

Southeast Alaska Power Agency  
Operations and Maintenance  
Organization Review

September 13, 2012  
**FINAL DRAFT REPORT**

Prepared for  
Southeast Alaska Power Agency  
Ketchikan, Alaska

by



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# Southeast Alaska Power Agency Operations and Maintenance Organization Review

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# **Southeast Alaska Power Agency Operations and Maintenance Organization Review**

## **Introduction**

This report summarizes the results and findings of an Operations and Maintenance Organizational Review (the “O&M Review”) of the Southeast Alaska Power Agency (SEAPA) and its hydroelectric and transmission facilities. D. Hittle & Associates, Inc. (DHA) was retained by SEAPA in April 2012 to conduct the O&M Review. The O&M Review is intended to address several issues related to evaluating the overall operation of SEAPA’s system to assure the most effective operation into the future. Ultimately, SEAPA’s goal is to provide safe, reliable and cost effective operation of its power supply and transmission assets for the benefit of the interconnected electric consumers long into the future. As a member-owned entity serving consumer-owned electric utility operations, reductions in SEAPA operating costs and improvements in performance provide a direct positive effect on the cost of electric service in the communities of Ketchikan, Petersburg and Wrangell.

## **Description of SEAPA**

SEAPA is a joint action agency originally organized in 2000 as the Four Dam Pool Power Agency and existing pursuant to the laws of the State of Alaska. The Four Dam Pool Power Agency was created by its members for the purpose of purchasing certain generating and transmission facilities from the Alaska Energy Authority, a public corporation of the State. In 2009, the Four Dam Pool Power Agency was restructured and its name was changed to SEAPA to reflect the withdrawal of two previous cooperative members and the generating and transmission facilities that served those members.

The members of SEAPA are the Alaska home rule municipalities of Ketchikan, Petersburg and Wrangell (collectively, the “Member Utilities” or the “Purchasing Utilities”). The municipally-owned electric utilities of the cities of Ketchikan and Petersburg and the City and Borough of Wrangell provide electric service within their respective communities. SEAPA’s system currently consists of two separate hydroelectric generation facilities and accompanying transmission facilities located in Southeastern Alaska (the Projects). Power is sold from the Projects pursuant to a Long-Term Power Sales Agreement (the “Power Sales Agreement”) dated February 2009 to the Member Utilities.

SEAPA is governed by a five-member board of directors consisting of directors appointed by the City Councils of the Member Utilities. Each director serves for a one-year term, January 1 through December 31, but continues to serve until a successor is appointed. Each year, Ketchikan appoints two directors to the board and Wrangell and Petersburg appoint one director each. In alternating years, the fifth director is appointed by Ketchikan or by either Petersburg or Wrangell. At the present time, there are two directors from Ketchikan, two directors from Petersburg and one director from Wrangell. There are also five non-voting alternate members of the board of directors, appointed in the same manner as the five directors.

SEAPA is authorized and has the power to design, develop, acquire, purchase, own, operate, manage, maintain and improve power projects or generating and transmission facilities. SEAPA's facilities consist of two hydroelectric generating plants, the Swan Lake Hydroelectric Project ("Swan Lake") and the Tyee Lake Hydroelectric Project ("Tyee Lake"), and related transmission lines (together, the "SEAPA Facilities") that connect the generating plants to the electric systems of the Member Utilities. In late 2009, SEAPA completed a 57-mile long transmission line interconnecting Swan Lake and Tyee Lake, the Swan-Tyee Intertie (STI). The STI provides interconnection of the electric systems of Petersburg, Wrangell and Ketchikan. Prior to completion of the STI, the electric systems of Petersburg and Wrangell were interconnected, however, the electric system of Ketchikan was electrically isolated from any other electric utility systems. Now all three Member Utilities are interconnected with both projects and with each other.

SEAPA owns, manages and administers the SEAPA Facilities. Regular operations and maintenance of the hydroelectric projects is performed by Ketchikan Public Utilities (KPU) and the Thomas Bay Power Authority (TBPA)<sup>1</sup> under contractual arrangements (the "Operations & Maintenance Agreements"). KPU operates the Swan Lake project while the TBPA, an operating entity created by the cities of Petersburg and Wrangell, operates the Tyee Lake project. SEAPA provides maintenance of the STI, which was not contemplated under the Operations and Maintenance Agreements and also supports certain maintenance, repair, and equipment replacement activities at the Swan Lake and Tyee Lake projects.

Power generated by the SEAPA Facilities is sold to the Member Utilities in accordance with the terms and conditions of the Power Sales Agreement. The Power Sales Agreement states, among other things, that:

- The output of Swan Lake is first dedicated to Ketchikan and the output of Tyee Lake is first dedicated to Petersburg and Wrangell.
- All capacity and energy generated by the SEAPA Facilities will be sold by SEAPA;
- The Purchasing Utilities must purchase from SEAPA, to the extent power is available, their full energy requirement that exceeds the output of existing Purchasing Utility-owned hydroelectric resources;
- SEAPA shall at all times, except when prevented by a cause or event not preventable by SEAPA, make power continuously available to the Purchasing Utilities;
- SEAPA is to provide an annual operations plan that estimates the energy requirements of the Purchasing Utilities and identifies the output of the SEAPA Facilities to supply the net loads with the objective of maximizing and optimizing the output of the SEAPA Facilities.

Pursuant to the Power Sales Agreement, energy generated at the two hydroelectric projects is sold at a Firm Wholesale Power Rate established each year to produce sufficient revenue to meet SEAPA's debt service obligations and to pay for the cost of operations, maintenance, renewals

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<sup>1</sup> TBPA was initially formed in 1976 to evaluate potential new hydroelectric generating resource opportunities. At the present time, Petersburg and Wrangell pay some of the operating costs of TBPA directly, including the cost of the office administrator.

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and replacements, insurance, regulatory compliance, and other costs. The wholesale power rate may be adjusted during the year as needed.

The Firm Wholesale Power Rate is presently set at 6.8 cents per kilowatt-hour, a rate that is sufficient to produce revenues that will pay all the costs of SEAPA and provide a deposit into SEAPA's Renewal and Replacement Fund (the "R&R Fund"). The Wholesale Power Rate has been at the present level since before the Four Dam Pool Power Agency's formation in 2002. At the present time, SEAPA's only sources of revenue are from the sale of power to the Member Utilities and earnings on invested funds. Table 1 summarizes certain operating statistics for the year ended June 30, 2012 for SEAPA.

**Table 1  
Southeast Alaska Power Agency  
Selected Operating Statistics  
Year Ended June 30, 2012**

Energy Sales (kWh)		
Ketchikan		91,103,000
Petersburg		42,011,980
Wrangell		37,594,100
Total Energy Sales		170,709,080
Revenues from Energy Sales <sup>1</sup>	\$	11,608,217
Other Income	\$	142,442
Expenses <sup>2</sup>	\$	10,949,836

<sup>1</sup> Does not include impact of rebates to Member Utilities.

<sup>2</sup> Includes all operating expenses, debt service and deposits to R&R reserve fund.

### **SEAPA Facilities**

The SEAPA Facilities consist of two separate hydroelectric generating systems and related transmission lines, switchyards and substations. The hydroelectric systems are geographically separate from each other but with the completion of the STI in 2009, the two projects are electrically interconnected. The projects provide a significant portion, if not all of the total electrical power requirement in the communities to which they are connected. Both of the projects include the transmission lines that interconnect the hydroelectric projects to the electric systems in the communities. Table 2 shows the two hydroelectric generating plants owned and operated by SEAPA.

**Table 2  
Southeast Alaska Power Agency  
Existing Hydroelectric Generating Plants**

Project	General Location	Nominal Capacity (MW)	Year of Initial Operation
Swan Lake Hydroelectric Project	22 miles northeast of Ketchikan	22.5	1984
Tyee Lake Hydroelectric Project	40 miles southeast of Wrangell	22.5	1984

The hydroelectric projects were originally developed and built in the early 1980's. A substantial portion of the original construction costs of the Projects was funded with State grants. The Projects have been in regular operation since they first became commercially operable in 1984.

In fiscal year 2011, SEAPA provided the majority of the total energy requirements of the Member Utilities. Further, the SEAPA projects provide essentially all of the load following for the Member Utilities' systems. Table 3 shows the energy resources of the Member Utilities' systems in 2012 and the percentage of the total energy provided by SEAPA. Note that total energy generation shown for SEAPA in Table 3 is before deductions for transmission losses estimated to be roughly 6.5%.

**Table 3  
Southeast Alaska Power Agency  
Member Utilities' Energy Resources  
Year Ended June 30, 2012**

	Ketchikan	Wrangell	Petersburg
Energy Resources (MWh)			
SEAPA	91,103	37,594	42,012
Utility-owned Hydro	82,000	-	13,500
Diesel	1,118	440	600
<b>Total</b>	<b>174,221</b>	<b>38,034</b>	<b>56,112</b>
Energy Provided by SEAPA	52%	99%	75%
Load Following Provided by SEAPA	100%	100%	100%

***Swan Lake Project***

The Swan Lake project is located on Revillagigedo Island at the head of Carroll Inlet, about 22 miles northeast of the city of Ketchikan. Primary facilities include a 174-foot tall concrete thin arch dam, a 2,217-foot long, 11-foot diameter power tunnel and a powerhouse with two Francis, vertical shaft turbines and two generating units having a combined nominal generating capacity

of 22.5 MW. The project includes two substations, one at the Swan Lake powerhouse and the Bailey substation in Ketchikan. The two substations are connected by approximately 30.5 miles of 115-kV transmission line. The Swan Lake project was constructed by the City of Ketchikan and subsequently purchased by the Alaska Power Authority. It began commercial operation in June 1984.

The Swan Lake project also contains a number of houses and support buildings, along with a dock. There is a road that connects the dam to the rest of the project features. The project is accessible by helicopter, float plane, boat or barge.

