City and Borough of Sitka
100 Lincoln Street • Sitka, Alaska 99835

December 16, 2019

Greg McIntyre
Facilities Consultant
Southeast Regional Health Consortium
221 Tongass Drive
Sitka, Alaska 99835

RE: Electric Power Sale Agreement
City and Borough of Sitka and SEARHC

Dear Greg:

Over the past two months our Electric Department staff and consultants have thoroughly studied Sitka's hydroelectric power generation systems. This effort included computer modeling of future reservoir(s) water availability based upon 50 years of historical climatological records.

We also factored into the analysis several different scenarios for potential SEARHC energy needs and a background community electric load growth of 0.67% per year.

Our consultants reviewed the preliminary design information that we have for your new medical campus. Our estimates of your non-heating energy loads are shown on Table LDEST1 in the attached technical memorandum.

Based upon our internal analysis and upon your preliminary design information we are comfortable with supplying SEARHC with approximately 10,000 MWH at the General Service-Public Authority rate.

Sitka is also very interested in providing electric power to SEARHC for the campus heating load. However, this additional, potentially large amount of energy can only be provided on an interruptible basis.

Our reservoir(s) management modeling concludes that the amount of excess, interruptible energy will decline over time as the background load of full rate paying customers increases.

However, our analysis indicates there are potential, significant cost savings for SEARHC if electric boilers are designed in series with primary oil-fired boilers. The City is willing to negotiate an incentive energy rate for interruptible power that is beneficial to both SEARHC and to the citizens of Sitka who own the electric utility.

Attached is a detailed report by Robert Dryden P.E. of Power and Control Engineering that summarizes our conclusions and recommendations.

We are ready to further refine our work when more detailed information becomes available as your project designs come together. Our eventual goal is to complete a power sales agreement with SEARCH.

Sincerely,

Hugh Bevan, P.E.
Interim Municipal Administrator

Attachment: SEARHC Load Estimates and Interruptible Heat Energy by Power and Control Engineering, December 11, 2019

C: Jeff Wheeler, Interim Utility Director
Erin Clay, Generation Superintendent
Robert Dryden, P.E.
Dean Orbison, P.E.
Michael Harmon P.E.

Power & Control Engineering
P. O. Box 2338
Sitka, AK 99835

11 December, 2019

REF: Technical Memo : SEARHC Load Estimates and Interruptible Heat Energy Availability

Hugh Bevan, City Administrator
City and Borough of Sitka
100 Lincoln St.
Sitka, AK 99835

As you requested, I offer a summary of our efforts in this matter. The effort involved primarily myself, and Dean Orbison PE.

We felt that we needed to completely re-evaluate the Generation Capacity situation in the long term, so updated our generation and reservoir model and used this, combined with the latest long-range planning documents, to come up with what the Department really can offer. That is done. I include summary charts. The supporting documentation is extensive, but beyond the scope of this document.

In review of the AMC report of Mar 29, 2018, I feel that there has been a considerable lack of understanding of the Interruptible Energy sales, as practiced by the Sitka Electric Department.

The details of our planning efforts, show that there should be no issue in providing what I estimate to be about 2.5 MW of annual peak and perhaps 10,000 MWh of energy, to the new facility, non-heating load. The estimate of 5.5 MVA (4.9 MW) seems very high, perhaps I misunderstand, and is discussed later in this letter.

In general terms, we looked at perhaps an interruptible load of something like an annual usage of as much as 20,000 MWh. The availability of such energy is probably workable right now, but due to variability of rainfall into the hydro reservoirs, there could be years where there is no interruptible energy available, dictated primarily by the required use of diesel to supplement. I offer two charts: Chart 2 and Chart 3.

The basic concept of Interruptible heat loads is to find a way to sell energy capacity in the early years of a project. The projects, Green Lake and Blue Lake Expansion, were designed to provide long term energy supply to the Community of Sitka. The only seemingly viable hydroelectric project, not yet developed, but intensively studied, Takatz Lake, represents an enormous investment of something like $600M, so seems economically impossible for a community with level or very low growth.

Hydroelectric excess energy can only be sold for low rates while there is no competing full rate load available. As full rate paying load develops, the availability of excess energy to be

sold will decline. On the other hand, if the City's full rate paying load declines, which it could do, then more interruptible energy might be available. I feel your options to use Interruptible energy should be left open in your future plans.
The plan of constructing all the new facilities with only electric resistance heating, and backing it up with a diesel fired power plant, seems like a concept supported by assuming availability of low-cost interruptible energy in the long-term life of the facility. This is not the case, refer to Chart 3, attached.

I would guess several points would make this a questionable choice:

a) If electric heat became unavailable, the campus would be heated for long periods of time (years) by running diesel generators at 30% efficiency and maintaining an operating crew -- doubling or tripling heating costs.

b) Conversion of all these buildings back to oil fired boilers would be very complex and expensive, if not provided for in the original design and construction.

c) Current projections suggest that the full amount of interruptible heat energy envisioned would only be available in total for 5 to 7 years, a small fraction of facility life. After that period reduced rate energy would be available, but in decreased amount. See Chart 3 attached.

