental flow method does not take into consideration the groundwater hydrology feeding wetlands of the Trading Bay Game Refuge.

While it is outside of the scope of this document to complete the environmental flow analysis needed to adequately address all of the environmental issues in the Chakachamna watershed, Table 3-2 below provides an estimate of environmental flows that may be more likely to be viewed favorably by permitting agencies. It should be noted, however, that these flows have not been reviewed or endorsed by any permitting agencies. Determination of environmental flows for the project will ultimately be the result of a detailed analysis of instream flow data by conducted by a multiagency review team over a multi year time period.

**Table 3-2 Estimate of Probable Environmental Flows**

Month	Historic Natural Flow (cfs)	Base Case Flow (cfs)	Minimum Probable Flow (cfs)	Notes
October	2468	402	1,250	50% of mean monthly flow: provides water to Noaukta Slough to attract adult coho spawners and protect historic side channel spawning habitats.
November	1206	365	600	50% of mean monthly flow: provides water to Noaukta Slough to attract adult coho spawners and protect historic side channel spawning habitats.
December	813	363	600	75% of mean monthly flow: protects incubation in Chakachatna/Noaukta Slough spawning beds.
January	613	365	500	100% of mean monthly flow: protects incubation in Chakachatna/Noaukta Slough spawning beds.
February	505	357	500	100% of mean monthly flow: protects incubation in Chakachatna/Noaukta Slough spawning beds.
March	445	358	500	100% of mean monthly flow to protect incubation in Chakachatna/Noaukta Slough spawning beds.
April	441	582	500	100% of mean monthly flow: protects incubation in Chakachatna/Noaukta Slough spawning beds.
May	1042	1,094	750	75% of mean monthly flow: protects juvenile rearing in Chakachatna/Noaukta Slough areas and provides for outmigration of smolts from lake.
June	5,875	1,094	2,000	33% of mean monthly flow: provides water for outmigration of smolts from lake and feeds groundwater to Trading Bay Refuge wetlands.
July	11,944	1,421	4,000	33% of mean monthly flow: provides water to attract spawning adults to Chakachatna/Noaukta as opposed to McArthur, provides adequate flow for adult passage through canyon below lake outlet, and feeds groundwater to Trading Bay Refuge wetlands.
August	11,996	5,599	4,000	33% of mean monthly flow: provides water to attract spawning adults to Chakachatna/Noaukta as opposed to McArthur, provides adequate flow for adult passage through canyon below lake outlet, and feeds groundwater to Trading Bay Refuge wetlands.
September	6,042	2,164	2,000	33% of mean monthly flow: provides water to attract spawning adults to Chakachatna/Noaukta as opposed to McArthur, provides adequate flow for adult passage through canyon below lake outlet, and feeds groundwater to Trading Bay Refuge wetlands.

### 3.2.3 Environmental Flow Analysis

To evaluate the effect of increased minimum environmental flow requirements in the Chakachatna River and/or the effect of lake level fluctuations, two alternatives to the base case were also evaluated. Environmental issues surrounding project operations generally revolve around three main issues: 1) habitat affected by flows in the bypass reach; 2) upstream and downstream fish passage; and 3) habitat affected by lake level fluctuations. The alternatives to the Base case evaluated were:

- **Alternative #1 – Base case with probable environmental flow.** Alternative 1 is the same as the base case except that:
  - Environmental flow requirements are revised as described in Table 3-2 above.
  - The lake level fluctuations are not restricted.
- **Alternative #2 – Base case with probable environmental flow & minimization of lake fluctuation.** Alternative 2 is the same as the base case except that:
  - Environmental flow requirements are revised as described in Table 3-2 above.
  - The maximum lake level fluctuation would be 15 feet below the weir outlet.

A comparison of potential environmental impacts resulting from each alternative are presented in Table 3-3.

**Table 3-3 Comparison of Potential Environmental Impacts Resulting from Chakachamna Lake Hydro Alternatives**

Issue	Base Case	Alternative 1	Alternative 2
<b>Lake Level Fluctuation</b>			
Impacts to shoal spawning areas for sockeye salmon and lake trout	Significant impacts to incubating eggs due to draw down	Significant impacts	Least significant case but impacts may still occur
Access to inlet streams (Chilligan and Igitna) for sockeye spawners	Not likely to be impacted	Could be impacted due to drawn down	Not likely to be impacted
Adult salmon passage into lake	Minor to moderate, passage via natural outlet 87% of time	Significant, dependent upon using fish tunnel 91% of the time	Minor to moderate passage via natural outlet 87% of time
Smolt outmigration from lake	Unknown, smolts 100% dependent on fish passage tunnel	Unknown, smolts 100% dependent on fish passage tunnel	Unknown, smolts 100% dependent on fish passage tunnel
<b>Chakachatna / McArthur Issues</b>			
False attraction of Chakachamna sockeye spawners to the McArthur powerhouse	Likely to occur	Least likely case but may still occur	Least likely case but may still occur
Noauktna Slough and Chakachatna side channel spawning and rearing habitats	Moderate impacts possible from winter freeze-out	Lower impacts than Base Case	Lower impacts than Base Case
<b>Trading Bay Wildlife Refuge</b>			
Groundwater fed wetland habitats	Moderate impacts	Lower impacts than Base Case	Lower impacts than Base Case

Under the Base Case and Alternative 1 the lake level would fluctuate approximately 60 feet from the normal maximum pool elevation of 1,142 feet to the normal minimum pool elevation of 1,082 feet. Spawning of adult salmon and Lake Trout may be effected and down cutting to tributaries may occur.

Lake level affects adult salmon passage into the lake in Alternative 1, where the natural outlet is not available to spawning adults 91 percent of the time. In this alternative, fish will be dependant upon using the two mile long fish passage tunnel. There is uncertainty whether fish will be willing to use the tunnel. In all cases the fish passage tunnel will be required for smolt outmigration.

In Alternative 2, the lake level is minimized to 15 feet below the outlet. While this amount of drawdown may exceed natural lake level fluctuation, it is the scenario offering the least impact to lake habitats.

For Chakachamna, limiting lake fluctuation (Alternative 2) to minimize the affect on upstream spawning will decrease the amount of runoff that can be captured, thereby decreasing the average annual generation. Figure 3-2 shows the post-project lake elevation by month for the base case and the two alternatives.

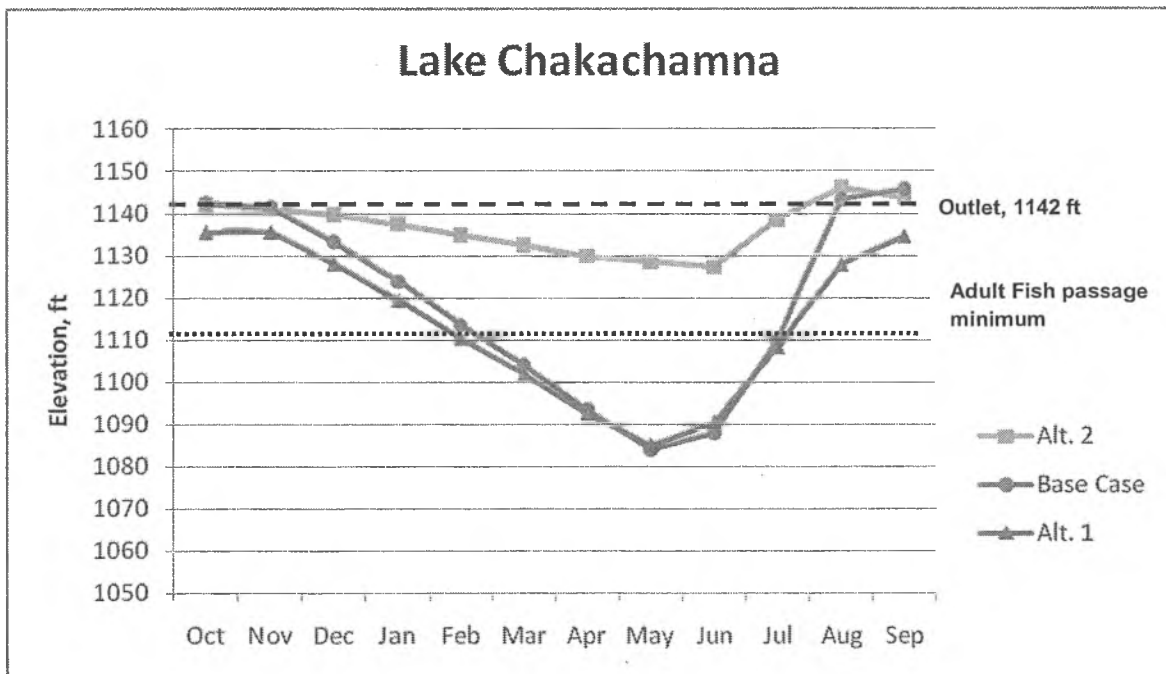


Figure 3-2 Chakachamna Lake Elevation by Month

Flows in the Chakachatna River during Project operation will be comprised of environmental flow releases and spill as shown in Figure 3-3. Since the powerhouse discharges return to the McArthur River, the net flows in the Chakachatna River are reduced in all cases.

Detailed Chakachamna environmental discussion can be found at [Susitna and Chakachamna – Preliminary Decision Document, Environmental-Energy-Cost November 12, 2010](#) located on the AEA Railbelt Large Hydro webpage.