Average annual energy generation at Swan Lake is 74,929 MWh based on actual generation over the period 1991 through 2011. During this twenty-one year period, annual generation at Swan Lake has ranged from a low of 55,538 MWh in 1997 to a high of 82,088 MWh in 2001. Engineering estimates indicate that the average annual energy generation of Swan Lake would be approximately 77,000 MWh with sufficient interconnected load to fully use the energy generation potential of the project in all years. Currently, loads are not in place that match the seasonal variation in available power and energy from SEAPA.

Studies are being contemplated to evaluate raising the level of the dam at Swan Lake to increase both the amount of storage and the amount of available head or water pressure at the existing turbines.

### *Tyee Lake Project*

The Tyee Lake project is located approximately 40 miles southeast of Wrangell and uses a lake tap intake to withdraw water from Tyee Lake. There is no dam at the Tyee Lake project. The project includes the lake tap intake, a drop shaft, an 8,300-foot long, 10-foot diameter unlined power tunnel, a 1,350-foot long steel penstock and a powerhouse. There are two vertical shaft, six jet Pelton turbines and two generating units with a combined nominal capacity of 22.5 MW. Provision was made at the time of construction for a third turbine-generator unit to be installed in the powerhouse at a later date. Provision was also made in the original project design to raise the lake level, which would provide additional head and reservoir storage. The project includes a substation at the powerhouse, the Wrangell switchyard, Wrangell Substation and Petersburg Substation. Approximately 70.5 miles of 138-kV transmission line<sup>2</sup> and 11.4 miles of submarine cable interconnect the Tyee Lake project to the communities of Wrangell and Petersburg, where the power is utilized.

Average annual energy generation at Tyee Lake has been 48,198 MWh based on actual generation over the period 1991 through 2011. Although energy sales from Tyee Lake were generally in the range of original expectations, connected loads in Wrangell and Petersburg were until recently, significantly lower than the generation capability of the project. As a result, actual historical energy generation at Tyee Lake is not reflective of the long-term energy generation capability of the project. The completion of the STI in 2009 connected the Tyee Lake project to Ketchikan where additional loads can be served. Since completion of the STI, the

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<sup>2</sup> The Tyee Lake transmission system is designed for 138-kV but is presently operated at 69-kV.

annual energy generation at Tyee Lake has increased approximately 30,000 MWh over 2008 levels. Engineering estimates indicate that the annual energy generation of Tyee Lake would be approximately 128,000 MWh with sufficient interconnected load to fully use the energy generation potential of the project in all years.

The Tyee Lake project was constructed by the Alaska Power Authority beginning in 1981. The project became commercially operable in May 1984. Although Tyee Lake was initially operated for a short period by the State, it has since then been operated by the Thomas Bay Power Authority, an entity formed by Petersburg and Wrangell, under agreement with SEAPA. Access to the project is by land-based planes on a gravel runway and there is a small shallow harbor for boat or barge access, but its use is limited by the tidal fluctuations.

### ***Swan-Tyee Intertie***

The Swan-Tyee Intertie is a 57-mile long 138-kV transmission line that interconnects the Tyee Lake and Swan Lake hydroelectric projects. Prior to completion of the STI in 2009, the Tyee Lake project only served Wrangell and Petersburg and the Swan Lake project only served Ketchikan. The STI provides for greater utilization of the capability of the Tyee Lake project, greater turbine efficiency of operation at the Swan Lake project, sharing of spinning reserves, as well as for integrated operation of all hydroelectric generation in the interconnected Petersburg, Wrangell and Ketchikan system. Further benefits of the STI should include improved reliability in the interconnected system and more effective scheduling of maintenance outages for the hydroelectric units.

Recently, SEAPA, with the implementation of the Swan-Tyee Intertie Control System (STICS), has implemented a water management plan that allows for additional energy to be produced by the projects through optimized use of turbine efficiency and sharing of energy to reduce spilled water. If there is sufficient desire by the Member Utilities, the interconnected sharing of economic benefits could ultimately include enhanced economic scheduling of some diesel-fired generation between the northern and southern ends of the SEAPA system.

### ***Remote Operation***

The Swan Lake and Tyee Lake projects are capable of remote operation. Both projects can be controlled from either powerhouse; however, some additional control and alarm indication may be needed for regular unmanned operation. Remote operation will provide valuable training and an understanding of the plants' and transmission system operation to all the operators. This will be especially beneficial if the operators rove between plants better utilizing the workforce.

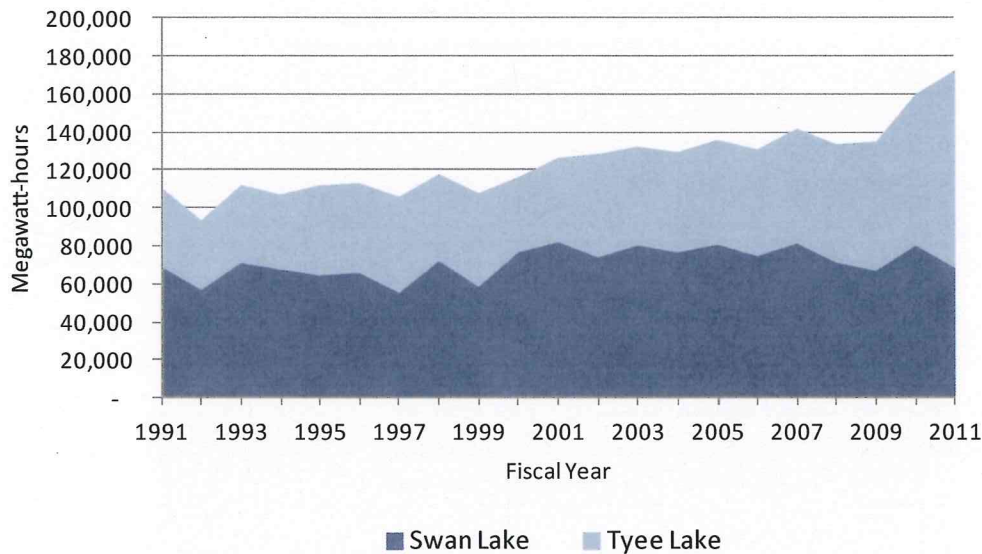
The current procedure to restore the system during system wide outage or black start situation is; Swan Lake would energize the Swan - Bailey line and Bailey would sync to it. Tyee Lake would energize the North Line and Wrangell and Petersburg would sync to it. Swan Lake will then energize the STI and Tyee would then connect the North - South systems. This procedure could be implemented from either powerhouse with remote operation.



***Total Energy Generation***

Total SEAPA energy generation varies from year to year depending on precipitation and the local power requirements. Both Petersburg and Ketchikan own and operate hydroelectric generation plants in the same general region as Swan Lake and Tye Lake. When precipitation levels are higher in the area, these utility-owned plants produce more power thereby reducing demand for power from the SEAPA projects. With the high cost of heating oil in recent years, there has been a large increase in power demand for the Member Utilities as residential and commercial customers convert to electric space heat. As a result, the overall demand for electricity has increased and with the STI, SEAPA has seen a relatively large increase in energy sales. In fiscal year 2011, total SEAPA energy generation was 172,297 MWh, up 28% from fiscal year 2009. Energy generation for the Swan Lake and Tye Lake projects over the 21 fiscal, years, 1991 through 2011, is shown in the following figure.

**Figure 1  
Swan Lake and Tye Lake Hydroelectric Projects  
Total Annual Energy Generation (MWh)**



**Purpose of the O&M Review**

The general purpose of the O&M Review is to assess SEAPA’s current approach to O&M and determine what adjustments could be made to improve O&M and provide potential cost savings. Eleven tasks were originally defined in the Request for Qualifications. We synthesized these tasks into six primary questions to be addressed in the study.

The primary questions addressed in the study with reference to the initially defined tasks included in the RFQ are as follows:

1. How are the plants currently being operated? (Task 1)
2. What is actually required in operating and maintaining the plants? Are staffing levels appropriate? (Task 2)
3. How do the existing O&M agreements function with regard to the purpose for which they are intended? How do these agreements function and perform as far as the relationship between SEAPA and its contractors? (Task 10)
4. What improvements could be made in the operations and maintenance of the hydro and transmission projects? What would be involved in establishing an unmanned or caretaker approach to operation of the hydro plants? Should the projects be operated and maintained by one entity rather than the two separate contractors? What costs and benefits could be realized with alternative approaches to operations and maintenance as compared to the current approach? (Tasks 3, 4, 5, 6, 7, 8, 9)
5. Are there functional improvements that could be made to SEAPA's management and staff to better provide for the operations and maintenance of the hydro and transmission system? (Task 11)
6. What specific changes in existing agreements and contracts are recommended to improve operations and maintenance? (Task 12)

In addition to the tasks defined above, the RFQ requested that Kodiak Electric Association be contacted with regard to KEA's operation of the Terror Lake Hydroelectric Project. At the beginning of the study effort, discussions with SEAPA deemphasized some of the initial tasks related to "fixing" the existing contracting arrangements. Rather, the study focused on the recommendations for a revised approach to operations and maintenance of the projects.

In preparing the O&M Review, various documents, financial reports, budgets and other materials were reviewed. SEAPA management and staff were interviewed and both hydroelectric projects were visited where operators were interviewed. Representatives from Ketchikan and the Thomas Bay Power Authority were interviewed as well. During the visits to the SEAPA facilities, the general condition of the facilities was observed on the ground as well as from the air.

