

Council Of Athabascan Tribal Governments (CATG) : Fort Yukon Wood Energy Program – Wood Boiler Deployment (AK)



Presented by :

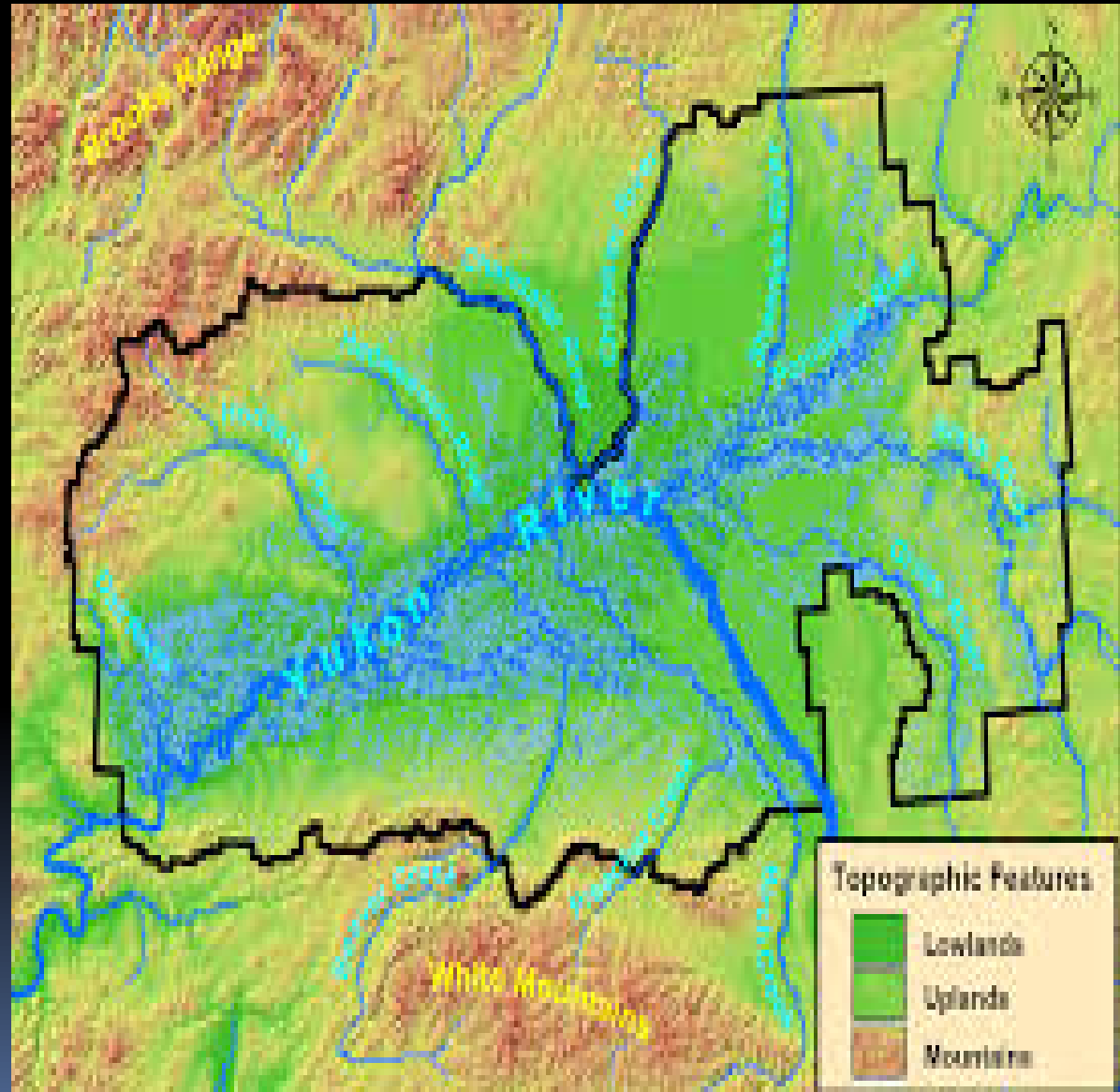
Frannie Hughes, GZ Corporation CEO

Bruce Thomas, NR Director CATG



Yukon Flats

- 10 Athabascan villages in the Yukon Flats
- 8 Gwich'in villages and 2 Koyukon villages
- 55,000 sq. mi. Size of Wisconsin
- 1500 people
- Fort Yukon largest Hub Village 650 people
- Smallest Village Birch Creek 25 people
- Fort Yukon and Circle are the only villages with a City Government
- There is no organized Borough in the Yukon Flats
- Two villages on road system