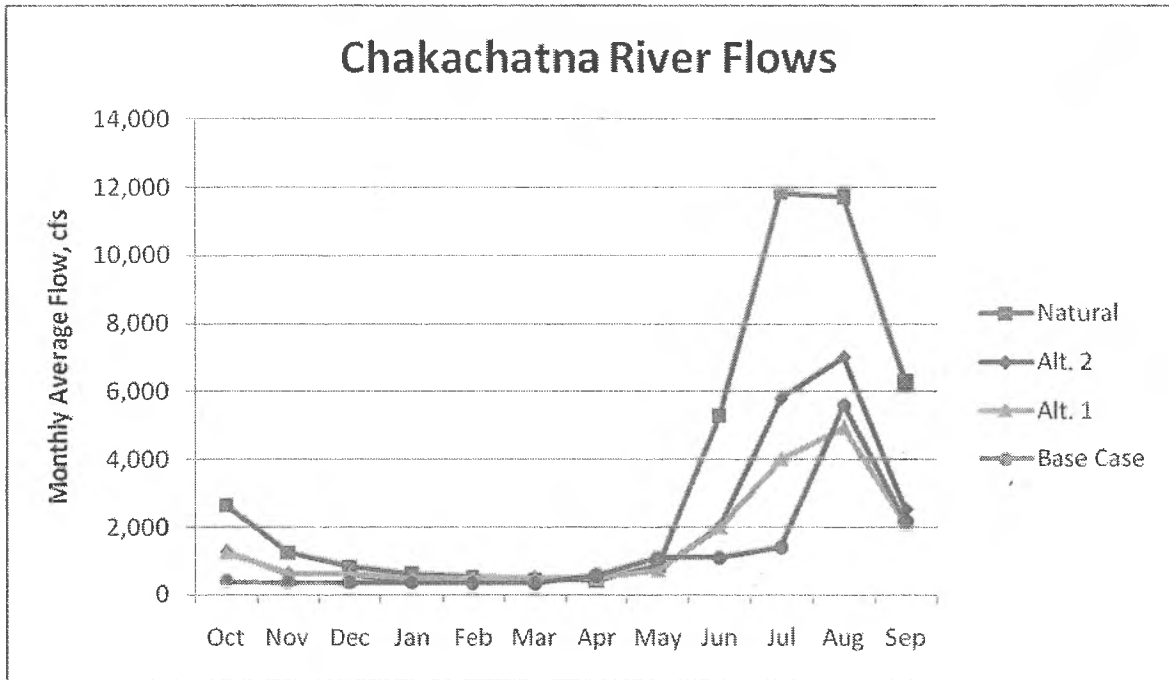


Figure 3-3 Chakachatna River Flows (Downstream of Lake) by Month



# Preliminary Energy Estimate

---

## 4.1 Evaluation of Average Annual Energy and Firm Winter Capacity

The amount of energy that can be produced from hydroelectric projects is a function of the amount of available water and, in the case of storage projects, how the available water can be regulated (systematically released). In addition to the average annual energy, the firm capacity attainable during winter months is of particular importance. For hydroelectric projects, the firm capacity is almost always lower than the installed generation capacity for a project. For the purposes of this study work, firm capacity is defined as:

*“The amount of power the project can generate on a continuous basis from November 1 through April 30 with 98 percent reliability.”*

It should be noted that this is only one manner of regulation. The water can be regulated in a variety of different means in order to achieve other objectives, such as peaking, spinning reserve, or backup capacity. Major assumptions used to develop the estimates average annual energy and winter plant capacity are presented below.

### 4.1.1 Susitna Model Assumptions and Data Sources

This potential project consists of the construction of a large storage reservoir on the Susitna River at the Watana site with a 700-foot-high dam and a four-unit powerhouse with a total installed capacity of 600 MW. This “Low Watana non-expandable” alternative is described in detail in *Susitna Hydroelectric Project, Conceptual Alternative Design Report* (HDR Alaska 2009b).

### 4.1.2 Chakachamna Model Assumptions and Data Sources

This potential project consists of the inter basin transfer of water from a lake tap near the outlet of Chakachamna Lake through an approximately 10.8-mile-long tunnel to an underground powerhouse that would discharge to the McArthur River. The powerhouse would have a total generating capacity of 300 MW. The Base case (as proposed) and two alternatives were evaluated. Alternatives, described in Section 3.1.3, show how alternative operational constraints on the project would affect project energy. These alternatives are as follows:

- **Base Case** for analysis was the project as described in the PAD (TDX Power 2009). This project used environmental flow recommendations for the Chakachamna River based on the Montana Method (Tennant 1972).
- **Alternative #1 – Base Case with Probable Environmental Flow.** Alternative 1 is the same as the Base Case except that higher environmental flows are required.

- **Alternative #2 – Base Case with Probable Environmental Flow & Minimization of Lake Fluctuation.** Alternative 2 is the same as the Base Case except that higher environmental flows are required and lake level drop would be limited.

## 4.2 Results

Firm capacities and average annual energy estimates are presented in Table 4-1.

Table 4-1 Firm Capacity and Average Annual Energy Estimates

Alternative	98% Winter Capacity (MW)	Average Annual Energy Production (GWhrs)
Susitna	245	2,600
Chakachamna, Base Case	170	1,300
Chakachamna, Alternative 1	140	1,100
Chakachamna, Alternative 2	30	860

The energy distribution by month for each of the above alternatives is shown in Figure 4-1 below.

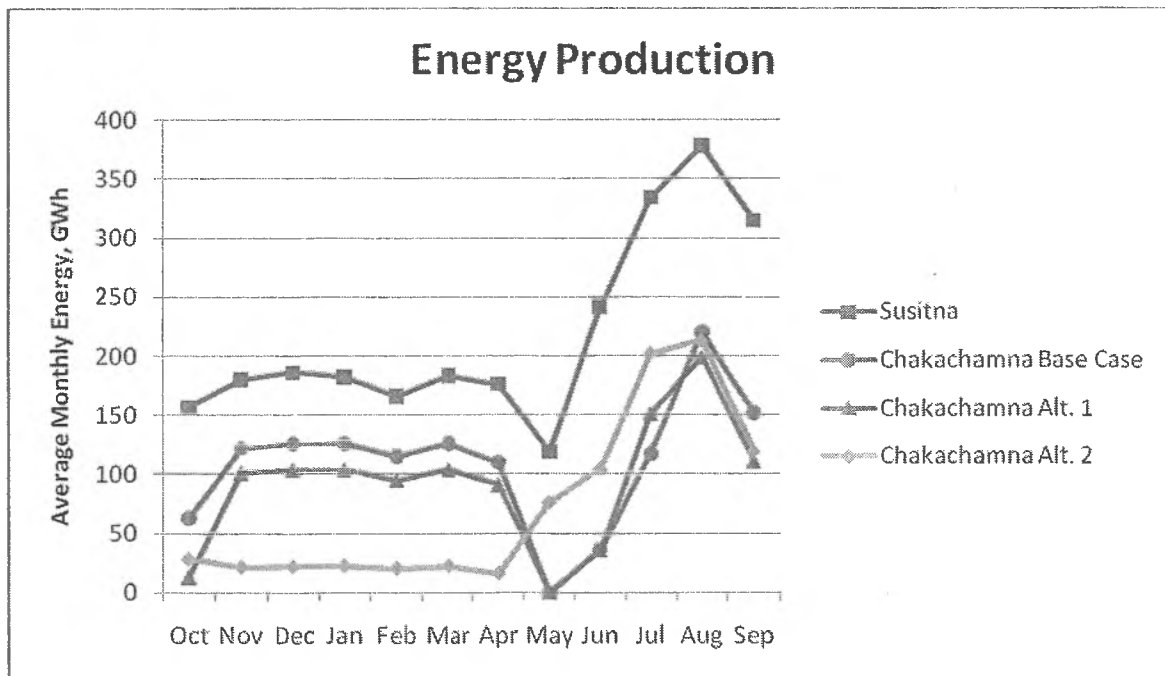


Figure 4-1 Energy Distribution by Month

As can be seen by these results, the firm winter capacity and average annual energy production estimates can vary significantly based upon the assumed environmental constraints placed upon the project. For the Chakachamna Project, increased environmental flow requirements (Alternatives 1 and 2) reduce the amount of water that is available for generation, thereby

lowering the annual energy. Reduced use of reservoir storage greatly limits the amount of energy that can be produced during the winter months (Alternative 2).

Detailed Chakachamna environmental discussion can be found at [Susitna and Chakachamna – Preliminary Decision Document, Environmental-Energy-Cost November 12, 2010](#) located on the AEA Railbelt Large Hydro webpage.

For the Susitna Project, environmental flow requirements are met by water passing through the generating units and then being released into the natural stream channel. The effect of changed environmental flows is to change the timing of the energy production but not necessarily the average annual amount of generation.

---

## Chapter 5 Permitting

---

### 5.1 Overview – Regulatory Processes

While pursuant to the Federal Power Act (FPA), the Federal Energy Regulatory Commission (FERC) has exclusive authority to issue licenses for most non-federal hydropower projects, there are several federal and state agencies that are authorized under several federal statutes to submit mandatory and recommended terms and conditions to be included in a FERC-issued license.

- **FERC's licensing process options** – Applicants may propose to use one of three options: the Integrated (ILP), Alternative (ALP), or Traditional (TLP). The default is the ILP, unless FERC approves use of either the ALP or TLP.
- **Pre-filing consultation** – extensive pre-filing meetings and exchange of information required.
- **Federal Energy Regulatory Commission – Application for License** required; Draft submitted for review & comments; Final filed.
- **Federal and State resource agencies consultation & terms & conditions** – File mandatory & recommended terms and conditions; most become License Articles and require compliance.
- **Numerous other State & Federal approvals & permits are required** – Applicants are required to provide evidence of consultation with agencies in an Application for License, and provide copies of permits and/or approvals.

Please also see R&M Consultants/Hatch Associates Consultants report (2010) for a detailed presentation of the various agencies and their authorities who would shape the content of any issued license.

### 5.2 Regulatory Issues – Chakachamna Project

*TDX received its first Preliminary Permit on November 14, 2006. The purpose of a Preliminary Permit is to reserve priority to conduct studies for a period of three years, and if the effort results in filing an Application for License. A successive (second) permit was issued on February 25, 2010. This permit expires on January 31, 2013. FERC noted in issuing the permit that “a successive permit can warrant a greater standard of Commission oversight.” “If the permittee fails to make significant progress toward developing a license application, the permit may be subject to cancellation.”*

On July 17, 2009, TDX filed its Notice of Intent to File an Application for License (NOI), Request to Use a Traditional Licensing Process (TLP), and Pre-Application Document (PAD). By letter dated July 27, 2009, FERC requested that they consider which licensing process it wishes to use and to refile its request noting that there would not be a need to refile the PAD. TDX met with FERC on August 5, 2009 to discuss the proceeding. On September 21, 2009, TDX requested to rescind its PAD. TDX stated that “this Project may be best served by an Integrated Licensing Process (ILP). TDX stated its intent to implement a field season in 2010 and to hold a study plan review and workshop in February 2010. TDX has a website for the Project and there is no evidence that work is proceeding as noted in their September 21, 2009, correspondence to the FERC. Nor has any further information been filed with the Commission. Under TDX’s current development schedule, a third FERC Permit would be necessary.