I would suggest another strategy, based on information available to date and the Departments current experience.

a) Design the entire campus based on the use of heating oil.

b) Regard Electric Heat based on Interruptible Rates as a supplemental heat source. The City is very interested in sale of this energy and willing to negotiate to find a best deal for both parties.

c) On large buildings that will be served by a central heating and cooling facility, the approach is normally to install the electric boiler in series with the hot water oil fired boilers, in the boiler return line. Any amount of electrical interruptible energy available is used to boost the overall required heat, displacing fuel oil. The electric boiler rating should not be based on MBTU sizing of the oil-fired equipment, but rather on a size that could displace most of the heating energy required. We find that the seven or so electric boilers already installed have annual load factors of 20 to 30 percent, so oversized. The electric boilers can be staged to allow what the utility can furnish at the moment with the oil boilers making up the difference. We envision eventually the Department generation operators could control availably remotely to optimize energy available and used. The Department already has in place extensive SCADA control of the power plants and distribution equipment.

d) On the residential buildings, the approach that the Community of Sitka has found very effective is the use of heat pumps, with something like Toyo stoves as backup. I am told that the modern heat pump systems can attain annual COP's of 3 and better, so

this could very substantially reduce the cost of heating by as much as 2, paying the full electric rate.

e) I would like to add that Sitka has one large building, the old Forest Service Building on Katlian, which is totally heat pump. I believe the building was built about 1985, and is still totally functional. As far as I know, this was very successful and economical. I have worked with Trane on large scale heat pumps, as far back as the late 1970's. It is a well-developed technology, capable of heating and cooling, for large buildings. The building belongs to Frank Richards and he would have a lot of information, as well as all the metering information the Department has.

f) To date, the Department has invested all the capital required to install electric interruptible heat boilers and has also accrued all the financial benefits of doing so, because the investor is the entire Community of Sitka and all benefits flow, in one manner or the other to the taxpayers and ratepayers of the community of Sitka. When you regard the investment decision in the light of the Community overall, the economics is obvious and very favorable.

The decision by an outside entity to purchase Interruptible Energy for heating is not nearly as favorable. The current rate structure offers a 10% savings over the cost of the heating fuel. It does not seem viable to me that this relatively small savings would pay for $12M additional cost of the back up power plant, and separate distribution system, just to handle interruptible energy. I also believe that a defined window of investment payback in the order of 5 to 7 years is reasonable. I analyzed a rate of 80% to the Utility, 20% savings to SEARHC, assuming 10% to debt service and 10% for incentive. It looks to me like this is workable and advantageous, but I need better understanding of the economics of the SEARHC design.

The best approach, I believe, is to build the facility based on oil heating. Provide adequate space and plumbing connections within the boiler room for installation of a supplemental electric boiler. The decision to install the electric boiler can be delayed until the project is better defined, and/or the economic situation is agreeable to both parties.

Load Estimate for New Facility

All of the engineering and economic calculations depend on a reasonable estimate of the New Campus Electrical, demand and energy requirements. The only document I have to review is the AMC Study of 19 Mar. 2019. I don't understand the difference in these calculation tables. The bottom line seems to be a prediction that the non-heating normal full rate paying load would be 4.9 MW. However, it appears no diversity was applied to these loads in coming up with this total. I have run through this roughly, with diversities typical of these types of loads and provide my calculations in Table LDEST. My estimate for non heating electrical energy is 2.4 MW and annual energy usage of 10,000 MWh. This is a first cut and I need more input from the SEARHC engineers to come to closer mutually agreed to load estimates. The Electric Department hydroelectric system would seem to have no

problem furnishing the above calculated demand and energy requirements far into the future.

Although I believe that the purchase of Interruptible Heat is a viable option for SEARHC, the amount of energy represented in the AMC estimates does not look sustainable, so we must work to find a mutually acceptable plan. The City is very interested in such reduced cost interruptible sales and would work to negotiate a rate and investment strategy that seems viable to both parties.

Robert E. Dryden PE

Attached: Table LDEST1, Chart 2, Chart 3

Review of Load Analysis -- New Search Hospital Sitka

12/11/2019

TABLE LDEST1 All loads Except Electric Space Heat

		Sq. Ft	VA/sq ft	Watts/sq ft	Annual Peak kW w/o Diversity	Diversity	Peak kW/year
1	New Clinic Building	61,285	10	6.57	403 kW	0.35	141.0
2	New Hospital Building	146,702	15	9.86	1,446 kW	1.00	1,446.5
3	New Raven's Way Program Building	11,878	10	6.57	78 kW	0.35	27.3
4	New 4 Bedroom House	2,338	5	3.29	8 kW	0.25	1.9
5	New Duplex (2-3 Bedroom Units)	21,336	5	3.29	70 kW	0.25	17.5
6	New 5 plex	13,706	5	3.29	45 kW	0.25	11.3
7	New 8 plex	11,570	5	3.29	38 kW	0.25	9.5
8	New Swing/Skilled Nursing Faciliity/LTC Building	69,686	10	6.57	458 kW	0.35	160.3
9	Renovation of Hospital (MEH) Building	76,405	15	9.86	753 kW	0.60	452.0
10	Renovation of Community Health Building (CHB)	28,911	10	6.57	190 kW	0.40	76.0
11	Renovation of 3 Bedroom House	9,918	5	3.29	33 kW	0.25	8.1
12	Renovation of Duplex	12,303	5	3.29	40 kW	0.25	10.1
13	Renovation of Community Center	3,673	5	3.29	12 kW	0.35	4.2
				Non-Diversified Peak ----->	3,575 kW		
				with NEC Reccommended Diversity for Overall Feeders @ 0.6 ---->	2,145 kW		