Yukon Flats- Fall Season



Our Tribal Organizations

- GZGTG
- Gwichyaa Zhee Gwichin Tribal Government *formally known as the Native Village of Fort Yukon*
- CATG
- Council of Athabaskan Tribal Government is an consortium of 10 Gwichin/Koyukon Villages
- GZC
- Gwitchyaa Zhee Corporation ANCSA Village Corporation



Overview of Project:

- ❑ Off Road system biomass CHIP
- ❑ New Power House (CHP) Facility construction
- ❑ Wood Chip Boiler
- ❑ District Heating loop providing heat to commercial buildings
- ❑ (6-10 buildings) I.e. School, Radio Station, Water Plant, etc.
- ❑ Sustainable Forest Management program
- ❑ Create a for profit in-village wood energy utility to displace diesel energy
- ❑ Support training needs for field forestry technicians and supports workshops for education on key biomass issues for Fort Yukon and the Yukon Flats Villages





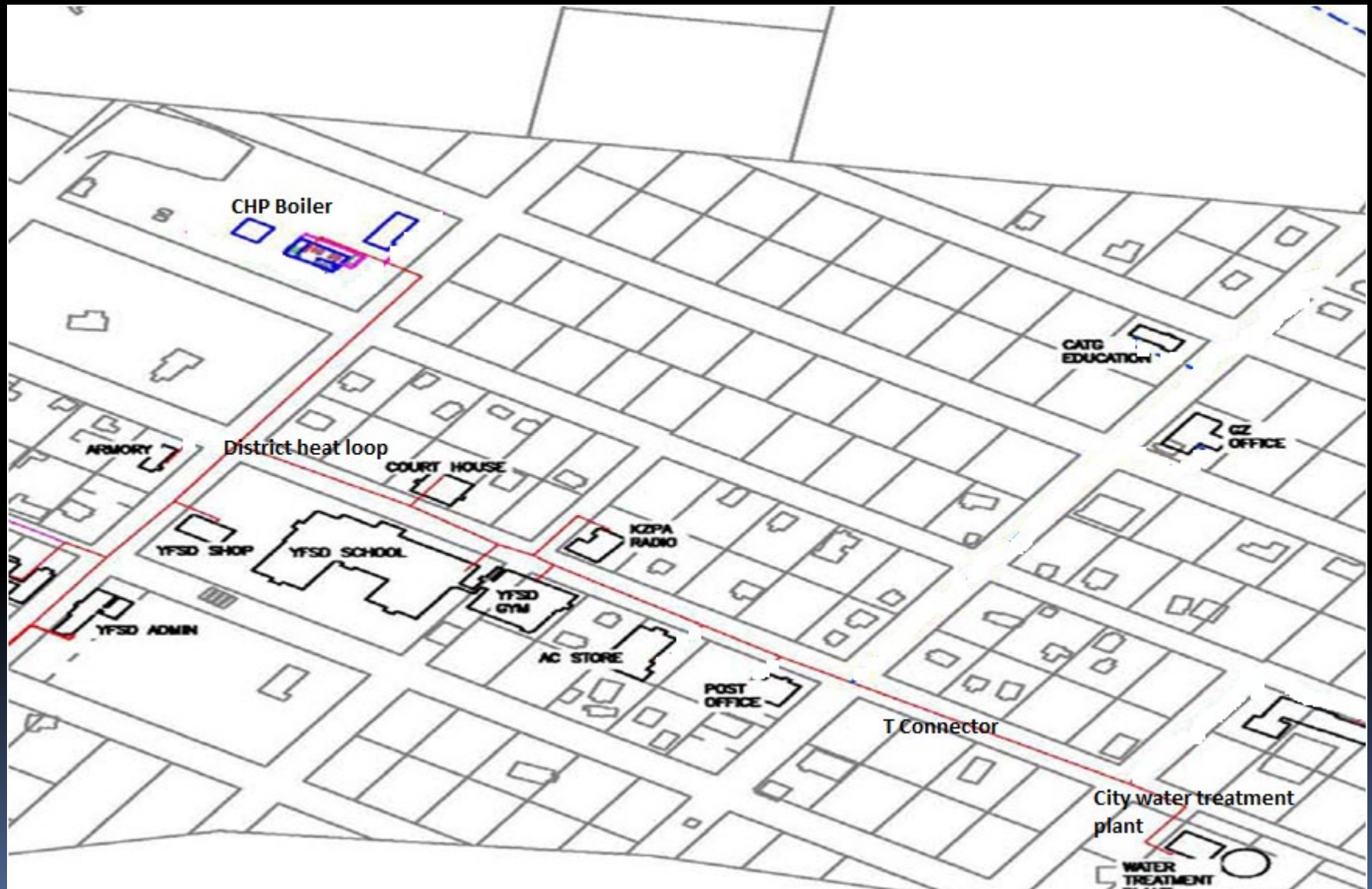
**Fort Yukon Combined Power & Heat
David Lee Thomas Building
Fort Yukon, AK**