Interviews were generally conducted during the week of April 16-20, 2012. The following individuals were interviewed during the course of the O&M Review:

Dave Carlson, Acting CEO, SEAPA  
Steve Henson, Director of Operations, SEAPA  
Eric Wolfe, Director of Special Projects, SEAPA  
Kay Key, Controller, SEAPA  
Sharon Thompson, Administrative Assistant, SEAPA  
Tim McConnell, Electric Division Manager, Ketchikan Public Utilities  
Andy Donato, Ketchikan Public Utilities, SEAPA Board Alternate  
Bret Blasingame, Foreman, Swan Lake

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Ray Davis, Swan Lake Operator  
Danny Smith, Swan Lake Operator  
Joel Buchanan, Swan Lake Operator  
Carl Thrift, Foreman (retiring), Tyee Lake  
Mick Nicholls, Tyee Lake Operator  
Steve Beers, Tyee Lake Operator  
Brent Mill, Tyee Lake Operator  
Dave Galla TBPA Commissioner  
Rhonda Dawson, TBPA Office Manager  
Brian Ashton, TBPA Commissioner, SEAPA Board Alternate  
Clay Hammer, TBPA Commissioner, Electric Superintendent, Wrangell Municipal Light  
& Power  
John Jensen, TBPA Commissioner, SEAPA Board Alternate  
Robert Larson, TBPA Commissioner, SEAPA Board  
Joe Nelson, SEAPA Board, TBPA Commissioner, Electric Superintendent, Petersburg  
Municipal Power & Light  
Paul Southland, Acting Manager, Thomas Bay Power Authority, TBPA Commissioner  
Jay Rhodes, SEAPA Board Alternate, IBEW Local 1547 Unit 104 (Ketchikan, Wrangell,  
Petersburg, Prince of Wales Island),

In general, the interviews were conducted to obtain an understanding of the work performed by SEAPA employees, the plant operators, and KPU and TBPA management with regard to performance of tasks pursuant to the O&M Agreements. The role of SEAPA and TBPA board members with regard to oversight of the operation of the SEAPA facilities was also reviewed. To insure candor, it was agreed that individuals interviewed would not be identified by their comments.

## **Existing Operations and Maintenance**

SEAPA operates the Swan Lake and Tyee Lake projects in a rather unique way. First, physical operation and maintenance activities have been contracted out by SEAPA to two contractors. Thomas Bay Power Authority operates and maintains the Tyee Lake project and Ketchikan Public Utilities (KPU) operates and maintains the Swan Lake project. Both TBPA and KPU perform their functions as operations and maintenance contractors pursuant to the terms and conditions of Operations and Maintenance Agreements dated January 31, 1997 for the TBPA agreement and January 24, 1997 for the KPU agreement (the “O&M Agreements”).

The two O&M Agreements were between the respective contractors and the Alaska Energy Authority, the owner of the Swan Lake and Tyee Lake projects prior to the establishment of the Four Dam Pool Power Agency. Prior to enactment of the O&M Agreements in 1997, TBPA and KPU operated the Tyee Lake and Swan Lake projects, respectively, pursuant to similar agreements. The O&M Agreements have not been revised or updated since establishment of the Four Dam Pool Power Agency and SEAPA.

At the time the O&M Agreements were enacted, the Alaska Energy Authority, an agency of the State of Alaska, assigned operation and maintenance of the projects to the utility organizations that purchased power from the projects. Wrangell and Petersburg ceded their normal operations and maintenance functions to the Thomas Bay Power Authority. The Alaska Energy Authority had only one employee based in Anchorage dedicated to management and administration of the Four Dam Pool projects and as such, did not have staff capable of operating the projects. In addition to the O&M contractors, the Alaska Energy Authority regularly retained the services of other contractors for engineering, construction, licensing-related and major maintenance services.

With the sale by the State of the of Four Dam Pool projects to the Four Dam Pool Power Agency (FDPPA) in 2002, the FDPPA retained management and staff that eventually included several positions to manage and administer the projects as well as provide certain engineering functions.

When SEAPA was established in 2009, some of the FDPPA staff transferred to SEAPA as SEAPA moved its headquarters from Anchorage to Ketchikan. At the present time, the SEAPA staff includes the following positions:

- Chief Executive Officer
- Director of Operations
- Director of Special Projects
- Controller
- Administrative Assistant

The existing SEAPA staff, with the oversight of the SEAPA Board, provides a number of critical functions related to operation and maintenance of the SEAPA Facilities including:

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- Compliance with FERC issues and requirements
- Compliance with provisions and obligations of the Power Sales Agreement
- Coordination with various State and federal agencies
- Community and public relations
- Administration of the O&M Agreements
- Oversight of the extraordinary and normal O&M contractors
- Installation, operation and maintenance of communications systems
- Review and approval of annual O&M budgets provided by the O&M contractors
- Accounting, billing and accounts payable
- Direct procurement of some items and review of procurement of some items
- Compliance with bond covenants and legal commitments
- Planning and implementation of renewal and replacement activities
- Retention and management of selected engineering and construction contractors associated with maintenance, repair, or equipment replacement and with other SEAPA investigations or projects.
- Coordination of O&M activities with plant operators (weekly meetings to discuss generation scheduling, water management, maintenance activities, among other items)
- Coordination of interconnected system operations and efforts to develop further improvements in integrated system operations
- Periodic inspection of certain transmission lines
- Maintenance of the Swan-Tyee Intertie
- Representation of SEAPA to the Alaska legislature and the Alaska congressional delegation
- Coordination with the SEAPA board of directors

In addition to the tasks above, at the present time the CEO and the Director of Special Projects indicate that 30% and 50% of their time, respectively, is spent on long term planning, evaluation of new resources, potential new contracts and other related activities.

SEAPA benefits from the longevity of certain employees and managers who have provided many years of service to SEAPA and its predecessor organizations. It also benefits from the many years of experience that some of the staff bring to their jobs. Further, the SEAPA staff understands that the reliable operation of the SEAPA Facilities is critical to the economic viability of the communities it serves.

For a further definition of the responsibilities of the SEAPA staff, see the job descriptions provided in Appendix A.

### **The O&M Contractors**

TBPA employs the operations and maintenance staff at the Tyee Lake project, and provides management services from Wrangell associated with the regular maintenance of the Tyee Lake project. TBPA is headquartered in the SEAPA owned warehouse near the SEAPA switchyard outside of Wrangell. The facilities also operated and maintained by TBPA include the transmission line between the Tyee Lake project and Wrangell and Petersburg.

In particular there are overhead and submarine transmission facilities from Tyee Lake to the Wrangell SEAPA switchyard station and overhead and submarine transmission facilities from Wrangell to the Petersburg SEAPA substation. The underwater transmission power crossings with submarine cable terminal stations include crossings at Zimovia, Stikine, and Sumner Strait. Other important functions currently provided by TBPA are the supervisory control and data acquisition (SCADA) operations and management of the: (1) Wrangell switchyard and the reactor within the switchyard; (2) the submarine cable termination stations, (3) the Wrangell substation and its breakers, (4) Petersburg substation and its breakers, (5) the STI, and normal synchronization of the intertie between the projects or the Swan Tyee Intertie Control System (STICS).

KPU employs the operations and maintenance staff at the Swan Lake project and provides management services from Ketchikan associated with the regular maintenance of the Swan Lake Project and with the delivery of power to KPU. The facilities also operated and maintained by KPU include the transmission line between the Swan Lake project and the KPU-owned Bailey substation switchyard, within which SEAPA has ownership of certain substation transformer, breaker and communication equipment. KPU, through its Bailey control center can also perform normal synchronization to the Swan Lake transmission line

There are four operators at each hydroelectric plant. The four operators (three operators and a relief operator) at Tyee Lake are employed by TBPA and the four operators at Swan Lake are employed by KPU. TBPA also employs a manager and an office manager, both located in Wrangell, who are assigned full-time to the management and administration of the Tyee Lake O&M Agreement. The cost of the TBPA manager is charged to SEAPA through net-billing while the office manager position is funded by Wrangell and Petersburg. There are three additional TBPA employees who perform right of way clearing, of which only the foreman is a full-time regular employee. KPU manages the Swan Lake O&M Agreement as an activity within its utility operation and does not employ a manager directly related to the O&M Agreement. Until last year, KPU had only used three operators at Swan Lake. A fourth operator was added in 2011 for safety concerns, as identified by KPU. The total number of full-time employees currently assigned to the management, administration, operation and maintenance of the SEAPA Facilities is shown in the following table:

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**Table 4  
SEAPA, Swan Lake and Tyee Lake  
Existing Staffing Levels (Full-time employees)**

SEAPA		Swan Lake <sup>1</sup>		Tyee Lake <sup>2</sup>		Total
Management & Admin	Technical	Plant		Plant		
		Operators	Management	Operators	Management	
3	2	4	0	4	2	15

<sup>1</sup> Employed by KPU.

<sup>2</sup> Employed by TBPA. TBPA indicates that it also has one regular and two seasonal right of way clearing laborers. One of the four Tyee operators is a relief operator. Some of the TBPA management staff labor costs are not SEAPA costs and are paid directly by Wrangell and Petersburg.

The plant operators have a variety of functions they perform. Some of the activities are provided on a daily basis and others are more periodic. In general, the functions provided by the operators are as follows:

- Monitor mechanical and electrical project equipment and log elected metered properties
- Respond to project alarms or abnormal events
- Respond to Wrangell and Petersburg SEAPA substation alarms or abnormal events (Tyee Lake operators)
- Comply with regulatory requirements
- Perform scheduled preventive maintenance via MAPCON
- Perform unscheduled maintenance
- Order parts and supplies
- Provide site security
- Clear snow from roads and aircraft runway
- Maintain dwelling units, shops, docks, miscellaneous buildings and associated utility systems
- Maintain vehicles, equipment, and boats
- Perform on-site training
- Assist other operators with repairs
- Work with contract service providers
- Assist in annual major maintenance outage work
- Take clearances, operate SCADA breakers on submarine cable and at substations and synchronize STI (Tyee Operators)
- Participate in weekly operations meetings with SEAPA

There are typically two plant operators at each project at all times. The TBPA operators and the KPU operators are governed by different IBEW Local 1547 Unit 104 contracts. The KPU three-year contract was just recently negotiated. The TBPA three-year contract will be renegotiated in

2013. As such, the respective project operators have different normal hours of work and some other differences in work rules.

