Atlin Hydro Expansion
Prefeasibility Study

Prepared for: Atlin Tlingit Economic Limited Partnership
General Information Meeting - April 18, 2015

1. Background to the study
2. Study objective
3. Study tasks
4. Power production opportunity
5. Concept layout
6. Preliminary cost estimates
7. Next steps
In March 2009 the Atlin Hydro project was commissioned to provide green energy to Atlin.

- The power plant has an installed capacity of 2.1MW

- ATELP has a power sales obligation to BC Hydro for a minimum & maximum supply until 2033
• The existing power plant is underutilized.

• The plant has an estimated average potential generating capacity of 11.6GWh/yr.

• Long-term power delivery obligation to BC Hydro is only 8.3GWh/yr.

• The renewable power potential of Surprise Lake and Pine Creek is only partially developed.
• The Yukon forecasts that it will not have enough renewable energy to meet growth in electrical demand.

• An opportunity exists for Atlin to provide renewable energy to help meet Yukon’s needs.
Atlin Hydro Expansion prefeasibility study successfully awarded funding in September 2014 from Aboriginal Affairs and Northern Development Canada’s ecoENERGY for Aboriginal and Northern Communities Program

- Additional funding provided by:
  - Yukon Energy Corporation;
  - In-kind contribution by ATELP

At the end of the study ATELP will have an asset regarding hydropower development potential of Pine Creek.
Goal of this study is:

1. What is the total hydropower potential of Pine Creek? How much renewable energy can be produced by this natural resource?

2. How could this renewable energy potential be developed?

3. Does it appear to be economically feasible to develop?

How big is the green-energy opportunity here and is it worth pursuing?
A Prefeasibility Study is to look at scale of opportunity – how big is it? What is the power production opportunity?

Limitations of this phase of study include:

1. The project layout is developed to estimate power production and project costs

2. The project layout and operating scheme has not been optimized at this stage

3. Environmental constraints have not yet been taken into consideration. At this phase we are just trying to determine the maximum opportunity before environmental mitigations are applied.

These items are all next steps. These steps should be conducted if the project looks attractive and if it is recommended to proceed to the next phase of study.
Study Tasks

1. Initial site visit by engineering team to understand existing infrastructure and the terrain constraints (completed late September 2014).
2. New 1-meter contour mapping required for design of penstocks etc. (received in Dec. 2014)
3. Develop a preliminary layout for power plant expansion
4. Power production study (complete)
5. Flood study (to size spillways, etc., completed)
6. Preliminary design (currently in draft)
7. Prepare cost estimates (in progress)

Not included:
- Transmission line to Yukon – assumed from 2011 scoping study from Yukon Energy Corp.

Other studies in progress:
- New stream-flow monitoring program setup in fall 2014
- Environmental data gap & regulatory needs assessment currently in progress.
Power Production Opportunity

Atlin

- Proposed New Penstock
- Proposed New Powerhouse Expansion (add 2.9 MW)
- Proposed New Lower Penstock
- Proposed New Lower Powerhouse (2.5 to 3MW)
- Existing Powerhouse
- Existing Penstock
- Proposed Headpond
- Existing Headpond & Intake
Findings of power production analysis for Surprise Lake & Pine Creek:

- Total average annual power production estimate: 42.5 GWh/yr
- Available for sale to Yukon: 35.6+ GWh/yr
- 2013 Atlin actual power consumption: 5.3GWh

Power Production Opportunity

- New lower powerhouse at Atlin Lake (3MW +/-)
- Expand existing powerhouse (add 2.9MW)
- Unused capacity (existing 2.1MW)
- Atlin forecast need (2033)

11.6 GWh/yr total potential estimated from current powerhouse
Simulated Monthly Average Power Production

- Proposed operating regime to maximize winter power production: when electricity is needed.
- This maximizes value for Yukon energy sales. Summer energy has little or no value.
- Winter power production is achieved by storing water in Surprise Lake during the summer to create power (stream flow) in winter months.
New project elements includes:

1. Modification to Surprise Lake control structure to increase water storage range in Surprise Lake.

2. Expansion to existing ("Upper") Powerhouse:
   - New intake at existing head pond
   - New 5’ (1.52m) diameter penstock
   - Expansion of powerhouse with 2 x 1.45MW new turbines

3. New Lower Powerhouse
   - New head pond at confluence of Spruce and Pine Creeks
   - 4km 7’ (2.2 m) diameter steel penstock
   - Powerhouse at Atlin Lake

4. 100km 69kV transmission line to Jakes Corner
Conceptual Layout for Costing

Upper power plant head drop: 107m
Lower power plant head drop: ~50m
Twin existing penstock with second penstock
Re-use existing headpond
Expand powerhouse to add two more turbines
Total generating capacity: 5MW
• New excavated head pond with overflow rockfill weir
• 4km long 2.2m (>7’) steel penstock (pending further evaluation)
• One 2.5 or 3MW Francis-type turbine
• Transmission line from lower to upper powerhouse
• Five different powerhouse locations considered, preferred location below Monarch Mt. trail parking lot.
Conceptual Layout:
Lower Powerhouse
Due to relative low head (50m) a Francis-type turbine is required at the lower powerhouse.

This also requires a “surge tank” or surge-pipe up the hillside.

Example of similar Francis turbines at Mayo-B powerhouse.
Key cost estimate considerations:

- Current project completed in 2009 was done at relatively low cost – ATELP achieved good cost efficiencies in the project overall.

- For proposed expansion the cost estimate is prepared based on more conventional project costs from recent project experience (Mayo-B, Taykwa Tagamou Nation’s New Post hydro project etc.)

- Many items are significantly more costly in this estimate, however optimization has not been conducted.

- Further work is needed to address the higher costs utilized – in particular related to penstock costs.
1. Complete Pre-feasibility study
   - Additional analysis of lower plant capacity is needed (2.5MW vs. 3MW), along with penstock optimization (steel vs. two smaller HDPE?)
   - Additional work warranted to better assess penstock costs

2. Initiate Feasibility Study
   b. Update cost estimate for transmission line
   c. Conduct full feasibility study including site drilling, etc.

3. Initiate Regulatory & Environmental Assessment work

4. Negotiations regarding Power Purchase Agreement with Yukon
Original question: How big is the green-energy opportunity here and is it worth pursuing?

- Atlin Hydro Expansion is a reasonable “small hydro” project with good energy production:
  - Atlin Hydro Expansion could produce a total annual average energy of 42 GWh/yr, of which about 36 GWh/yr is available for sale to Yukon.

- The project is worth pursing and moving to the next step:
  - The project appears to be financially positive, however work is needed to manage the range of costs and will depend on the financial terms (price Yukon is willing to pay, financing costs, etc.)
Thank You