Open house day



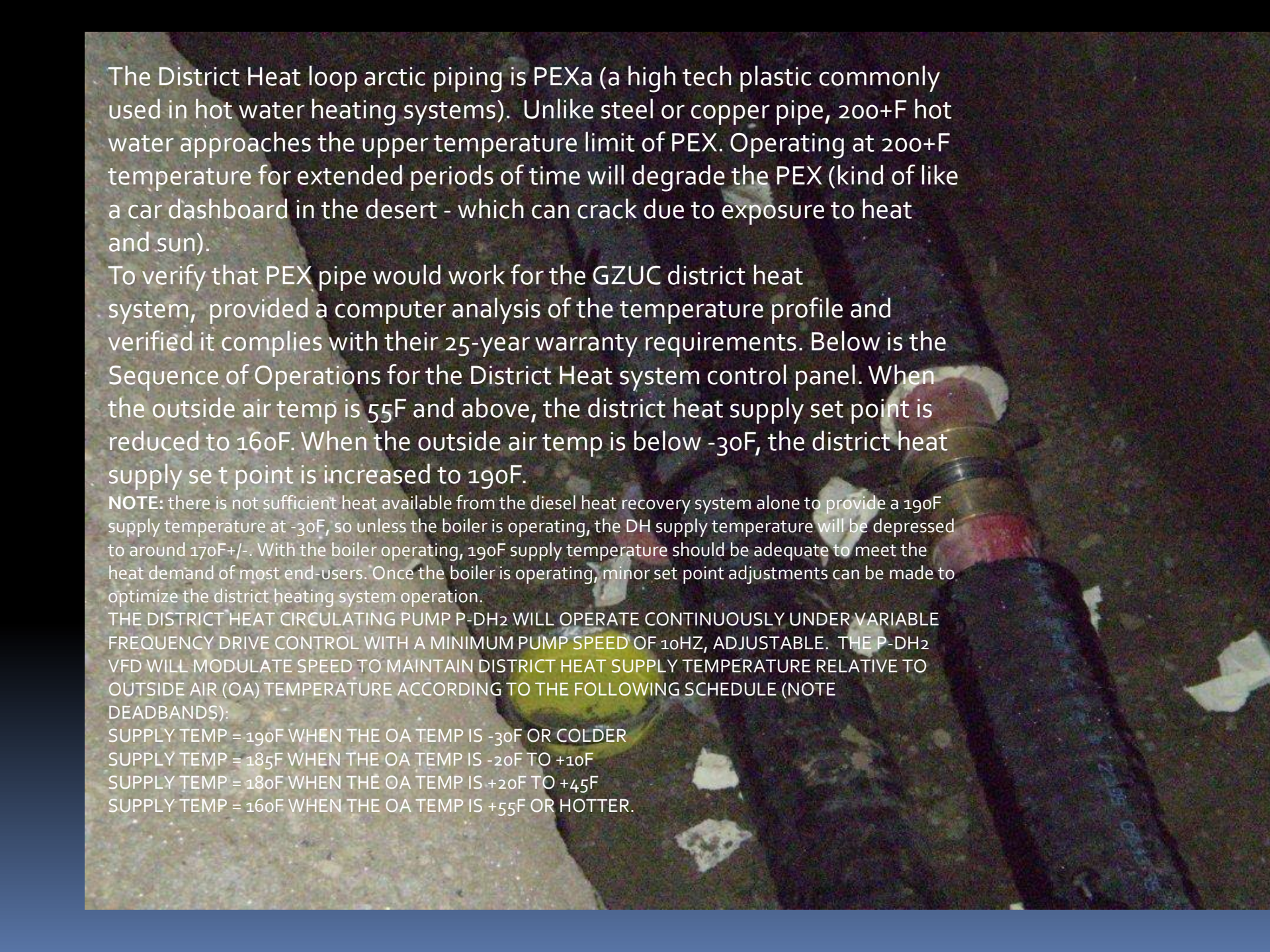
The town came to see
the new facility!!
Nov 2017