### **5.2.1 Licensing Schedule**

Once the pre-filing process restarts the schedule could be:

- Prepare and File Final Application for License – 4.5 years
- FERC Processing and License Issuance – 2.5 years

### **5.3 Regulatory Issues – Susitna / Low Watana Project**

At present, there is no FERC Preliminary Permit in effect. While a FERC Permit is not required, it would be prudent for an entity representing the State to secure priority to study the Project. As discussed above, the Alaska Power Authority (APA), now known as AEA prepared and filed an application for license in February 1983. That application was withdrawn and APA revised the Project schedule to realize benefits identified with a three, as opposed to two-year construction schedule in 1985. In 1986, APA abandoned pursuit of a FERC license for numerous reasons, including financial feasibility.

In 2008, AEA began an update of the project, including preparation of the Railbelt IRP to evaluate the ability of the Susitna Project, and other resources, to meet long term demand in the Railbelt Region.

### **5.3.1 Licensing Schedule**

Table 5-1 shows a Licensing, Engineering and Construction Schedule Comparison for the two projects. For the Susitna Project, based on information available at this time, the FERC schedule could be:

- Prepare and File Final Application for License – 3.5 years
- FERC Processing and License Issuance – 2 years

## 5.4 Total Project Development Timeline

Table 5-1 provides a Development Schedule Comparison for the two projects. Based on information available at this time, the comparative total schedule from start of the FERC process, in the case of the Chakachamna a restart of their pre-filing process, could be:

**Table 5-1 Development Schedule Comparison**

Major Task	Chakachamna	Susitna Low Watana
FERC Pre-filing Process	4.5 years	3.5 years
FERC Processing – DC	2.5 years	2.0 years
FERC Processing - Portland	2.0 years	1.0 years
Construction through Start up	5.5 years	4.5 years
<b>TOTALS</b>	<b>14.5 YEARS</b>	<b>11 YEARS</b>

Detailed Susitna and Chakachamna Licensing and permitting information is found at [Susitna-Low Watana & Chakachamna Projects, Large Hydro Evaluation of Two Projects, Preliminary Decision Document, Environmental & Regulatory Issues November 14, 2010](#) located on the AEA Railbelt Large Hydro webpage.

## Chapter 6

# Development Schedule

---

The following tables (Table 6-1 and Table 6-2) show the major tasks associated with hydro project development, and the estimated preliminary schedule for completion for the Chakachamna Project compared to the estimated preliminary schedule for completion for the Susitna Project. Special considerations and assumptions for each are listed below.

**Table 6-1 Considerations / Assumptions**

Chakachamna Project	Susitna Project
<ul style="list-style-type: none"> <li>▪ TBM est. 14-16 months to order and deliver to site</li> <li>▪ 4.5 year pre-filing process assumes studies underway in 2011 (one year behind schedule in TDX PAD, 2009)</li> <li>▪ 2.5 years for FERC Processing and License Issuance, and 5.5 year construction schedule based on PAD (Appendix 2-1)</li> <li>▪ FERC-PRO processing and some procurement must be accomplished before field work can begin</li> <li>▪ Longer construction schedule due to significant underground work, with higher risk profile and greater uncertainty</li> <li>▪ Project "access" to require 2 yrs to construct</li> <li>▪ Chakachamna has higher risk that the schedule to Project Startup will extend beyond 14.5 years.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Significant, extensive and valid environmental studies performed in 1980's to be updated and used to develop FERC documents</li> <li>▪ Significant geotechnical investigations performed previously</li> <li>▪ FERC-PRO processing and some procurement must be accomplished before field work can begin</li> <li>▪ More surface features and work carries more schedule certainty, less risk</li> <li>▪ Project "access" to require 2 yrs to construct</li> <li>▪ Engineering schedule based on "Low Watana Non-Expandable Development" (HDR, 2009)</li> <li>▪ Susitna has lower risk that the schedule to Project Startup will extend beyond 11 years.</li> </ul>

Table 6-2 Licensing, Engineering, and Construction Schedule Comparison

	Regulatory / Environmental Major Tasks			Engineering / Construction Major Tasks		
<b>Pre-License Issuance</b>	Preliminary Permit	<b>Chakachamna</b>	<b>Susitna</b>	Feasibility Engineering Design Specifications, Drawings & Bid Documents ↓	<b>Chakachamna</b>	<b>Susitna</b>
	Scoping					
	Draft Application	4.5 yrs	3.5 yrs			
	Final Application					
	FERC Processing (DHAC)	2.5 yrs	2 yrs			
	License Order Issued					
<b>Post-License Issuance</b>	License & Permits Compliance			FERC Processing (Portland Regional Office)	2 yrs	1 yr
				Procurement		
				Construction Testing & Commissioning Project Startup	5.5 yrs	4.5 yrs
<b>Reg/Env Estimated Schedule</b>		<b>7 yrs</b>	<b>5.5 yrs</b>	<b>Eng/Const Estimated Schedule</b>	<b>7.5 yrs</b>	<b>5.5 yrs</b>
<b>ESTIMATED TOTAL TO STARTUP</b>					<b>14-15 years</b>	<b>11 years</b>

## Chapter 7

# Financial

---

Based on project risk for investors, the two projects, Susitna and Chakachamna, are similar. Project financing for either project, where the costs of the project is paid for solely by the sale of power produced from the project, is assumed to be unavailable. Without State participation these project are unlikely to proceed. State participation of whatever form it takes place will enable these projects to occur and lower the cost of the energy to ratepayers.

Large projects have financing that is structured on some amount of government participation. Government participation is normally required because of the following risks generally associated with large hydroelectric projects make project financing unattainable:

- **Timeline:** Project may take 10-20 years prior to first power sales. Private investors do not like to spend substantial funds for an extended time when the payoff is a long time or may not occur.
- **Licensing and Permitting Risk:** Significant funds can be spent only for the project to have long delays in licensing and in operation constraints placed on project.
- **Construction Risk:** Estimating the cost of a project many years out has risk of the prices changing for materials and labor. In addition, the demand for a product can change.

The “Bradley Model” has been discussed as a way that a new large hydroelectric facility can be financed for construction with State assistance. Licensed and constructed in the 1980’s and early 1990’s it is Alaska’s largest hydroelectric project. Bradley Lake Hydroelectric Project (Bradley Project) is located southeast of Homer, Alaska and is a 125-foot high concrete faced rock filled gravity dam. The project has 126MW of installed capacity and produces approximately 9 percent of the railbelt’s annual energy. The state paid for licensing and much of the cost of the project. Approximately 50 percent of the project’s licensing and construction cost was paid by the State. The railbelt utilities purchase all the power for the projects and pay all the costs of the project (bond financing, Operations and maintenance). Once the debt service is retired then the utilities will continue to pay the State the same amount as the debt service.

Detailed information on State participation and Bradley financing is available at [Hydroelectric Project Risk Analysis & the Bradley Lake Funding Model Summary Report, November 15, 2010](#) located on AEA’s website at the Railbelt Large Hydro webpage.

## Chapter 8

# Cost of Power

---

The cost of power from the Susitna and Chakachamna Projects is addressed in this chapter. A simple calculation of the cost of power, which assumes 50 percent State equity in either project, a financing rate of 6 percent, and annual energy from sections above results in the generation costs shown in Table 8-1 below.

**Table 8-1** Cost of Power Comparison

Project	Finance Amount (50%)	Rate	Term (years)	Annual Energy (GWhrs)	Cost per kWh
Susitna	2,250,000,000	6%	30	2600	\$0.063
Chakachamna Alt 1	1,440,000,000	6%	30	1100	\$0.09
Chakachamna Alt 2	1,440,000,000	6%	30	860	\$0.12

This simple table gives an idea of how the two projects compare in the cost of power. Interest during construction is excluded from this comparison.

The estimated construction cost of Chakachamna Alternative 1 would need to decrease by 30 percent to have a comparable cost of power with the Susitna Project. Or, assuming no changes in the cost the energy of the Chakachamna Project, annual energy would need to be 1600 GWhrs. This could only be achieved by having zero environmental flow.

An alternative way of analyzing cost comparisons is to estimate State contributions needed if generation costs are held at \$0.06 kWh. From this perspective, the State required contribution would be \$2.35 B for the Susitna Project (2,600 GWhrs) and \$1.96 B for the Chakachamna Project (1100 GWhrs) or \$2.17 B (860 GWhrs). Assuming state participation would be based on providing \$.06 cost per kWh, the Susitna project would cost 20% more than Chakachamna project Alternative 1; however, it will provide approximately 136% more energy and compared to Alternative 2, an 8% greater cost with 200% more energy.

## Chapter 9

# Operational Uncertainty

---

Table 9-1 presents a summary of the comparative operational uncertainties associated with developing the Chakachamna and Susitna Projects.

Table 9-1 Operational Uncertainties Issue Comparison

Issue and likelihood of occurrence within next 100 years	Chakachamna Project	Susitna Project
	Issue Notes/Requirements	Issue Notes/Requirements
<b>Earthquake Risk</b>		
<p>Immediate damage due to fault movement</p> <p>Studies show 700-year return period for significant earthquakes (magnitude 6 to 7), last such earthquake approximately 650 years ago.</p>	<p>Castle Mountain fault, approximately 11 miles from the lake, magnitude 7+, displacements of up to 6 ft, only 4500 ft from powerhouse site.</p> <p>Infrastructure near the fault include; powerhouse and bridge over Chakachamna River.</p> <p>Power tunnel intersects numerous smaller faults. Seismic event may cause localized collapse in the fault zone if not lined. Lack of information about whether movement could occur on any of these smaller faults.</p>	<p>Castle Mountain Fault located 65 miles from powerhouse, intake, lake, magnitude 7+,</p> <p>Denali Fault located 45 miles , magnitude 8.0,</p> <p>Inter-plate subduction zone located 40 miles, magnitude 9.2</p> <p>Dam could experience high seismic loads (known seismic zone, EQ design case should consider loading)</p>
Secondary effects	Landslide and avalanche potential into lake and onto access road.	Potential landslides and avalanches along access roads.
<b>Hydrological Risk</b>		
Generation	<p>USGS record at site 11 years of data, correlation with 4 streams.</p> <p>Understanding of the hydrology</p> <p>There is potential during events such as floods or glacial activity for down cutting of the glacial moraine at the end of the lake which could reduce head and storage in the project</p> <p>Smaller basin will cause greater deviations from average hydrological flow and energy generation.</p> <p>Drought (Not sure if needed, see above)</p> <p>Tunnel roughness may increase with time due to wear which will reduce generation.</p>	<p>USGS record at site 54 years of data on Susitna River.</p> <p>Understanding of the hydrology vis a vis climate change effects.</p>
<b>Climate Change</b>		
Glacier recession	Increase in flows as the glaciers melt (>100 yrs), followed by reduced and more "flashy" flows at the project.	Increase flow for a period with glacier recession (>100 yrs) followed by decreased flow.
<b>Volcanism</b>		