Two operators at Swan Lake work eight ten-hour days at the plant and then have six days off. Each Wednesday the two sets of Swan Lake operators overlap for much of the day at the project. This results in a float plane arriving with a crew each Wednesday morning and then a second float plane returning Wednesday afternoon and taking the relieved crew back to Ketchikan. An estimate of current annual air charter costs for Swan Lake crew changes is indicated to be about \$50,000 per year, although KPU budgets about \$74,000 per year for this expense.

The Tye Lake operators work a more complex schedule. At Tye Lake three operators work staggered ten eight-hour days at the plant and have four days off. This schedule allows all operators to be on site together twice a month. During one of these overlap days each month, a Tye Lake operator performs preventive maintenance at the Wrangell and Petersburg substations. There is a fourth operator who is used for coverage during vacations, illness and major maintenance. With this schedule, a flight will arrive at the project land-based air strip twice each week. One week it will arrive on Monday and Friday and the following week it will arrive on Tuesday and Thursday, with each flight dropping off one fresh operator and leaving with a different operator. An estimate of current annual air charter costs for Tye Lake is \$44,000 per year.

The Swan Lake and Tye Lake project operators employ a variety of skills. Traditionally, the primary skills have been classified as either mechanical or electrical. At Swan Lake, currently there are two electrical operators and two mechanical operators. At the time of our interview at Tye Lake the classifications of the operators were one electrical operator, one lineman, one millwright and one boiler worker. As the projects are maturing and replacements are occurring, skill needs appear to be changing. Most of the preventive maintenance work at the power plants is general in nature, taking readings, and performing routine modifications, changes of filters, cleaning, oil changes, taking samples, etc. Another form of routine maintenance has to do with snow removal associated with roads and the landing strip at Tye. This principally is heavy equipment operation along with maintenance of the heavy equipment.

Another major function at both projects is administration of the computer maintenance system, MAPCON and its backup. Another significant function has to do with maintenance, both preventative and unscheduled, of support infrastructure at the project sites. This includes repair to dwelling units, shops, potable water lines, infrastructure electrical systems, sewage and solid waste (incineration) systems, and associated vehicles and boats and docks. The Swan Lake project includes a dam that has maintenance requirements including periodic checking.

Currently there are essentially four operators that are distributed in two different types of overlapping shifts at each project. There is a single foreman at each project who is with one shift, but communicates with the other operators and coordinates work on days where staff overlap at the project. It was indicated that in the past, there have been fewer operators employed at the projects.



As the projects have evolved and are likely to evolve in the near future there will be a greater need for electronic, telecommunication, fiber optic, and electronic relay skills at the two projects. This trend is likely to increase even more and should be a consideration for future hiring and training.

Based on observations, if the projects were remotely operated and there were better access, there could come a point in time that one FTE for preventive maintenance may be all that is required per plant, with a care-taker at the plant when operator(s) are not present. The first major change in staffing would likely be to reduce the number of operators to two with principally electrical, mechanical or hydro plant operator skills at each project during the week and a caretaker position at each project on the weekends and, as weekends could alternate, the caretaker position could be shared between the two projects.

A problem with implementing this concept at both Swan Lake and Tyee Lake is equipment operator road/airstrip snow removal during the operator off days and if that lack of snow removal would jeopardize operator access or medical evacuation of the caretaker.

### **The O&M Agreements**

The O&M Agreements are relatively general in their specification of activities to be provided by the contractors. When originally developed, the Alaska Energy Authority had a very limited role in operation and maintenance of the projects and placed a high degree of responsibility on the utility contractors, as recipients of the project output, to maintain and operate the projects. The Swan Lake and Tyee Lake O&M Agreements are essentially the same from the perspective of provisions, terms and conditions. The term of the O&M Agreements was five years from the date of initiation (1997) and year to year thereafter. Written notice must be provided by July 1<sup>st</sup> one year in advance to terminate the agreement.

Included in the provisions of the O&M Agreements are the following contractor responsibilities, among others:

- Operation of the project including dispatching, starting and stopping
- Maintain project features, station logs and records
- Deliver project power to the Purchasers in accordance with the terms of the Power Sales Agreement
- Provide all labor, material, technical support and training to repair the project facility
- Comply with federal and state agency requirements
- Provide security of the project facility at all times
- Conduct scheduled technical, operation and maintenance inspections of the project facility
- Read, maintain and operate all project facility metering devices
- Integrate power from the project into the Purchaser's system
- Provide trained and qualified personnel with the ability to provide the duties of the agreement

- Interpret the cause of and provide notification of protective relay or alarm action
- Take all reasonable measures to protect equipment, personnel and the general public from hazards from equipment failure
- Monitor and record the operating characteristics of all equipment and machinery
- Each year submit a five (5) year schedule of equipment replacement
- Submit a budget each year for the project facility
- Provide notification of equipment failure or other contingency that requires extraordinary maintenance

In general, it appears that the O&M contractors are fulfilling the requirements of the O&M Agreements. Areas which seem to be of some concern at Swan Lake include: frequency of transmission normal right of way clearing between Swan Lake and Bailey substation by KPU, wood transmission pole testing by KPU along that stretch of transmission line, MAPCON report documentation by KPU operators, Swan Lake operator training and cross trade training, and a detailed MAPCON derived bottoms up normal O&M functional budget. At Tyee Lake some of the areas of concern are: Tyee Lake operator training and cross trade training, quality of power sales metering, current transformers and potential transformers, and the amount of call-out time expended by operators on Wrangell and Petersburg SEAPA substations due to load loss on substations breakers/feeders.

The O&M contractors have not been providing the five year schedule of equipment replacement identified in the O&M Agreements. Since divestiture in 2002, the FDPPA has had to prepare a comprehensive renewals and replacement (R&R) plan. The R&R plan was updated in 2007 and is currently being updated again by SEAPA. The O&M Agreements are provided in Appendix B.

### **O&M Costs**

Each year, the O&M contractors prepare a draft budget, have the draft budgets approved by their respective governing bodies and then submit the draft budgets to SEAPA for the upcoming fiscal year. SEAPA reviews the draft budgets and provides comments and proposed adjustments. The contractors then incorporate the adjustments, as appropriate, and submit the budgets for approval by the SEAPA board. Payments to the O&M contractors are not made directly; rather, they are provided as reductions in the cost of purchased power from the projects by the Member Utilities. Each month, TBPA submits its O&M costs to Wrangell and Petersburg and each community pays half that cost by deducting the payments from the amount owed SEAPA for purchased power. This method of deducting operating costs from purchased power is known as “net-billing”.

The following table shows the actual O&M costs for the past five fiscal years. Typically, budgeted costs each year are noticeably higher than actual results. It is important to understand that O&M costs do not include capital costs or forward funding for certain renewals and replacements.

**Southeast Alaska Power Agency  
Operations and Maintenance Organization Review**

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**Table 5  
Southeast Alaska Power Agency  
Actual O&M Costs  
(Fiscal Years Ending June 30)**

	Actual				
	2008	2009	2010	2011	2012
Facility O&M					
Swan Lake	\$ 932,942	\$ 885,664	\$ 1,005,028	\$ 740,207	\$ 699,502
Tye Lake	<u>1,049,487</u>	<u>1,123,342</u>	<u>1,006,509</u>	<u>1,054,015</u>	<u>1,130,918</u>
Subtotal - Facility O&M	\$ 1,982,429	\$ 2,009,006	\$ 2,011,537	\$ 1,794,222	\$ 1,830,420
SEAPA Expenses <sup>1</sup>					
Hydroelectric O&M	\$ 298,308	\$ 559,950	\$ 386,993	\$ 626,705	\$ 817,501
Transmission and Dispatching	32,057	81,500	488,292	561,532	671,827
Administrative Expense	<u>1,521,014</u>	<u>2,125,690</u>	<u>2,010,782</u>	<u>1,918,042</u>	<u>2,017,846</u>
Subtotal - SEAPA Expenses	\$ 1,851,378	\$ 2,767,140	\$ 2,886,067	\$ 3,106,279	\$ 3,507,174
Total Expenses	\$ 3,833,807	\$ 4,776,146	\$ 4,897,604	\$ 4,900,501	\$ 5,337,594

<sup>1</sup> SEAPA Expenses shown for 2008 and 2009 are approximate allocations of The Four Dam Pool Power Agency expenses in those years. SEAPA was established in February 2009.

Included in the facility O&M expenses are the costs of SCADA operation and dispatch at Bailey and the costs of transmission at both plants. Until a recent budget revision, SEAPA had included 50% of KPU's SCADA system costs as Swan Lake operating costs. Deducting these costs from the facility O&M expense provides the cost of operating and maintaining the hydroelectric plants themselves. Table 6 shows the resulting hydroelectric generating plant O&M.