Total Kw with each load diversified individually 2,366

Annual kWh using 0.5 Annual Load Factor 10,362,477

Note: The main hospital building is the "base" because it operates 24/7 Annual Megawatt Hrs. 10,362

CHART 2 -- ENERGY AVAILABLE FOR INTERRUPTIBLE ENERGY SALES

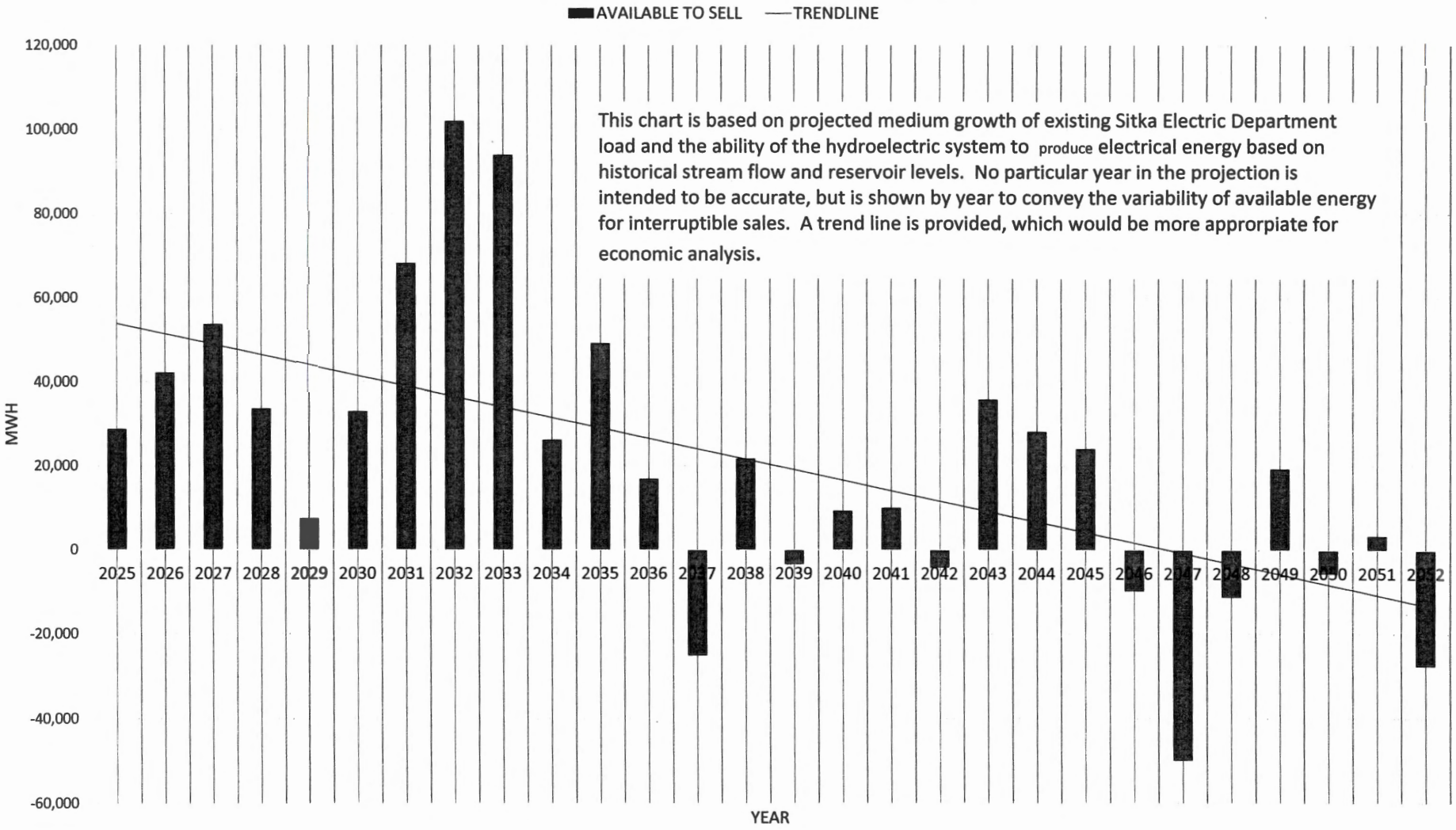

CHART 3 AVAILABLE ENERGY, FOR INTERRUPTIBLE SPACE HEAT