Table 9-1 Operational Uncertainties Issue Comparison

Issue and likelihood of occurrence within next 100 years	Chakachamna Project	Susitna Project
	Issue Notes/Requirements	Issue Notes/Requirements
Effects on Project Facilities and Features	<p>Mt Spurr is located immediately adjacent to the project, Redoubt volcano is approx. 50 miles to the west.</p> <p>Explosive eruption at Mt. Redoubt 2009</p> <p>Previous eruption on Mt. Spurr was a side blowout.</p> <p>Debris flows similar to those that occurred in 1953 and 1992 eruptions of Crater Peak could dam Chakachamna River. The debris dams might erode progressively or may burst abruptly.</p> <p>Lava flows could dam the Chakachamna River and raise Chakachamna Lake.</p> <p>Large floods would be produced by surging and melting of glacial ice during an eruption.</p> <p>Glacier movement (melting at base) is probable. Ice flow on Barrier Glacier may surge, dam the lake, raise water level and erode through, typically below the glacier in material.</p> <p>Access road may become blocked or destroyed by mud or erosion (high flows in river from melting glacier or glacial dam breakout).</p> <p>Effects on river bridges from debris flow</p> <p>Ash effects on transmission</p> <p>Poison gas cloud could affect the powerhouse (unlikely with distance &amp; powerhouse location)</p> <p>Communications may be disrupted by volcano.</p>	<p>Mt Wrangell is located to the more than a hundred miles to the East and is closer to Watana. Mt Wrangell is in a non-eruptive active state at present but with history of 9 reported possible eruptions since 1760, most recently 1930; steaming at present. Ash could reach the Watana project and transmission lines depending on wind conditions. Pyroclastic flows are unlikely to affect Watana due to distance and intervening terrain.</p>
<b>Tunnelling and Foundation Conditions</b>		
Dam	<p>Small structure on rock foundation.</p> <p>Material of the natural dam, believed to be moraine, could contain significant quantities of ice, lahar material, or volcanic ash that could affect the permanence of the natural dam.</p>	<p>Geotechnical exploration indicates favorable foundation conditions on bedrock.</p> <p>Foundation (permafrost). Melting permafrost in the rock could lead to increased permeability of foundation that may require additional grouting associated with project site.</p>

Table 9-1 Operational Uncertainties Issue Comparison

Issue and likelihood of occurrence within next 100 years	Chakachamna Project	Susitna Project
	Issue Notes/Requirements	Issue Notes/Requirements
		River diversion tunnels. Large spillway.
Power tunnel(s)	Extensive underground construction will be expensive to shut down for inspection and repair if necessary.  Very hard rock along tunnel alignment – more than 35,000 psi, which is extremely hard and could present difficulty for a tunnel boring machine resulting in slow progress.	Competent rock conditions for dam and tunnel construction, studies date to 1982.  Very short power tunnel(s) – 1.0 mile max, and shallow and surface power tunnel, therefore less risk of delay in construction.  Limited number of geotechnical fault zones to pass through, due to location and short length of tunnels, provided "Fingerbuster" and "Fin" zones are avoided.
<b>Glacier Activity</b>		
Dam and Intake	Unpredictability regarding the interaction of glaciers with the volcanic activity, including possible melting at the base of the ice that would cause glacial pulses or surges.  An advance of Barrier Glacier at the Chakachamna Lake outlet, initiated by heat from below the ice, could dam the outlet and raise the lake level. When the ice nose decayed, a large volume of water would be released that could erode the lake outlet and lower the lake below its present level. There is potential during events such as floods, glacial activity for down cutting of the glacial moraine at the end of the lake which could reduce head and storage in the project. Lowering the lake would reduce the submergence of the power inlet below what is acceptable. Breakout in 1971 one of Alaska's largest recorded floods.	N/A
Powerhouse	Blockade Glacier has been identified as a source of outburst floods on McArthur River	N/A
Surging Glaciers	Four glaciers in the Chakachamna study area have been identified as surging glaciers. They include Pothole Glacier and Harpoon Glacier in the Nagishlamina River Valley and Capps Glacier on the eastern slope of Mt Spurr.	N/A

Table 9-1 Operational Uncertainties Issue Comparison

Issue and likelihood of occurrence within next 100 years	Chakachamna Project	Susitna Project
	Issue Notes/Requirements	Issue Notes/Requirements
Outburst Glaciers	Glacier damming of the Nagishlamina Valley by a surging glacier may result in outburst conditions at the outlet from Chakachamna Lake. A sudden influx of water into Chakachamna Lake could produce significant changes including lowering of the lake outlet.	N/A
<b>Other</b>		
Intake	Lake tap would need fish screens Volcano eruption may affect power tunnel intake.	N/A
Access Road	Landslide, avalanche danger part of the route.	Avalanche danger over a portion of the route.
Transmission Line	42 miles of new transmission line to Beluga Sub Station. Submarine cable across Cook Inlet subject to marine environment risks such as currents, scour, dragging anchors.	58 miles of new transmission line.
<b>Operation &amp; Maintenance</b>		
Operations & Maintenance	Long tunnel intersecting numerous faults susceptible to rock-falls over time and maintenance requirements Rock entrained in tunnel flow could damage turbines Long tunnel has higher risk of collapse, blockage Long tunnel will require planned outages for inspection and maintenance over life of project, higher risk of interruption.	Multiple short tunnels allows for more regular inspection and maintenance without prolonged outages and impact to operations
<b>Load Stability</b>		
Powerhouse location with respect to load centers	Off the end of the railbelt load center, not easy to stabilize (brown-out/black-out).	Location between Anchorage and Fairbanks means project is closer to center of load, easier to stabilize grid using reactive potential.
<b>Hydrological Risk - Water Shortage</b>		
Drought	Small catchment mainly fed by meltwater from glaciers, which make this site more susceptible to water shortages and less dependable as a source of energy.	Catchment is less susceptible to drought.

# Summary and Conclusions

This document compared two large hydroelectric projects to determine which would better meet the needs of the railbelt population and the State of Alaska now and into the future. The following table shows a comparison summary of the two projects.

**Table 10-1 Comparison Summary**

Criteria	Susitna (Low Watana) Project	Chakachamna Project
Engineering (Cost)	\$4.5B	\$2.9
Environmental	Same basin, modified flows, little to no salmon present.	Cross basin drainage, substantial concern regarding fisheries and Trading Bay State Game Refuge.
Energy	2,600 GWhrs annual average. About 50% of existing railbelt annual electrical energy. Meets and exceeds State energy policy without other projects.	Most likely to be less than 1,100 GWhrs annual average. About 20% of existing railbelt annual electrical energy. Does not provide substantial winter power.
Start-up Date	Approximately 11 years	Approximately 15 years
Licensing/Permitting	Substantial site knowledge likely to reduce licensing/permitting delays.	Significant unknowns on environment, geology, and hydrology likely to slow process
Finance	Requires State financial support	Requires State financial support
Cost of Energy	Simple calculation using cost & energy numbers above, 50% State equity, and 6% interest yields \$0.06 /khr	Simple calculation using cost & energy numbers above, 50% State equity, and 6% interest yields \$0.09-0.12 /khr
Operational Uncertainty	Less long term operational risk from seismic. Central location helps to stabilize grid.	Greater long term operational risk from seismic events, volcano eruption, & glacial changes. Energy more variable on an annual basis. Harder to stabilize.
Notes	River system has potential to expand generation by going upstream, downstream, or raise dam height. Transmission lines could connect to other areas of the State.	

The Susitna Project would produce more energy and at a lower cost per MW. Historically the flow has varied little year to year so that the amount of energy can be better estimated. Most of the Project is anticipated to be above ground so that geotechnical unknowns that influence construction cost risk are minimized. Produced energy during summer would be greater than desired so that flows would remain high for salmon downriver. However, the reservoir area would give the Project the ability to still generate substantial power during the winter critical months.

The Chakachamna Project would not be able to divert flow as was used for estimating energy in the early 1980's. The reduced flow would have substantial effects on the Trading Bay State Game Refuge down river and would cause false attraction to return adult salmon so that they are not able to find their way to the lake. In addition, the smolt salmon in the lake need substantial outlet flow to enable them to find the exit to the lake. Drawing down the lake during the winter would cause mortality of shallow spawners and may prevent salmon from ascending up the rivers at the head of the lake during early summer. If the Project is operated to provide significant environmental flows and restrict the lake drawdown then the cost of energy increases significantly and would produce minimal energy during the critical winter months. Because of the complex two drainage system hydrology and rich fisheries determining the environmental flow and conditions will require many years and millions of dollars. The substantial number of multi-year studies would delay the licensing and start-up date.

The Susitna Project is thought to be a licensable project without a fatal flaw. Geotechnical information indicates bedrock is suitable for construction. Environmental information indicates that impacts would be minimal. The Chakachamna Project has many fisheries concerns that will restrict the Project operation, increase the cost, and decrease the energy output of the Project. Some of the issues may not be able to be mitigated.

The Susitna Project provides a lower cost per unit of energy, the least environmental impact, a greater total amount of energy, and the anticipated startup date is sooner.

Based on the projects economics and impacts Susitna Project (Low Watana non-expandable alternative) should be the primary Project to pursue with Chakachamna Project as the alternative.

# Recommendations

---

We recommend that field studies and engineering evaluations be conducted on the Susitna Project preparing for a Final Decision Document scheduled to be released on November 15, 2011. In addition, we also recommend that a FERC license application be initiated on January 1, 2012 for the selected Project. In order for the process to move forward it is recommended that a Preliminary Permit be filed with FERC for the selected Project by December 31, 2011.