**Southeast Alaska Power Agency  
Operations and Maintenance Organization Review**

**Table 6  
Southeast Alaska Power Agency  
Hydroelectric Generating Plant O&M  
(Fiscal Years Ending June 30)**

	Actual				
	2008	2009	2010	2011	2012
<b>Swan Lake</b>					
Facility O&M	\$ 932,942	\$ 885,664	\$ 1,005,028	\$ 740,207	\$ 699,502
Less: SCADA, Dispatch & Trans. O&M <sup>1</sup>	<u>(538,638)</u>	<u>(517,586)</u>	<u>(370,794)</u>	<u>(71,961)</u>	<u>(1,241)</u>
Net Hydroplant O&M	\$ 394,304	\$ 368,078	\$ 634,234	\$ 668,246	\$ 698,261
Increase (Decrease) over Prev. Year		-6.7%	72.3%	5.4%	4.5%
<b>Tyee Lake</b>					
Facility O&M	\$ 1,049,487	\$ 1,123,342	\$ 1,006,509	\$ 1,054,015	\$ 1,130,918
Less: Transmission O&M <sup>2</sup>	<u>(275,168)</u>	<u>(302,314)</u>	<u>(177,379)</u>	<u>(195,268)</u>	<u>(238,685)</u>
Net Hydroplant O&M	\$ 774,319	\$ 821,028	\$ 829,130	\$ 858,747	\$ 892,233
Increase (Decrease) over Prev. Year		6.0%	1.0%	3.6%	3.9%
<b>Swan Lake and Tyee Lake Combined</b>					
Net Hydroplant O&M	\$ 1,168,623	\$ 1,189,106	\$ 1,463,364	\$ 1,526,993	\$ 1,590,494
Increase (Decrease) over Prev. Year		1.8%	23.1%	4.3%	4.2%

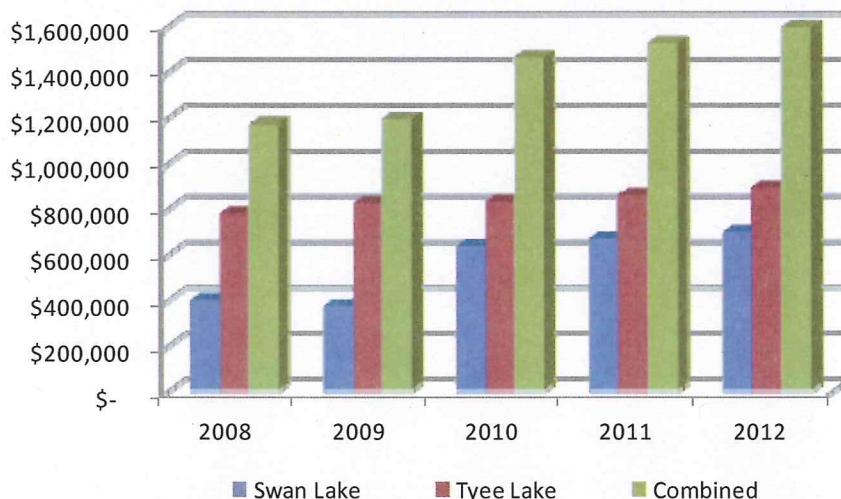
<sup>1</sup> Includes SCADA and Dispatch expenses, Account 561100 and transmission O&M expenses, Account 571100.

<sup>2</sup> Includes SCADA and Dispatch expenses, Account 561200 and transmission O&M expenses, Account 571200.

As shown in Table 6 the hydroelectric plant O&M costs have increased noticeably at both plants over the past five years. Over the five year period 2008 through 2012, the hydroelectric plant O&M costs have increased an average of 15.4%, 3.6% and 8.0% per year, for the Swan Lake, Tyee Lake and the two plants combined, respectively.

Figure 2 shows the hydroelectric plant O&M costs graphically.

**Figure 2**  
**Swan Lake and Tye Lake Hydroelectric Projects**  
**Hydroelectric Plant O&M Expenses**  
**(Fiscal Years Ending June 30)**



If, for an example, the hydroelectric plant O&M costs were to continue to increase at 4% per year over the next ten years (half the average increase of 8.0% per year the past five years) the annual cost would be \$2.4 million, 48% higher than the cost incurred in 2012. The terms of the PSA would indicate that as O&M costs increase, the wholesale cost of power from the SEAPA projects will increase and electric rates in the Purchasing Utilities would need to increase accordingly. Assuming annual energy sales increase approximately 1.25% per year and O&M costs increase 4% per year, the SEAPA wholesale cost of power is estimated to increase from 5.8<sup>3</sup> cents per kWh in 2012 to 7.1 cents per kWh in 2021<sup>4</sup>. In addition to O&M costs, the wholesale cost of power includes annual debt service and renewal and replacement expenditures.

### Observations

The operations and maintenance contracts with TBPA and KPU have not substantively changed since they were originally created with the Alaska Energy Authority back in 1985. However, the project assets and SEAPA have evolved over time. Much of the Swan Lake and Tye Lake physical equipment is approximately 28 years old. The STI was constructed and became

<sup>3</sup> Although the wholesale price of power as charged by SEAPA is 6.8 cents per kWh, the actual cost of power production is less than this amount. SEAPA has in the past refunded a portion of the difference between the cost of production and the wholesale price to the Member Utilities.

<sup>4</sup> At 1.25% annual growth, energy sales are estimated to increase from 169,800 MWh in 2012 to 189,900 MWh in 2021. The wholesale cost of power production includes O&M and A&G expenses, debt service and deposits to the R&R Fund.

operational in late 2009 which interconnected the entire Petersburg, Wrangell and Ketchikan electric systems. Generators have been rewound and governors were replaced at the Tyee Lake project in 2010. An additional significant change has occurred recently with the increase in loads in the communities caused by higher oil prices and the greater reliance upon low-cost power from the SEAPA projects.

Another evolution on the part of SEAPA has been the more active management role it has taken in the operations and maintenance of its assets. SEAPA has ultimate responsibility to provide power to the Purchasing Utilities pursuant to the terms of the PSA and as such, needs to have an active role in assuring the reliable operation of the interconnected utility systems.

Part of the change has been due to the SEAPA staff and their past experience. For example, the current Director of Operations is a good example of local employee experience, having worked as the Electric Superintendent of Wrangell Municipal Light and Power as well as an operator at the Tyee Lake hydro project. His knowledge of hydro maintenance and operations and understanding of the management and training of electric utility employees has helped refocus attention on project maintenance needs in a way that is consistent with the cultures of the projects and their communities.

Concurrent with the personnel changes at SEAPA there have been changes in the leadership at TBPA. TBPA, unlike KPU, does not have other electric utility operations or maintenance. As such, its support of plant operators at Tyee Lake is limited to resources of the individual operators and a limited number of active contract engineers, technicians, and consultants. So when operators at the Tyee Lake project have technical questions regarding the operation or maintenance of the plant they really don't have technical resources within TBPA.

Conversely, when operators at the Swan Lake project have technical questions regarding operation or maintenance they can contact management and staff at KPU who may be able to provide some limited technical support. KPU also maintains and operates the Beaver Falls hydro project, the Silvis Lake hydro project and the Ketchikan Lakes hydro project and significant amounts of diesel generation. A noticeable problem, however, is that KPU management and staff have seen a fair amount of turnover in the past. In the past five years, there have been four different KPU individuals assigned to manage the hydroelectric plants, including Swan Lake. This relatively constant change would indicate that there is a continuing need to relearn the specific requirements related to operation and maintenance of the projects.

Partially because of the limited depth of technical support for operators from TBPA and partially because of the historic knowledge of operations and maintenance at Tyee Lake that resides with SEAPA's Director of Operations, TBPA operators have recently been relying upon SEAPA staff and interacting with them more than in the past. This is indicated to have led to some perceptions related to control at TBPA.

The Director of Special Projects at SEAPA, has undertaken a number of new projects at SEAPA and technical/engineering leadership has been provided through this position that would potentially have been previously provided by consultants hired and working directly for either KPU or TBPA. A different example of an evolved SEAPA role is due to the completion of the

STI transmission line and the greater need to coordinate operation of all hydroelectric facilities in the interconnected system. SEAPA has implemented a water management system to increase the total energy generation from the two hydro projects through more efficient use of water to meet load requirements. This has significantly benefited the Member Utilities but is not explicitly discussed in the O&M Agreement.

SEAPA staff conducts a weekly telephone meeting with the operators to assure mutual understanding of and coordinate schedules and planned maintenance activities. Problems at the projects are also discussed in these meetings. These meetings have contributed to a greater involvement of SEAPA with the operators and a better understanding of the technical capabilities of SEAPA staff by the operators.

It appears that in recent years, much of the success in continuing to operate the projects effectively is due to the ever increasing role that SEAPA management and staff play in managing the operations and maintenance effort. The O&M Agreements do not provide enough specificity to direct the actions of the O&M Contractors in operating and maintaining the Projects and as such, the projects are operated based on procedures established by the contractors that don't necessarily acknowledge the integrated operation of the system. Prior to the operation of the STI, Swan Lake served only KPU, which operated the project and Tyee Lake served only Wrangell and Petersburg. In essence each contracted operator organization (TBPA & KPU) had an unquestioned vested interest in prudently operating and maintaining the principal low cost source of power to its respective community.

Acknowledging the ongoing increase in operation and maintenance costs, the changes in the SEAPA facilities and the interconnected system, and the changes in SEAPA itself, the need to change the way the SEAPA facilities are operated and maintained is apparent.

### **Terror Lake Operations and Maintenance**

The 22.5-MW Terror Lake hydroelectric project (Terror Lake) is owned and operated by Kodiak Electric Association (KEA). Terror Lake was part of the Four Dam Pool and the Four Dam Pool Power Agency until restructuring of the FDPPA in 2009 and has been operated by KEA since construction of the project was completed in 1985. As part of the O&M Review, SEAPA requested that KEA be contacted to gain a better understanding of how KEA currently operates Terror Lake. The project is located on Kodiak Island approximately 25 miles southwest of Kodiak and access to the project is by boat or float plane only.

Primary facilities of the Terror Lake project include a 193-foot tall, 2,400-foot long concrete faced rock fill dam, a 26,700-foot long power tunnel with additional diversions, penstock, powerhouse and switchyard. Transmission systems include 17.4 miles of 138-kV and 12 miles of 12.5-kV overhead lines and two substations. At the present time, the project includes two vertical shaft, Pelton type turbines although provision exists for a third turbine-generator unit. KEA is planning to install a third turbine with a capacity of approximately 11-MW in 2013.

KEA operates Terror Lake within its power production division and the chief operator at Terror Lake reports to KEA's Power Production Manager. At the present time, there are three regular operators (two operators and one chief operator) at Terror Lake. All three operators work four ten-hour days each week, Monday through Thursday, and one operator, on a rotating basis, remains on standby duty at the site through the three day weekend to monitor the project and for security. With one operator on standby over the weekend<sup>5</sup>, the other operators can either go home or stay on-site. There are three separate houses for the operating staff at the projects.

The Terror Lake project cannot be started remotely so it is necessary to have an operator available at the project if a restart is needed. Scheduling and dispatching of the project output is conducted by KEA's production and dispatch staff in Kodiak.

KEA indicates that ideally, the skill classifications of the operators would be one electrical and two mechanical, although at the present time, the skills are about ½ electrical and 2-½ mechanical. All operators are represented by IBEW Local 1547. For larger maintenance tasks, KEA will use other KEA staff to supplement the Terror Lake operators. Some contractors are used but to a limited extent. Transmission maintenance is provided by the KEA line crews. Right-of-way clearing is conducted on the entire KEA system on roughly a five year rotation. The 2-½ substations included in the Terror Lake project have been recently overhauled so maintenance on these facilities is minimal.

KEA has continued to use the MAPCON maintenance software for maintenance activity scheduling and monitoring. This system is Windows based and is indicated by KEA to be more robust than is actually needed for a smaller utility such as KEA. Training programs for Terror Lake operators have not been formally established at the present time; however, the close integration of the operations staff with KEA's production staff provides a means for some training and skill improvements.

Although KEA evaluates the long-term replacement needs for Terror Lake, it does not contribute to or maintain an R&R fund to pay the costs of renewals and replacements. Rather, KEA expects to fund renewal and replacement expenditures primarily with new debt at the time the expenses are paid. KEA indicates, however, that it may establish a limited reserve fund to contribute to future expenses.

The total annual O&M budget for Terror Lake is \$2.5 million, as provided by KEA. This budgeted amount includes everything for the operations and maintenance of the project and the transmission lines and also includes insurance costs, FERC costs and other related expenses. The current annual Terror Lake O&M budget amount also includes \$622,000 of system dispatching costs.

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<sup>5</sup> The standby operator is required to make two 30 minute checks of the plant each day.



## **Conclusions and Recommendations**

### **Conclusions**

SEAPA and its facilities are a very valuable asset to the residents and businesses of the Petersburg, Wrangell and Ketchikan communities. The benefits of reliable, low-cost, hydroelectric power generation have been realized in the communities and should be realized for many years to come. To ensure the continuation of maximum benefits, it is important that SEAPA and the Member Utilities acknowledge the functional changes that have occurred in recent years to SEAPA's organizational and ownership structure and make appropriate adjustments. Based on our review of SEAPA and its operations we offer the following conclusions:

1. Pursuant to the terms of the PSA, SEAPA has a legal obligation to make electric power available from the SEAPA Facilities to the Purchasing Utilities at all times, except when prevented by a cause or event outside the control of SEAPA. The term of the PSA extends to 2033.
2. The wholesale price of power charged for SEAPA power sales to the Purchasing Utilities, pursuant to the PSA, is a rate that will provide sufficient revenues to pay SEAPA's debt service obligations and pay the costs of operation, maintenance, renewals and replacements, insurance, regulatory compliance and other costs of SEAPA. As such, the costs of operations and maintenance for the SEAPA Facilities will directly affect the cost that the Purchasing Utilities pay for SEAPA power. If the O&M costs continue to increase over time, there will be a need to increase the wholesale power rate. Conversely, if O&M costs can be reduced, the wholesale power rate could potentially be decreased, kept from increasing, or allowed to fund renewals and replacements or other SEAPA board approved activities.
3. Operation and maintenance activities have been contracted out by SEAPA to two contractors. Thomas Bay Power Authority operates and maintains the Tyee Lake project and Ketchikan Public Utilities operates and maintains the Swan Lake project. Both TBPA and KPU perform their functions as operations and maintenance contractors pursuant to the terms and conditions of Operations and Maintenance Agreements dated January 31, 1997 for the TBPA agreement and January 24, 1997 for the KPU agreement. The O&M Agreements have not been revised or updated since establishment of the Four Dam Pool Power Agency and SEAPA. At the direction of SEAPA, TBPA now performs some right of way clearing of SEAPA transmission lines other than the Tyee Lake line.
4. The original purpose of the O&M Agreements was for the Purchasing Utilities, as direct users of the output of the Projects, to perform the needed operations and maintenance of the projects. Although the O&M Agreements have worked over time in that the Swan Lake and Tyee Lake projects have continued to provide reliable electric service to the Purchasing Utilities, there are a number of problems with regard to the continued effectiveness of these agreements. One of the principal issues is that the O&M Agreements do not reflect the current ownership structure of the system and SEAPA's

obligations under the Power Sales Agreement. Exhibits attached to the O&M Agreements are in significant need of being updated to reflect current conditions. Among the problems of the O&M Agreements are:

- a. The O&M Agreements are not consistent with the SEAPA system as it exists today. In particular, the STI was not constructed or operational at the time the agreements were written and, as such, the operation of the interconnected electric systems of the Purchasing utilities was not anticipated.
- b. Responsibilities for the maintenance and operation of certain system facilities such as the STI and STICS are not defined in the O&M Agreements. As such, SEAPA performs some of these functions. This however, creates an area of potential misunderstanding and problems at times, particularly at the interfaces of various system facilities.
- c. SEAPA does not have direct control over staffing and budgeting at the Projects. However, SEAPA has the contractual responsibility for delivery of the output of the projects to the Purchasing Utilities.
- d. Certain provisions of the O&M Agreements, such as the need for the contractors to provide a 5-year plan of equipment replacements, have not been regularly followed. The renewals and replacements for the Projects are planned, financed and implemented by SEAPA. This points out an element of the O&M Agreements that is not consistent with practice.
- e. There are no performance standards defined in the O&M Agreements nor are there any O&M standards reflective of industry standards for similar facilities.
- f. There is a lack of symmetry in the organizational structures of TBPA and KPU as O&M contractors. For example, KPU is a fairly large utility that provides for its own system operations and is responsible for meeting the training requirements of its staff. KPU has many skilled employees on staff that can assist with many different types of utility problems; however, in the past KPU staff may not be available or willing to go to Swan Lake. TBPA has a much more narrowly focused function than KPU and has less depth of technical capability.
- g. There are inconsistencies in staffing, training of operators, preventative maintenance procedures, budgeting, and other factors, as implemented by the two O&M contractors that are not reflective of an interconnected system owned by a single entity.
- h. The turnover of management and employees over the years of TBPA and KPU, as well as, among the operators at the plants, causes a certain degree of uncertainty as to the responsibilities of staff and management in performance of the O&M Agreements.
- i. Because of the need to perform utility functions outside the SEAPA O&M Agreement responsibilities, there can be conflicts in prioritizing the assignment of resources by the O&M contractors to the projects. For example, KPU had a shortage of linemen during a power problem a few years ago and had to decide

whether to assign linemen to Swan Lake to perform switching or to use them in Ketchikan for critical work to serve KPU's retail customers. TBPA expressed concern about the use of its right of way clearing crew by SEAPA on the Swan Lake to Bailey transmission line when it had contract right of way responsibilities on the Tye Lake transmission line.

- j. The year-to-year budgeting within the O&M Agreements does not provide an appropriate incentive or means to control costs. Further, since each O&M Contractor operates independently of the other, costs and charges are not necessarily similar for each project.
  - k. Charges for O&M services pursuant to the O&M Agreements are credited (net-billed) against the charges to each of the Purchasing Utilities for purchased power. Accounting for the charges through the net billing arrangements is not necessarily easy to appropriately track.
5. There is an asymmetry as to how the two O&M Contractors charge for certain expenses. For example, TBPA has little on-going purpose besides acting as the agent for Wrangell and Petersburg for operation and maintenance of the Tye Lake project. As such, its overheads, like insurance, management and a portion of office staff are included in the charges to SEAPA pursuant to the O&M Agreement. In contrast, KPU insures its normal electric utility operations and its other hydro-electric projects, so many of these similar items are not directly charged to SEAPA.
  6. The cost to operate and maintain the Swan Lake and Tye Lake projects through the O&M Agreements has increased an average of 8.0% per year over the past five years. If the O&M costs continue to increase at this rate, there will be pressure to increase the wholesale cost of power that SEAPA charges for power sold to the Purchasing Utilities. If total O&M costs increase at 4% per year, the wholesale cost of power from SEAPA would increase from 5.8<sup>6</sup> cents per kWh to 7.1 cents per kWh over the ten years between 2012 and 2021.
  7. The approval process for the annual O&M Contractors' budgets to SEAPA is complicated and time-consuming. The budgets are developed by KPU and TBPA independent of each other and SEAPA. The specific tasks, within each budget are not fully documented and are not based on defined metrics, but are defined by various FERC accounts. These budgets then must be approved by the respective City councils, the TBPA Commissioners and ultimately the SEAPA Board of Directors. As such, the budgeting does not necessarily provide a budget that is aligned with SEAPA's obligations pursuant to the Power Sales Agreement.
  8. The current net-billing procedure does not allow for monitoring and review of costs as would typically be expected with utility operations. The Member Utilities have generally paid their monthly power bills net of their respective monthly O&M expenses between 30 and 50 days after each month. In this manner, it has been the responsibility of the

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<sup>6</sup> Although the wholesale price of power as charged by SEAPA is 6.8 cents per kWh, the actual cost of power production is less than this amount. SEAPA has in the past refunded a portion of the difference between the cost of production and the wholesale price to the Member Utilities.

Member Utilities to determine the amount to be paid to SEAPA each month. Although a report of monthly O&M costs is provided to SEAPA by KPU and TBPA, SEAPA does not have time to review the costs before the net-billed payments are made. If SEAPA determines that adjustments need to be made with regard to the net-billed costs reported by TBPA and KPU, the adjustments are made after the fact and can cause some confusion and misunderstanding. It would potentially be a better arrangement if the detailed O&M costs for each month were reported directly to SEAPA by the 15<sup>th</sup> of the following month for review and adjustment as needed. SEAPA could then prepare and submit to the Member Utilities an invoice by the 30<sup>th</sup> of each month for power purchases net of the appropriate O&M costs for the previous month. Payment could then be due by the 10<sup>th</sup> of the next month. This procedure would allow for better tracking and review of O&M expenses.