Specific studies to be completed in 2011 include:

- A complete review of the 1985 Susitna environmental study plan and the conduct of critical studies from that plan. Changes to the river system and the environment need to be documented.
- Field work to verify Susitna environmental conditions.
- A detailed cost estimate of the Chakachamna Project including changes to the Project introduced by environment constraints such as downstream flow releases (size optimization).
- A final determination of the type dam to be used at the Susitna site and the access plan and a revised cost estimate of the overall scheme.
- Detailed engineering studies on transmission needs, design drawings, and geotechnical review.

It is anticipated based on the schedule discussion in preceding Section 6.0 that the data gathered in the 2011 field season can be used for both the primary and alternative project. The FERC Preliminary Permit for the Susitna Project should be filed by December 2011.

## Chapter 12

# References

---

### 12.1 Reference Lists

Acres 1982. *Susitna Hydroelectric Project Feasibility Report*.

Bechtel 1983. Chakachamna Hydroelectric Project Interim Feasibility Assessment Report, Vol. I, II, and III. Bechtel Civil and Minerals Inc. Alaska Power Authority.

Black & Veatch 2010. Alaska Railbelt Regional Integrated Resource Plan (RIRP) Study. Final Report. February 2010. Available online:  
<http://www.aidea.org/aea/regionalintegratedresourceplan.html>

EPS. 2009. Susitna Hydro Transmission Study. Report to AEA dated October 22, 2009

Harza Ebasco. 1985. *Introduction to the Amendment to the License Application before the Federal Energy Regulatory Commission*. Chapter III Project Description.

\_\_\_\_\_. 1985. Susitna Hydroelectric Project Draft License Application. Volume 1. Exhibit A Project Description. Sections 1- 15.

\_\_\_\_\_. 1985. Susitna Hydroelectric Project Draft License Application. Volume 15. Exhibit F Project Design Plates.

\_\_\_\_\_. 1985. Susitna Hydroelectric Project Draft License Application. Volume 16. Exhibit F Supporting Design Report.

\_\_\_\_\_. 1985. Susitna Hydroelectric Project Draft License Application. Volume 2. Exhibit B Project Operation and resource Utilization. Section 3 Description of Project Operation.

\_\_\_\_\_. 1985. Susitna Hydroelectric Project Draft License Application. Volume 2. Exhibit B Project Operation and resource Utilization. Section 4 Power and Energy Production.

\_\_\_\_\_. 1985. Susitna Hydroelectric Project Draft License Application. Exhibit D Project Costs and Financing. Section 1 Estimates of Cost.

\_\_\_\_\_. 1985a. Susitna Hydroelectric Project Draft License Application. Volume 9. Exhibit E Chapter 3 Sections 1 and 2 – Fish, Wildlife and Botanical Resources.

\_\_\_\_\_. 1985b. Susitna Hydroelectric Project Draft License Application. Volume 10. Exhibit E Chapter 3 Section 3 – Fish, Wildlife and Botanical Resources.

\_\_\_\_\_. 1985c. Susitna Hydroelectric Project Introduction to the Amendment to the License Application.

- \_\_\_\_\_. 1985d. Susitna Hydroelectric Project Draft License Application. Volume 11. Exhibit E Chapter 3 Sections 4, 5, 6 & 7 – Fish, Wildlife and Botanical Resources.
- \_\_\_\_\_. 1985e. Susitna Hydroelectric Project Draft License Application. Volume 12. Exhibit E Chapter 4, 5, and 6. – Cultural Resources, Socioeconomic Resources, and Geological and Soil Resources.
- HDR 2010. Susitna and Chakachamna Preliminary Decision Document Energy-Cost-Environmental. Prepared for Alaska Energy Authority
- HDR Alaska. 2008. Field Reconnaissance Interim Summary Report, Chakachamna Hydro Project. Prepared for TDX Power, Inc.
- \_\_\_\_\_. 2009. Susitna Hydroelectric Project, Project Evaluation, Interim Memorandum, Final, March 2009.
- \_\_\_\_\_. 2009. Susitna Hydroelectric Project, Conceptual Alternatives Design Report, Final Draft. November 2009.
- Johnson, J. and P. Blanche. 2010. Catalog of waters important for spawning, rearing, or migration of anadromous fishes – Southcentral Region, Effective June 1, 2010. Alaska Department of Fish and Game, Special Publication No. 10-06, Anchorage.
- R&M Consultants/Hatch Associates Consultants 2010. Susitna-Low Watana & Chakachamna Projects Large Hydro Evaluation of Two Projects Preliminary Decision Document Environmental & Regulatory Issues.
- R&M Consultants 2009. Susitna Project Seismic Setting Review and Geologic and Geotechnical Data Reports Review. Prepared for Alaska Energy Authority.
- SNW 2010 Hydroelectric Project Risk Analysis & the Bradley Lake Model, Summary Report. Prepared for Alaska Energy Authority
- TDX Power 2009. Pre-Application Document. Chakachamna Project (FERC No. 12660), July 2009.
- Tennant, D.L. 1972. A method for determining instream flow requirements for fish, wildlife and aquatic environment. In: *Pacific Northwest River Basin Commission Transcripts of Proceedings, March 15-16, 1972*, Pacific Northwest River Basin Commission, Portland, Oregon. 3-11.
- Yanusz, R., R. Merizon, D. Evans, M. Willette, T. Spencer and S. Raborn. 2007. Inriver Abundance and Distribution of Spawning Susitna River Sockeye Salmon, 2006. Alaska Department of Fish and Game Fisheries Data Series No. 07-83. Anchorage.



*Hydroelectric Project Risk Analysis &  
the Bradley Lake Funding Model*

*Summary Report*

SNW

1420 Fifth Avenue, Suite 4300  
Seattle, Washington  
98101

Phone: (206) 628-2882

Fax: (206) 343-2103

11/15/2010

## INTRODUCTION

The State of Alaska is analyzing the Susitna and Chakachamna hydroelectric projects for possible development. Both projects would require the investment of substantial resources and capital to move to the construction phase, including time and costs associated with an environmental review and the Federal permitting and licensing process. As part of the information gathering process, SNW has been asked to perform the following specific work tasks:

1. List and, if possible, assess the potential risks from an investor's perspective of the Susitna and Chakachamna hydroelectric projects.
2. Research, compare and contrast the Bradley Lake project and its original funding mechanisms to a potential similar project today.

### *Context for the Risk Assessment Component of This Report*

Currently, there are several large hydroelectric facilities being constructed around the world. Many of these projects are being built in the BRIC nations (Brazil, Russia, India and China), where there are fewer permitting and environmental challenges to overcome. Nearly all projects of the size and scope of Susitna and Chakachamna currently being developed internationally are structured with some amount of government assistance or government guaranty, and many also include an equity investor participant. Some examples include China's Three Gorges, BC Canada's Toba Montrose, BC Canada's Waneta Expansion, Thailand/Laos' Pak Chom and Ban Koum projects (similar size/costs), and Brazil's Santo Antonio. The Waneta Expansion project financing is typical of the structures used to develop large hydro electric facilities; a more detailed description follows:

#### **Waneta Expansion Project Description**

Fortis Inc., an electric utility holding company, has entered into a partnership with Columbia Basin Trust (CBT) and Columbia Power Corporation (CPC), both 100% owned corporations of the Government of British Columbia, to construct a \$900 million 335 megawatt hydroelectric generating facility on the Pend d'Oreille River, near Trail, British Columbia. The partnership calls for Fortis to own and operate 51% of the non-regulated portion of the facility and the CBT/CP group to own and operate the other 49% of the Waneta Expansion Project. The energy generated by the project will be sold to BC Hydro under a long-term power purchase contract. The surplus capacity will be sold to FortisBC under a long-term capacity purchase agreement. Fortis' portion of the initial financing costs are expected to be covered through credit facilities and then through long-term debt and equity take-out financing. The CPC portion is being funded through a \$500 million commitment to be used as equity funding for joint venture power projects. Construction on the Waneta Expansion Project is expected to last four and a half years.

One important distinction between the large generation projects being constructed globally and the projects under consideration in Alaska is that the projects being built globally have access to large populations via transmission grids. This ability to both serve the immediate power consumption needs within the facility's service area and have access to other markets via a transmission system improves the baseline feasibility of a power generation facility and creates the option to develop excess capacity, which can be sold at market rates. Without state or federal support, Alaska's isolated geographic location eliminates the ability to build capacity which, when added to the current generation capabilities within the railbelt, exceeds existing demand.

It is the isolated geographic location of the railbelt customer base, in combination with the scope and complexity of the Chakachamna and Susitna projects, that lead us to conclude that neither of these facilities can be completed through a project finance vehicle (i.e., the security for the financing would be exclusively revenue from the sale of project-generated power). In our view, these projects will require State funding, which could be directly via capital investment and/or indirectly through some form of credit support or backstop, in order to obtain securities market access. It is also our view that it is reasonable for the State to consider investing in railbelt generation assets with the objective of developing a long-term stable source of base load power at a cost that will promote economic stability and growth within the railbelt region. Nevertheless, the process the State should go through in determining whether to invest additional time and resources into either the Susitna or Chakachamna project is analogous to the diligence that an equity investor would perform prior to the commitment of capital.

The following section identifies many of the risks inherent to an investment in either the Susitna or Chakachamna project. SNW is not qualified to advise AEA on the susceptibility of Susitna or Chakachamna to most of the risks identified. Many of these risks are focused on engineering or geological elements specific to the projects, and we are not an engineering firm. For this reason, we have confined our work to just the identification and explanation of risks, and for the most part have withheld any opinion as to whether either of the projects is more or less susceptible to a particular risk. The State, with its engineering and geotechnical resources and significant history with each of these proposed facilities, is in the best position to risk-weight the projects. Our objective is to help to identify as many of the project risks as possible and provide some framework to assist AEA with its risk assessment.

#### **FINANCING CRITERIA: DISTINGUISHING RISK**

Through a review of publicly available websites and documents footnoted or sourced throughout this report, we have evaluated and categorized some of the different risks associated with the two selected projects. As with the analysis of any project finance type structure, an investor will rely on a project feasibility study to outline the various engineering risk factors and risk mitigation efforts that are being undertaken throughout the stages of project development. SNW has not specifically studied nor are we suited to evaluate the two projects with respect to the different types of geological, volcanic, environmental risks, etc. from an engineering perspective. However, it is these risks that primarily distinguish Susitna and Chakachamna from one another.