9. As the two hydro projects have evolved and especially after the generator and governor upgrades at Tyee Lake, the amount of unscheduled power plant maintenance has dropped. Most of the power plant maintenance is now scheduled maintenance or renewals and replacements. The preventive and normally scheduled power plant maintenance requirements at each plant could reasonably be accomplished with one full time equivalent (FTE) operator per project based on our experience and observations at the projects. Maintenance of dwellings, shops, miscellaneous buildings, and especially snow clearing increases the level of O&M work load at each project to something above one FTE and less than two FTEs. However, snow removal is seasonal. Swan Lake has four operators and Tyee Lake has three operators and a relief operator. This indicates that there is potential for significantly reducing project O&M costs as each project now has effectively four FTE operators.

Safety during certain kinds of maintenance such as operation of heavy equipment and work in proximity to live electrical parts, as well as, the remote nature of the two projects will likely require more than one person doing many of the maintenance tasks for most situations. However, if heavy equipment operations and more complex maintenance activities can be planned and performed only when more than one operator is on site, there is the potential to scale back the number of operators from eight to five with a possible floating caretaker. This would potentially be accomplished with two operators at each project during a five day week and the caretaker providing security during the weekends. While not immediately obtainable under current bargaining contract rules, this is something that could be achieved in the next few years as various agreements are renegotiated and with attrition of the operating staff.

10. Transportation of hydro project operators is an expense that could be reduced. For example, even if there were no change in staffing levels, at the Swan Lake project one group of operators is flown to the project in the morning and a separate flight takes the relieved operators home later that day (weather permitting). There is an overlap so that information between operators can be exchanged on what has been modified and what work needs to be done. In talking to Swan Lake operators they questioned the value of the overlap information transfer. With the proposed fiber-optic link to the Swan Lake project, some of the overlap could take place prior to the crew change via a video

conference and reduce the length of time personal communication needs to occur to the point that a single flight might be possible. Similarly, when the all-weather road to Shelter Cove is finished, it will provide an alternate way to get crews in and out of the Swan Lake project that would be less expensive, if a suitable boat is available to transport crews.

11. There is a close and interrelated nature of many of the people serving on various boards or commissions related to the SEAPA projects. For example, there are TBPA board members who are SEAPA board members and KPU management who are SEAPA board members. This can lead to problems when O&M contractor issues come before the SEAPA board. Business theory has long identified that interlocking boards of directors can cause problems if the directors are not extremely careful in their responsibilities to each of the organizations for which they are involved.
12. SEAPA has been fortunate in having a staff with complementing skills that fit together quite well. There are some functions that likely need to be adjusted. With the hiring of the new SEAPA CEO there will be a natural change in direction of some aspects of the organization
13. The SEAPA system could benefit from obtaining certain additional skills. These skills include information technologies, communication systems, and CADD, among others. These specific skills would help with some problems identified by the current SEAPA staff and help provide better support to the hydro projects.
14. A concern indicated by SEAPA staff, KPU staff, and TBPA staff was confusion over what is to be included within normal budgets. A more transparent, bottom up and collaborative budgeting process is needed. It appears that much (with the exception of labor and contracted services) of the Tye Lake budget was generated via the MAPCON system on a task or bottom up basis. There was further interest expressed regarding budget performance. It was noted that the operators at both the Swan Lake and Tye Lake plants took pride in their project and wanted the projects to perform well from a reliability basis and from a cost performance basis. The operators were interested in knowing what was within the budget and how their team was performing against the budget.
15. Regular preventive maintenance of transmission systems, structure inspections, sampling and testing (along with treatment if necessary) of wood pole structures, regular air and ground right of way inspections and maintenance conducted by SEAPA are all typical of lower-48 transmission maintenance. SEAPA with the cooperation of TBPA has been working with TBPA to increase right of way clearing efforts along the transmission routes. A cursory examination of the right of way found that it was generally in well cleared condition. SEAPA has been moving forward on a number of fronts in regards to formalizing transmission O&M plans. Sampling of wood poles to determine their structural strength or decay levels, as currently underway, is good.
16. SEAPA is in the position to potentially plan, develop, and finance additional new hydroelectric generating resources to supply power to its currently interconnected system, as well as, other communities which may become interconnected in the future. As such,

the ability to effectively integrate new resources into the interconnected system and operate them efficiently is a critical function that SEAPA provides in southern Southeast Alaska.

### **Recommendations**

The ability for SEAPA to continue to provide highly reliable, low-cost hydroelectric power to the communities of Petersburg, Wrangell and Ketchikan is an essential element in the economic viability and quality of life in these communities. Based on our review of the SEAPA system and the operations and maintenance of the SEAPA Facilities, we offer the following recommendations.

1. SEAPA's Member Utilities would be better served from a power cost and project efficiency basis with either a single O&M contractor or by having SEAPA operate and maintain the SEAPA facilities itself. This would provide a more consistent system of operations, planning, budgeting, operator training, career development, staffing, preventative maintenance and board oversight, among other factors. With a single O&M contractor or with SEAPA providing O&M, there is a better opportunity to define procedures and retain operating knowledge in a more consistent manner. We would recommend that one of two options be undertaken:
  - a. Perform the operations and maintenance of the SEAPA Facilities by SEAPA itself. Operators would work directly for SEAPA and work under the direction of SEAPA management.
  - b. Establish a detailed scope of services for the O&M of both projects and solicit bids for these services from potential operating entities. Include specific terms and conditions, operating standards, performance measures, payments and penalties, local procurement requirements (if needed) and expected SEAPA involvement. Retain a single operating contractor for a period of time through a competitive bidding process, three years for example.
2. In the least, the terms and conditions of the O&M Agreements and their exhibits should be reviewed and updated. SEAPA's organization and the SEAPA interconnected electric system are significantly different than what was in place when the existing O&M Agreements were established. If alternative operating structures are expected to be significantly different in the future, the updated terms and conditions will serve as the basis for establishing operating standards and conditions for future operations.

Simply revising the O&M Agreements will not address the difficulties and inconsistencies associated with multiple contractors and governing boards. In order to fully gain the advantages of operating the SEAPA Facilities as an integrated utility system as well as maximize the benefits to the Member Utilities, it is recommended that either a single operating contractor or

SEAPA operate and maintain the projects. The advantages for a single operating organization include:

- Cross-training of operators to work either project or together for certain tasks, as needed;
- Potential reduction in the total number of operators;
- Potential reductions in O&M costs and better cost control;
- Uniform and consistent training of operators;
- Better coordination between operators and SEAPA management and operations staff;
- Tighter integration of R&R projects with operating staff;
- Potential for improvements in budgeting and budget approval procedures;
- Reductions in the number of board and council approvals needed for budgets, labor agreements and other factors.

A concern was noted with regard to bidding out the O&M Agreement to a single contracting firm in that aggregated SEAPA economic efficiency could potentially come at a price to the communities in the loss of local employment and in local purchases of goods and services.

Another noted concern is the importance of electric service to the local communities and the need to seamlessly integrate many of the operational issues with local utility needs. For example, a portion of TBPA Tyee Lake operator time is spent dealing with remote operation and clearances with SEAPA substation breakers serving Wrangell or Petersburg distribution feeders. It will be important to consider these factors in retaining a single contractor. Specific terms and responsibilities will need to be defined.

A single operator would need to be carefully monitored by SEAPA and have the trust of all the key stakeholders. A single operator would also need to have a very carefully detailed list of maintenance requirements for each hydro project and the transmission lines. It will be important to update the O&M standards and define them in significant detail as part of contracting to a single operator. This is less of a problem if SEAPA were to be the operator as SEAPA and its Board of Directors have an obligation to and accountability with the Member Utilities.

Another challenge with a single operating organization will be coordinating modifications to the two IBEW bargaining agreements that now govern the Swan Lake and Tyee Lake operators. The KPU three-year labor agreement was recently signed and the TBPA agreement will be negotiated in 2013. Likewise, as broadband fiber optic communication is brought to the projects and as the Tyee Lake DOS based SCADA system is replaced, there will be the potential to add site security features, increased smart automation, and make enhanced operator training available on-site.

The transition to a single operator organization will require a fair amount of work on SEAPA's part, but in the long-run a single O&M entity would be much more efficient and cost-effective than with the current arrangement of two contractors.

### **Proposed Operations and Maintenance Staffing**

If SEAPA were to undertake the operation and maintenance of both projects or if a single O&M contractor were retained, we would recommend that the number of operators be reduced at the plants. Hydroelectric plants similar to the Swan Lake and Tye Lake projects are regularly operated and maintained with fewer operators than are currently used by TBPA and KPU. In the past, KPU and TBPA have used fewer operators at the projects and it was not indicated to have caused a problem with reliability. An operating staff of two full-time operators at each plant working five day shifts could be employed. The five day work weeks would not coincide at the two plants so that a caretaker could rotate between the plants to provide security on the days that the two operators are not at the project.

A fifth operator would serve as a rover or relief operator alternating between the plants and providing backup during vacations and at other times. This fifth operator could have other duties and be an assistant operations manager. The skills of the operators could vary but could be general hydroelectric plant operators, as compared to the traditional electrical or mechanical classifications (See Appendix C). With SEAPA or a single contractor handling O&M, the operators could alternate between the projects and at times provide support to each other at one of the plants for special projects and heavier work needs.

At the present time, there are currently approximately 16 FTE's and two seasonal right of way employees devoted to the SEAPA Facilities (See Table 6). There is some additional management and administrative effort provided by KPU in support of their role as an O&M Contractor. Charges for this support labor show up either in overhead rates applied to direct labor costs or in billed hourly charges by KPU to SEAPA. TBPA has some services associated with accounting and billing provided by the City of Wrangell. It should also be noted that some of the TBPA office labor cost is paid directly by Wrangell and Petersburg. Also there are other services now provided by firms under contract either to KPU, TBPA, or directly with SEAPA.