Some potential risk factors are discussed below:

##### *Overall Project Timeline*

Both Susitna and Chakachamna are expected to take multiple years to permit and construct. The phased execution of the projects over multiple years has the effect of amplifying the elements of construction risk and reducing the overall confidence in project feasibility. Specifically with regard to Susitna and Chakachamna, the remote location of the projects will also be a factor in timely completion of the projects and therefore project feasibility. A large risk factor associated with either project is the unknown site or geological issues that could materialize during the construction phase. All other factors being equal, a shorter project permitting process and construction timeline is likely to result in less project risk.

##### *Permitting and Licensing*

There will be significant permitting risk, at both the Federal and local/State level. Projects of this scope and size would expect strong environmental opposition to the facility, transmission lines, roads (even if only

temporary), and/or railroads. Any project financing would occur only after all permits/licenses were issued and all court challenges were exhausted, so investment of capital leading to the permitting of either project will be substantial. Any risk assessment of the projects under consideration based on permitting and licensing should be done while simultaneously considering the feasibility of construction and the long-term operating viability of the project.

#### *Development/Pre-construction*

There is a significant portion of pre-construction development work that needs to be completed, at a sizable cost. These expenditures are rarely risks that investors will carry. Pre-construction costs would have to be paid by the State or an independent developer.

#### *Construction Risk*

Both the Chakachamna and Susitna projects are subject to a variety of construction risks. The three primary credit concerns relating to construction include (1) the cost of the project, (2) the schedule for the project, and (3) the quality of the completed project. Each can negatively impact the availability of funding and/or the date that the project comes on-line and begins producing revenue.

Project cost risk is influenced by a whole host of risks inherent to both projects in various degrees. As noted above, the duration of construction can amplify the risk of many of these cost factors. Some of the risk elements that can influence project cost are:

**Inflation Risk.** The risk that the future cost of materials and/or labor will exceed estimates.

**Supply Risk.** The risk that materials required for construction will be unavailable due to competing construction demand and/or the inability to deliver materials to the job site due to a remote location or problems along the supply route.

**Labor Risk.** The risk that there will be either a shortage of the labor required to move the project forward on schedule or a work stoppage delaying completion.

**Engineering Risk.** The risk that the project will encounter unanticipated and/or under-estimated construction challenges. While we are not an engineering firm, it is our understanding that many large project cost overruns are caused by unforeseen underground conditions. The scope and nature of underground work at both Susitna and Chakachamna should be carefully assessed and factored into overall project feasibility.

**Contractor Risk.** The risk that a contractor will fail to perform on its contractual obligations. This risk can be mitigated by allocating construction risks among the various project participants through the use of design/build contracts and the implementation of fixed price/fixed schedule agreements, and by including price incentives and disincentives in construction contracts. Nevertheless, it is impossible to completely insulate a project from contractor risk, and the overall complexity of the project including project siting and engineering should be factored into the risk assessment.

#### *Geological Risk Factors*

There are significant potential geological risks associated with the two projects, which have been identified and discussed in the following documents:

*Susitna Project, Watana and High Devil Canyon – RCC Dam Cost Evaluation*, prepared by R&M Consultants, Hatch Acres, and Jack Linnard Consulting (which sourced two other studies including *1982 Feasibility Study (Acres)*, and *1983 License Application (Harza Ebasco 1983)*).

Both projects entail significant project risk and it is our opinion that the risks associated with both projects would require substantial financial backing in the form of credit support from the State to be feasible. For Chakachamna, the potential implications of Mt. Spurr volcanic activity, the close proximity of the Castle Mountain fault, and the geological nature of the lake tap would be significant areas of concern for investors. From a capital markets perspective, and not based on any engineering expertise, it is our opinion that the seismic and geological risk factors connected to the Susitna project seem to be considerably less than Chakachamna, nevertheless Susitna will demand extensive seismic and geological analysis prior to obtaining outside capital funding.

#### *Environmental (Fish, Plant, Wildlife) Risk Factors*

Both projects will incur environmental issues in the form of fish passage, changes in water quality and temperature, vegetation removal, wildlife habitat loss or alteration, and reservoir fluctuations. These risks may not be limited to the construction period. Post-construction environment risk could materialize due to an unanticipated environmental impact. Again, based solely on our capital markets perspective, the design of the Chakachamna project, which will necessitate the diversion of water flow from one drainage to another, appears to have the increased potential for environmental risk, particularly the potential for post-construction environmental damage and possible corresponding operating risk.

#### *Regulatory/Legal Risk Factors*

While there are significant federal hurdles associated with the permitting of a hydro project (of any size), there have been some recent positive legal developments out of Washington, D.C. The U.S. Department of Energy, Department of Interior, and the Army Corps of Engineers recently signed a Memorandum of Understanding intended to promote the development of hydropower in the United States. The MOU is intended to increase cooperation among the different agencies and to integrate policies and procedures at the federal level. This potentially creates efficiencies through the regulatory approval process and an improvement in the time frame in which required approvals are obtained.

Notwithstanding the above, it would be a mistake to proceed with either project under the assumption that there is no political risk. While politically stable, the United States has a long history of changing rules and regulations due to a political shift in governance or general public sentiment.

#### *Technology Risk*

Hydro is a tried and true technology capable of providing very stable base load power, but it is capital-intensive. The possibility of technological improvements in other sources of base load power leading to greater output, lower environmental impact, and reduced generation and transmission costs would be a factor for any investor. This risk factor can be mitigated through the structure of the Power Purchase Agreement.

## **BRADLEY LAKE COMPARISON ANALYSIS**

### *Description and History*

The Bradley Lake Hydroelectric Project is located in south-central Alaska at the southern end of the Kenai Peninsula. The project includes a 610-foot-long, 125-foot-high concrete-faced and rock-filled gravity dam, a 3.5-mile power tunnel and a steel-lined penstock. The project has 126 megawatts of installed capacity. Two

20-mile, 115-kilovolt transmission lines connect the project to a transmission system on the Kenai Peninsula. The project provides electric power to the most populous areas of Alaska, including the Kenai Peninsula, the Municipality of Anchorage, the Matanuska-Susitna Borough, and the Fairbanks area. Under a Power Sale Agreement, AEA has sold 100% of the capacity to the following purchasers:

- Chugach Electric Association, Inc. (30.4%);
- Municipality of Anchorage (25.9%);
- Alaska Electric Generation & Transmission Cooperative, Inc. (25.8%) acting on behalf of Homer Electric Association, Inc. (12.0%) and Matanuska Electric Association, Inc. (13.8%);
- Golden Valley Electric Association, Inc. (16.9%); and
- City of Seward (1.0%).<sup>1</sup>

The power generation potential of Bradley Lake was first studied by the U.S. Corps of Engineers and presented in a report dated March 1955. The project was authorized by Congress in 1962, but, despite its feasibility, federal funds were not available for its construction. The Alaska Energy Authority (then Alaska Power Authority) assumed responsibility for the project in 1982. Preliminary plans and field investigations started in 1982. In April 1984, AEA submitted a license application to the Federal Energy Regulatory Commission. The FERC license is the primary regulatory approval governing project development. The license to construct the project was issued on December 31, 1985, under the Energy Program for Alaska. In addition to the FERC license, AEA applied for and received 170 federal, State and local permits and licenses required to support construction and operations. A number of studies and investigations were performed to ascertain the geologic and geotechnical conditions of the site and structures. Seismic design considerations and the results of the investigations were reviewed and found prudent by the projects' technical review board and the FERC board of consultants.<sup>2</sup> In addition, a number of environmental studies were done, including studies of the effects of the project on wildlife, fish and winter ice conditions.<sup>3</sup> Construction of the project commenced on June 17, 1986, with site preparation work. Construction was suspended, however, after the completion of Phase I in May 1987 due to the pending negotiations of a satisfactory power sales agreement. In December 1987, AEA and the railbelt utilities entered into a Power Sales Agreement, and legislation was introduced in January 1988 to exempt the Bradley Lake power sales agreements from review by the Alaska Public Utilities Commission.<sup>4</sup> Construction of the project resumed on March 12, 1988, and the project was declared in commercial operation on September 1, 1991. From the project's completion in 1991 through 2009, the project has had an average annual output of 386.4 million kilowatt hours.

### *Original Financing*

Project cost in the amount of \$357.2 million (including reserves, capitalized interest, and cost of debt issuance) was funded long-term by (1) appropriations from the State in the initial aggregate amount of \$175 million (later reduced to \$163.6 million), (2) proceeds from the sale of AEA's bonds issued in the amount of \$165.3 million, and (3) approximately \$28.3 million of interest earnings during construction. A portion of the

---

<sup>1</sup> Alaska Energy Authority Bradley Lake Hydroelectric Project Fact Sheet (2010)

<sup>2</sup> Alaska Energy Authority Power Revenue Bonds, Second Series Official Statement (1990)

<sup>3</sup> "Throwing the switch at Bradley Lake," Alaska Business Monthly (1991)

<sup>4</sup> "Throwing the switch at Bradley Lake," Alaska Business Monthly (1991)

State appropriations funding was provided by the Railbelt Energy Fund, which was established from the Power Development Fund and seeded with appropriations for the canceled Susitna Hydroelectric Project.<sup>5</sup>

AEA issued approximately \$267.5 million of Variable Rate Demand Bonds during the project construction phase to be used for construction cost. The Variable Rate Demand Bonds were sized in an amount that, together with interest earnings, would be sufficient to completely cover construction of the project. This approach created the ability to earn the maximum amount of interest earnings during construction. The Variable Rate Demand Bonds were general obligations of AEA and were secured by bank letters of credit and a capital reserve fund under an Indenture of Trust from AEA to the Bank of New York. Following construction, the Variable Rate Demand Bonds were redeemed using a combination of State-appropriated funds and the proceeds of long-term, fixed rate bonds issued in the amount of \$165.3 million. The initial bond sales were issued in very flat yield curve environments, with interest rates ranging from 6.1% on the short end to 7.25% on the long end.<sup>6</sup> The original financing plan for the project is outlined in the table below:

**FINANCING PLAN FOR BRADLEY LAKE**

<i>Available Funds</i>	
Long-Term Bond Issuances	\$ 165,260,157
State Appropriations	163,605,157 *
Interest Earnings from VRDBs	28,375,379
<b>Total</b>	<b>\$ 357,240,693</b>
<i>Application of Funds</i>	
Project Construction	\$ 312,500,000
Capitalized Interest	17,418,182
Capital Reserve Fund	13,392,890
Renewal and Contingency Fund	5,000,000
Bond Insurance Premiums	1,302,839
Bond Issuance Expenses	3,339,175
Operating Reserve Account	625,000
Net Original Issue Discount	3,662,607
<b>Total</b>	<b>\$ 357,240,693</b>

\* The original appropriation was in the amount of \$175,080,000, but \$11,474,843 was refunded to the State after construction.