In addition to showing the current staffing levels, Table 6 also shows the proposed staffing if SEAPA were to undertake O&M for the projects directly or if a single contractor were to be retained. In the case of SEAPA undertaking O&M directly, all of the current positions at SEAPA would be continued. We would recommend that one additional FTE be included on staff to serve as an Assistant Operations Director assigned to coordinating training, communications and IT systems, and potentially provide some CADD capability. This employee would also provide operator assistance at the plants periodically as needed. For the single contractor case, the Assistant Operations Director could potentially be an employee of the contractor in a supervisory role. The addition of employees with alternative skills would mitigate some of the impact of the reduction of operators at the Projects.



**Southeast Alaska Power Agency  
Operations and Maintenance Organization Review**

**Table 6  
Southeast Alaska Power Agency  
Potential Modified Organizational Structures**

Existing Organizational Structure			Modified SEAPA Structure With SEAPA Providing O&M	Modified Structure with Single Contractor	
SEAPA	KPU	TBPA		SEAPA	O&M Contractor
CEO			CEO	CEO	
Executive Assistant			Executive Assistant, HR	Executive Assistant, HR	
Controller			Controller	Controller	
Director of Operations			Director of Operations	Director of Operations	
Director Special Projects			Director Special Projects	Director Special Projects	
	Foreman		Assistant Operations Manager (Operator Training, IT and Communications Systems, Roving Operator Tech and Backup)		Operations Supervisor
	Operator		Senior Operator		Senior Operator
	Operator		Operator		Operator
	Operator		Operator		Operator
		General Manager	Operator		Operator
		Office Manager	Roving Caretaker		Roving Caretaker
		Foreman	Right of Way foreman		Right of Way foreman
		Operator	Seasonal worker		Seasonal worker
		Operator	Seasonal worker		Seasonal worker
		Relief Operator			
		Right of Way foreman			
		Seasonal worker			
		Seasonal worker			

For SEAPA to fully undertake O&M of the Swan Lake and Tyee Lake projects and the STI, it would likely require a staff of about eleven regular employees plus some seasonal employees related to right of way clearing. SEAPA currently has five employees. There would be an increase in payroll, purchasing, human resources, public affairs and training functions that SEAPA does not now provide. Some of these functions are directly or indirectly currently supplied by TBPA and KPU. As we stated, we feel that there could be a potential reduction in the number of operator staff if road/airstrip snow removal functions and related shift transportation functions can be streamlined. This could allow for a potential increase in some functions such as training, information technology, electronics, public affairs at SEAPA and its assets.

**Estimated Costs and Benefits**

The proposed modified structure will result in the saving of four FTEs and depending on the schedule of operators, additional savings in transportation costs. Whether the O&M is to be provided by a single contractor or SEAPA directly, the estimated cost savings is between \$450,000 and \$500,000 per year when compared to the current costs of O&M. An O&M contractor could potentially include certain administrative and overhead costs among its charges to SEAPA. These costs would need to be defined at the time a contract for O&M services is negotiated. Table 7 shows the estimated cost savings with the modified O&M services approaches.

**Table 7  
Southeast Alaska Power Agency  
Potential Cost Savings with Modified Organizational Structures**

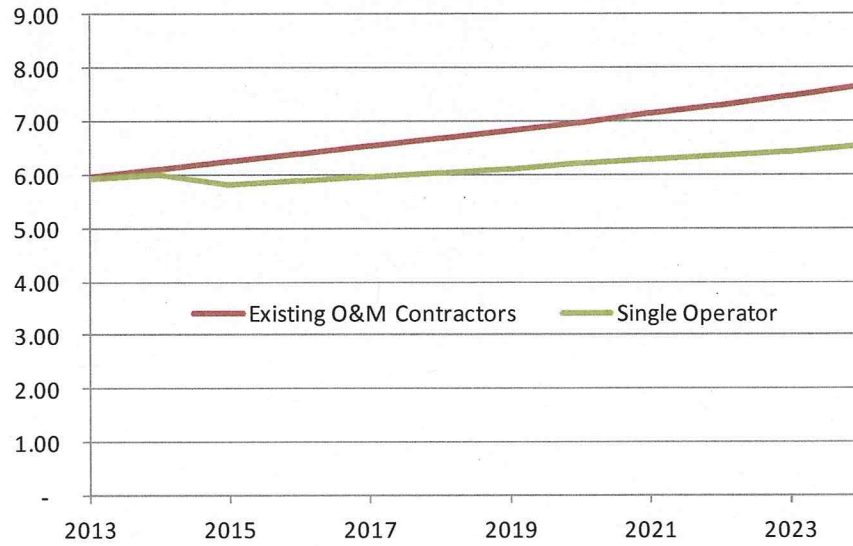
	Cost Reduction	Cost Increase
Plant Operator	\$ 154,000	\$ -
Plant Operator	154,000	-
Plant Operator	139,000	-
Plant Operator	139,000	-
TBPA Manager	115,500	-
Asst. Operations Manager		130,000
Roving Caretaker		120,000
Operator Transportation	10,000	-
<b>Total</b>	<b>\$ 711,500</b>	<b>\$ 250,000</b>
<b>Net Reduction</b>	<b>\$ 461,500</b>	

Assuming that O&M costs were to be reduced by an estimated \$460,000 per year beginning in fiscal year 2015 and that O&M costs would increase annually by 4% per year for the existing case and 2.5% for the single operator case, the estimated cost of power from SEAPA to the Member Utilities would be 6.5 cents per kWh in 2024 compared to 7.7 cents per kWh if the reductions in O&M costs were not made<sup>7</sup>. SEAPA should have a greater opportunity to control and manage costs if it were to operate the projects itself. As a result, it is assumed that escalation in annual O&M costs would be less for the projects if SEAPA were to provide O&M services. The estimated cost of SEAPA power to the Member Utilities is shown in the following chart.

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<sup>7</sup> Based on estimated costs as provided by SEAPA for the Status Quo case assuming no new generating plant developments by SEAPA. Total SEAPA annual energy sales are assumed to increase 1.25% per year from 176,200 MWh in 2015 to 197,100 MWh in 2024.

**Figure 3**  
**Estimated Wholesale Cost of SEAPA Power**  
**Cents per kWh**



Without a detailed evaluation of current O&M contractor budgets, it can't be stated precisely what total cost savings could potentially be realized. It is important to note, however, that the proposed modified structure includes additional technical capabilities for SEAPA that will directly benefit the operations and maintenance of the system.

### **Proposed Action Plan**

The actions to be undertaken by SEAPA with regard to changes to the operations and maintenance of the SEAPA Facilities will depend upon which approach the SEAPA board chooses to undertake. Further, since additional information will most likely be needed to determine if significant changes are to be made, it is reasonable to expect that various decision points be established where alternative directions can be taken if deemed appropriate. We have prepared a list of action items that could be undertaken by SEAPA to transition towards an alternative approach to operating and maintaining the SEAPA Facilities.

1. Provide notice of cancellation of current O&M contracts.
2. Define and develop operating standards and criteria for the SEAPA Facilities that closely align with the current configuration of the SEAPA system.
3. Develop contract terms, specifications and standards that would supplant and augment the terms and conditions of the existing O&M Agreements.
4. Evaluate contractual arrangements for current employees of the O&M contractors to determine the best way for transitioning these employees to the alternative means of operations and maintenance at the Projects.
5. Define on-going responsibilities of SEAPA staff.
6. Discuss potential transitional labor agreement with the IBEW if SEAPA is to take over operations and maintenance of the SEAPA Facilities. If a single contractor is to be used, the contractor will need to conduct discussions with the IBEW.
7. Solicit bids for O&M contractors.
8. Evaluate bid results and determine if a contractor is to be retained or if SEAPA should undertake the operations and maintenance function.
9. Develop operating plan for SEAPA to operate and maintain the Projects.

Many of the items in the preceding list can be defined and developed; however, the SEAPA board may ultimately decide not to actually undertake an alternative operating approach. In this manner, as additional research is conducted and cost estimates and transitional operating procedures are prepared it may be determined that going forward would not yield the net benefits desired by SEAPA. If changes in the O&M procedures are not made and the cost of operations and maintenance continue to increase at the historical rate, the time when the wholesale price of power will need to be increased will come sooner rather than later.

The development of contract terms and specifications as indicated in Items 2 and 3, above, could serve as the basis for developing a request for proposals (RFP) for a single operating contractor. The RFP should include provisions for industry standard operating procedures tailored to the specific locations and characteristics of the SEAPA Facilities. The RFP should also state terms and conditions for performance, measures of compliance and non-compliance, financial backing terms for non-compliance, standard payment terms and payment terms for operational excellence objectives, among other items.

If SEAPA decides to pursue a single O&M contractor option, the following chart provides a timeline to implement this option. As shown in the chart, the expected transition date for the new contractor is July 1, 2014.

**Southeast Alaska Power Agency  
Operations and Maintenance Organization Review**

**Figure 4  
Proposed Action Plan Timeline  
Single O&M Contractor Alternative**

Milestone or Task	Schedule and Milestones																			
	20-Sep-12	Oct 2012	Dec 2012	Feb 2013	Apr 2013	May 2013	1-Jul-13	Sep 2013	20-Sep-13	Oct 2013	Nov 2013	Dec 2013	23-Jan-14	Feb 2014	Mar 2014	Apr 2014	May 2014	Jun 2014	1-Jul-14	
Board Decision to continue with O&M Review, provide notice of cancellation of O&M contracts	●																			
Define and develop operating standards and criteria aligned with current system		■	■	■																
Develop contract terms, specifications and standards to replace existing O&M Agreements					■	■														
Evaluate contractual arrangements for current employees, develop transition plan			■	■	■	■														
Begin final year of existing O&M Contracts							●													
Define on-going responsibilities of SEAPA staff				■	■	■	■	■												
Develop RFP for O&M contractor services					■	■	■	■												
Issue Request for Contractor Proposals									●											
Evaluate Proposals										■	■	■								
Select Contractor													●							
Contract Negotiation														■	■					
Contractor Preparations																■	■	■	■	
New O&M Contract Executed and Operating																				●