<sup>5</sup> "Allure of the Railbelt Energy Fund," Alaska Business Monthly (1990)

<sup>6</sup> Electronic Municipal Market Access and Alaska Energy Authority Power Revenue Bonds, Second Series Official Statement (1990)

The Variable Rate Demand Bonds were refunded through two long-term issuances, the first in 1989 in the amount of \$105 million and the second in 1990 in the amount of \$60,259,015. The sources and uses for the permanent financing of the project are outlined in the table below.

	1st Series Revenue Bonds	2nd Series Revenue Bonds	Total
<i>Sources</i>			
Principal Amount of Bonds	\$ 105,001,142	\$ 60,259,015	\$ 165,260,157
Existing Funds*	100,000	227,848,767	227,948,767
Total	\$ 105,101,142	\$ 288,107,782	\$ 393,208,924
<i>Uses</i>			
Redemption of Variable Rate Demand Bonds	\$ 76,600,000	\$ 190,900,000	\$ 267,500,000
Deposit to Construction Fund	-	82,300,919	82,300,919
Deposit to Interest Account	12,245,356	3,840,138	16,085,494
Deposit to Capital Reserve Fund	8,423,148	4,969,742	13,392,890
Deposit to Renewal and Contingency Reserve Fund	1,524,466	3,475,534	5,000,000
Deposit to Operating Reserve Account	-	625,000	625,000
Bond Insurance Premium	798,839	504,000	1,302,839
Underwriting Discount and Costs of Issuance	2,030,445	1,308,730	3,339,175
Net Original Issue Discount	3,478,888	183,719	3,662,607
Total	\$ 105,101,142	\$ 288,107,782	\$ 393,208,924

#### *Comparison of Current Financing Environment*

The project was an innovative deal at the time that it was originally built and financed, and was the first instance of a state agency financing a power project on a long-term basis.<sup>7</sup> While the current financing environment is very different from that of 25 years ago, when the project was developed, the size, scope and success of the project makes it a relevant standard to analyze when considering a comparable large scale hydroelectric project. For this comparison, we have focused on highlighting the key components of the original financing relative to what could be expected in today's market. These components include:

- Arbitrage and investment earnings
- Rate environment and pricing
- Equity
- Security
- Power sales agreement
- Regulatory review and waivers
- Financing terms and conditions

**Arbitrage and Investment Earnings:** During the construction phase of the Bradley Lake project \$267.5 million of Variable Rate Demand Bonds were utilized as interim funding and were later repaid through the

<sup>7</sup> Alaska House Judiciary Committee, Action Narrative, January 26, 1988. Tape 88 Side 1.

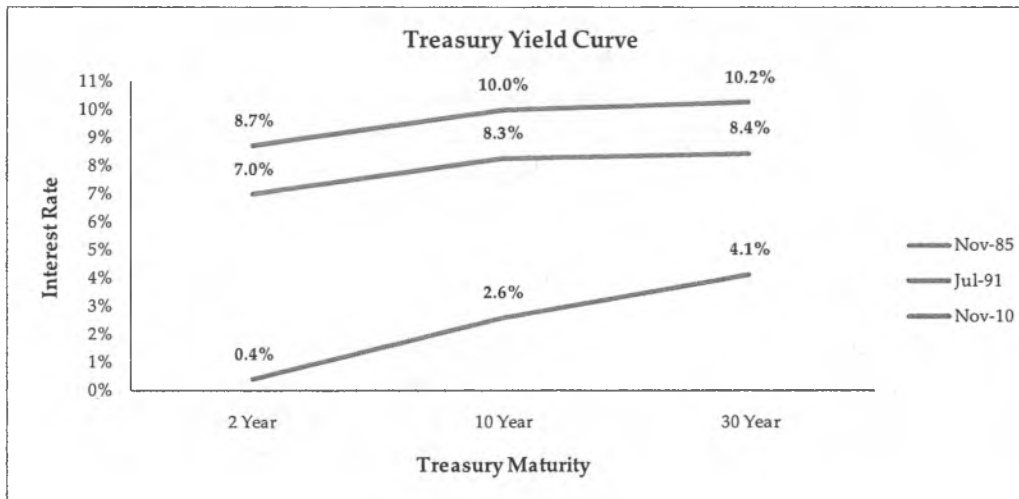
combination of State appropriations, which, in effect, acted as equity in the transaction, and long-term fixed rate revenue bonds, which would be backed by the power sale agreement. One significant aspect of variable rate demand bonds issued at the time is that, because they were issued prior to the Tax Reform Act of 1986, unspent proceeds from the bonds could be invested at a higher, taxable rate of interest. This interest rate arbitrage was used as additional source of capital for the project. Investment earnings on this arbitrage over the life of the Bradley Lake variable rate demand bonds equaled \$28.3 million or approximately 9.0% of the total project costs. The 1986 Tax Act eliminated any ability to use tax-exempt bond proceeds to earn interest arbitrage, so interest rate arbitrage would not be available for a similar transaction today.

**Rate Environment and Pricing:** The 1980s saw a declining interest rate environment with relatively flat yield curves. While rates did not decrease in a linear fashion, due to some volatility in the decade, the overall rate decrease was fairly dramatic. For example, the 10-year treasury rate went from almost 15% in 1981 to around 8% in 1989, while the 2-year treasury rate went from almost 16% to around 8% over the same period. Long-term rates were in the 10% range in 1985 when the variable rate demand bonds were issued. The permanent take-out bonds were issued on a serial basis, with interest rates ranging from 6.10% on the short end to 7.25% on the long end. This environment is very different from the one we are currently experiencing, with historically low rates and a very steep yield curve. Rates on the 2-year treasury are currently 0.38%, while the 30-year treasury is around 4.12%.

The combination of historically high long-term tax exempt interest rates and a declining interest rate environment made variable rate bonds during the construction phase of Bradley Lake a good choice. As noted above, prior to being expended on the project, proceeds of bonds issued during the construction phase were invested above the variable rate cost of capital, creating interest earnings that exceeded the interest cost of the construction financing. The Bradley Lake funding structure took full advantage of the arbitrage strategy by borrowing for the full amount of the project, including the amount that was expected to be loaned by the State.

Additionally, the use of variable rate bonds served to minimize borrowing cost during construction. As bond proceeds were expended and therefore no longer able to be invested to create arbitrage earnings, the cost of interest was minimized since, in the typical upward-sloping yield curve environment, short-term variable rates were lower than long-term fixed rates. The combination of arbitrage earnings and low rates once bond proceeds were spent served to lower the funding cost of the project during the construction phase.

The Bradley Lake funding cost was additionally benefitted by falling rates during the construction period. As construction wrapped up, the variable rate bonds were refinanced with long-term fixed rate bonds in a lower interest rate environment than the long-term rate environment that existed when the project was started, as illustrated in the table below.



Interest rate risk is always a concern for project feasibility. Rising rates during project construction can substantially jeopardize project feasibility. By utilizing variable rate funding during the construction phase of the project, Bradley Lake was exposed to rate risk; however, this was a calculated risk, since the project was started in a high interest rate environment. Variable rate funding could also be a tool utilized to finance either Susitna or Chakachamna to provide extremely low-cost capital during the construction phase. Of course, the projects would be exposed to interest rate risk until the long-term fixed rate funding is secured. Contrary to 1985, today's long-term interest rates are historically low, creating an incentive to use fixed rate funding during the construction phase and eliminate the risk of rising rates.

While eliminating rate risk, fixed rate funding would likely result in additional cost in the form of negative arbitrage, or the inability to invest construction proceeds at or above the long-term borrowing rate, during the construction phase. Since negative arbitrage would only exist during the construction phase, it should be considered as an additional cost that, at least in the current rate environment, is outweighed by the risk of rising rates.

**Equity:** Another key component of the Bradley Lake funding structure was the large percentage of equity that was provided through appropriations from the State. State appropriations for the project ended up accounting for approximately 50% of the total project costs. The State's participation in the Bradley Lake project allowed the substantial capital cost of the project to be spread over a period of time that exceeded what would have been available through the bond market.

**Security:** The Variable Rate Demand Bonds were backed by a letter of credit as well as a general obligation of AEA. The permanent take out bonds were backed by revenues of the power sale agreement, the general obligation and full faith and credit of AEA as well as a moral obligation of the State. In today's environment, an investor would expect to see at least this level of credit support for a deal of this size and complexity.

**Power Sales Agreement:** The power sale agreement is simply the business deal between the power generator and the power purchaser and can be used to shift risk from the generator/developer to the power purchaser. The power sale agreement in the Bradley Lake project was heavily negotiated by the various parties and at one point was actually the cause of a significant construction delay on the project.<sup>8</sup> As the main source of payment and security, the power sale agreement was integral in arranging the permanent financing. A unique attribute

<sup>8</sup> Throwing the Switch at Bradley, Alaska Business Monthly (1991)

of the Bradley Lake power sale agreement was that the agreed payments continued for an additional 20 years after bonds used to fund the project were scheduled to be retired. This structure was designed to repay the State for the considerable capital that was contributed to the project but also served to extend the time frame for amortizing the cost the project.<sup>9</sup> SNW believes that this aspect of the Bradley Lake contract has applicability to future generating projects within the railbelt.

**Regulatory Review and Waivers:** While no one would argue that the Bradley Lake project was fast tracked, given the time spent on analysis and the rigorous regulation process that was required, two key waivers were obtained in the process. The first was a special federal exemption that allowed the project to use tax-exempt financing despite the fact that it would serve three contiguous counties. Normally, private activity bonds for electric facilities are exempt only if the facilities are used by a utility serving no more than two contiguous counties. Secondly, the sale and purchase agreement was exempt from APUC review, which removed a great deal of uncertainty within the investor community and seems to have been instrumental in moving the project forward at a critical juncture in time.<sup>10</sup> While these specific waivers may not be necessary for a similar project in today's environment, it is important to remember that a project of this size and scope has the potential to require various agencies and levels of the public sector to work together to achieve success.

### *Financing Terms*

The tables below outline the key terms and conditions achieved in the Bradley Lake financings compared to what might be achievable for a similar project today.

---

<sup>9</sup> Alaska House Judiciary Committee, Action Narrative, January 26, 1988; tape 88 side 1

<sup>10</sup> Alaska House Judiciary Committee, Action Narrative, January 26, 1988; tape 88 side 1

**INITIAL CONSTRUCTION FINANCING**

<b>FUNDING MECHANISMS</b>	<b>ORIGINAL BRADLEY LAKE PROJECT</b>	<b>POTENTIAL PROECT TODAY</b>
<b>Construction Costs</b>	\$312,500,000	Dependent on project
<b>Equity (State Allocation)</b>	\$175,000,000	Likely to be greater than 50% or more of total project cost
<b>Interim Financing</b>	Variable Rate Demand Bonds	State funding potentially in combination with conventional bond funding
<b>Amount of Bonds</b>	\$267,500,000	Dependent on project
<b>Date Issued</b>	11/20/1985	Dependent on project
<b>Use of Funds</b>	Construction	Permitting, licensing, construction
<b>Security</b>	General Obligation of the Authority, Letter of Credit and Capital Reserve	Dependent on project; however, for a large scale project, investors would expect to see significant credit support
<b>Financing Costs</b>		Dependent on project
<b>Interest Rate</b>	Variable Rate	Dependent on security, interest rate environment, tax-status, size, credit rating
<b>Letter of Credit</b>	Required	Possible requirement
<b>Capital Reserve</b>	Required	Necessary requirement
<b>Completion Bonds</b>	Allowed without compliance	-

**PERMANENT TAKE-OUT FINANCING**

<b>FUNDING MECHANISMS</b>	<b>ORIGINAL BRADLEY LAKE PROJECT</b>	<b>POTENTIAL PROJECT TODAY</b>
<b>Bond Resolution</b>	Maximum of \$175,000,000	-
<b>Par Amount Issued</b>	\$165,260,157 \$105,001,142 Series 1 \$60,259,015 Series 2	-
<b>Credit Rating</b>	Moody's Aaa (enhanced) S&P AAA (enhanced)	-
<b>Type</b>	Negotiated / Tax Exempt	-
<b>Underwriters</b>	John Nuveen & Co; Goldman Sachs; Merrill Lynch; Paine Webber; and Lehman Brothers	-
<b>Dates Issued</b>	9/1/1989 Series 1 7/15/1990 Series 2	-
<b>Use of Funds</b>	Refund VRDB and capitalize reserve funds	-
<b>Financing Costs</b>		-
<b>Interest Rate</b>		-
<b>Security for Bonds</b>	Direct and general obligations and full faith and credit of the Authority and revenues received from operation of the project under Power Purchase Agreement	-
<b>Insurance</b>	Yes and provided by MBIAC	-
<b>Power Purchase Agreement</b>	Five utilities purchase 100% of Annual Project Costs, including debt service and annual reserves	Likely different structure than Bradley Lake, but there will need to be a strong PPA in place between the project owner and the railbelt utilities
<b>Power Purchase Default</b>	If insufficient funds available because of payment default of Power Purchaser, ADA may increase each other Power Purchaser's share of costs up to 25%	Step-up provision in the PPA will be a necessary security structure feature; however, it could be structured differently than Bradley Lake
<b>Capital Reserve Fund</b>	Equal to Maximum Aggregate Debt Service	Required, but could be structured differently than Bradley Lake
<b>State Obligation</b>	Moral obligation of the State to restore Capital Reserve Fund	Will depend on PPA structure, but State pledge of any kind would benefit the credit
<b>Completion Bonds</b>	Allowed on parity	Yes, typically up to 10% of original bonds issued to fund the project
<b>Additional Bonds</b>	May be issued on parity for the cost of acquisition and construction of any capital improvement related to the project with approval from the project	Dependent upon type of debt. It is not typical to allow additional bonds for a project revenue bond structure however system debt would permit additional bonds

	management committee as well as proof that the additional bonds will not hinder debt service payments on the original bonds	subject to meeting certain financial thresholds. Bradley Lake is a hybrid additional bonds provision.
<b>Consultant Engineer</b>	Report estimating the projected costs and revenue requirements for a 10-year period as well as opinions on the project	Required
<b>Renewal and Contingency Reserve Fund</b>	Yes	Required
<b>Operating Reserve Account</b>	Yes	Required
<b>Optional Redemption</b>	102% (7/1/00-6/30/01) 101% (7/1/01-6/30/02) 100% (7/1/02 – thereafter)	Will depend on debt type. Taxable bonds would typically not permit optional redemption, while tax-exempt bonds would allow for optional redemption.
<b>Notice of Redemption</b>	At least 30 days but no more than 60 days	-

### *State Financial Assistance*

As identified in previous reports<sup>11</sup> discussing potential financing structures for large generation assets, State financial assistance in a form similar to the Bradley Lake project model will be a necessary tool for either of the potential hydroelectric projects being evaluated. State financial assistance offers a number of advantages not available through traditional utility enterprise bond funding or project finance. State funding, whether in the form of a grant or loan, can be utilized to defer higher cost conventional revenue bond funding. Obviously a grant from the State provides the cheapest form of capital, but even when structured as a loan, State assistance can dramatically lower the overall cost of capital. State funding in the form of a loan has three significant advantages when compared to revenue bonds or a loan from a commercial lender:

**Repayment flexibility.** State funding can be utilized to extend debt repayment beyond the terms available in the public or commercial debt capital markets. Additionally, a State loan can easily be restructured or deferred to achieve system rate objectives.

**Credit support/risk mitigation.** State funding can be used to mitigate project construction risk to investors. This is particularly relevant for projects with extended construction timelines, such as the Susitna or Chakachamna hydro projects. Risk mitigation is also relevant in situations where permitting is an issue or a new technology is being used. As discussed earlier, investors will not accept the significant construction and permitting risks inherent with large-scale projects without some form of support from the State.

**Potential interest cost benefit.** State funding can provide a lower cost source of capital. The State's high investment grade credit rating allows it to borrow for less than even the most secure utility enterprise, and this lower borrowing cost can be passed on to the project. Alternatively, the State can use cash reserves to invest in a large-scale generation project like Susitna or Chakachamna. By using a funding model similar to Bradley Lake's, this capital investment can be returned to the State over an extended period of time. Extending the return of capital to a term that more closely matches the useful

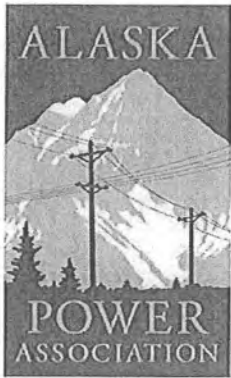
<sup>11</sup> Regional Integrated Resource Plan – Financial Analysis Summary Report, 2/3/2010

life of the asset lowers the rates and charges for utility customers and spreads the capital cost of the project over a larger customer base.

## CONCLUSION

In conclusion, SNW does not believe that it is possible to differentiate between the Susitna and Chakachamna projects on the basis of capital markets access. As we have underscored in this report, the scope of both projects, combined with the unique nature of the railbelt region, will necessitate a funding structure for either project that is supported by State credit or a State capital commitment. We think that it is likely that we would reach this same conclusion for any project with similar complexity and cost developed within the railbelt. There are engineering, geotechnical and seismic factors specific to each of the projects that would be relevant for the State to consider in risk weighting the projects prior to investing additional time and resources in further development. We've highlighted some of those risks in this report but do not have the technical expertise to advise AEA on the importance of these risks.

Finally, we believe that elements of the Bradley Lake funding model have applicability to funding new large hydroelectric facilities within the railbelt. Market conditions and the legal constraints under which any new project would be funded are dramatically different than when Bradley Lake was funded, so the Bradley Lake structure cannot be replicated as a whole. However, the ability to collaborate with the State to mitigate certain risks and spread the capital cost over an extended period of time will be critical to funding a multi-billion dollar project.



# ALASKA POWER ASSOCIATION R E S O L U T I O N

## A Resolution in Support of Expanded Powers for the Alaska Energy Authority

The Alaska Legislature has adopted a goal of 50 percent renewable energy by 2025. The only way this goal can be met is with the construction of a major hydropower facility for the Railbelt or other very large generation projects, the cost of which would be well beyond the financial ability of any of the individual Alaska electric utilities.

Therefore, the state will need to be an integral partner in the funding and construction of any such projects. The logical state entity for this partnership is the Alaska Energy Authority (AEA), but it is, at present, limited by its statutory authority.

Alaska Power Association supports the expansion of statutory powers of the AEA that would, at a minimum, allow the agency to acquire, construct or own any interest in an electric project or any right to capacity of an electric project or to perform feasibility studies, design and engineering with respect to power.

(Adopted Feb. 2011)

### Association Members

Alaska Electric and Energy Co-op  
Alaska Electric Light & Power  
Alaska Power & Telephone  
Alaska Railbelt Energy Authority JAA  
Alaska Village Electric Cooperative  
Anchorage Municipal Light & Power  
Aurora Energy  
Barrow Utilities & Electric Co-op  
Chugach Electric Association  
Copper Valley Electric Association  
Copper Valley Telephone Co-op  
Cordova Electric Cooperative  
Doyon Utilities  
City of Galena  
Golden Valley Electric Association  
Homer Electric Association  
INN Electric Cooperative  
Inside Passage Electric Co-op  
Kodiak Electric Association  
Kotzebue Electric Association  
Kwaan Electric Transmission  
Interlie Cooperative  
Malanuska Electric Association  
McGrath Light and Power  
Metlakalla Power & Light  
Middle Kuskokwim Electric Co-op  
Naknek Electric Association  
Nome Joint Utility System  
North Slope Borough  
Nushagak Cooperative  
OTZ Telephone Cooperative  
City of Seward  
Southeast Alaska Power Agency  
Tanalian Electric Cooperative  
Tanana Power Company  
TDX Power  
Unalakleet Valley Electric Co-op  
Yakutat Power

### Anchorage office

703 W. Tudor Road,  
Suite 200

Anchorage, Alaska  
99503

907-771-5700  
1-877-992-7322

### Juneau office

302C Assembly  
Building

211 Fourth Street  
Juneau, Alaska 99801  
907-463-3636

[alaskapower.org](http://alaskapower.org)