Fort Yukon District Heat Loop





Installing District Heat Loop with Arctic Pipes, this was installed over the ANTHC's water-sewer infrastructure.



The District Heat loop arctic piping is PEXa (a high tech plastic commonly used in hot water heating systems). Unlike steel or copper pipe, 200+F hot water approaches the upper temperature limit of PEX. Operating at 200+F temperature for extended periods of time will degrade the PEX (kind of like a car dashboard in the desert - which can crack due to exposure to heat and sun).

To verify that PEX pipe would work for the GZUC district heat system, provided a computer analysis of the temperature profile and verified it complies with their 25-year warranty requirements. Below is the Sequence of Operations for the District Heat system control panel. When the outside air temp is 55F and above, the district heat supply set point is reduced to 160F. When the outside air temp is below -30F, the district heat supply set point is increased to 190F.

NOTE: there is not sufficient heat available from the diesel heat recovery system alone to provide a 190F supply temperature at -30F, so unless the boiler is operating, the DH supply temperature will be depressed to around 170F+/- . With the boiler operating, 190F supply temperature should be adequate to meet the heat demand of most end-users. Once the boiler is operating, minor set point adjustments can be made to optimize the district heating system operation.

THE DISTRICT HEAT CIRCULATING PUMP P-DH₂ WILL OPERATE CONTINUOUSLY UNDER VARIABLE FREQUENCY DRIVE CONTROL WITH A MINIMUM PUMP SPEED OF 10HZ, ADJUSTABLE. THE P-DH₂ VFD WILL MODULATE SPEED TO MAINTAIN DISTRICT HEAT SUPPLY TEMPERATURE RELATIVE TO OUTSIDE AIR (OA) TEMPERATURE ACCORDING TO THE FOLLOWING SCHEDULE (NOTE DEADBANDS):

SUPPLY TEMP = 190F WHEN THE OA TEMP IS -30F OR COLDER
SUPPLY TEMP = 185F WHEN THE OA TEMP IS -20F TO +10F
SUPPLY TEMP = 180F WHEN THE OA TEMP IS +20F TO +45F
SUPPLY TEMP = 160F WHEN THE OA TEMP IS +55F OR HOTTER.

Kob Pyrotec Boiler

Our Biomass Chip Boiler !!!



- 1 Feed auger (with light barrier)
- 2 Burner trough with internal grate
- 3 External grate
- 4 Moving annealing grate
- 5 Secondary air flow
- 6 Ignition fan
- 7 Deashing system
- 8 High-temperature burnout zone
- 9 Combustion chamber door
- 10 Triple-pass heat exchanger
- 11 Safety heat exchanger
- 12 Pneumatic pipe cleaning system

**Biomass Boiler arrival via
Local Barge Company on the
Yukon River, 2017**





Boiler Delivered to the CHP site from the Barge Sept 29, 2017

The manufacture did not get the boiler loaded onto the barge in Austria, was delayed a month, which created a domino effect with all the other logistic planning.

**BOILER IN
CONNEX**



NEW PLANT



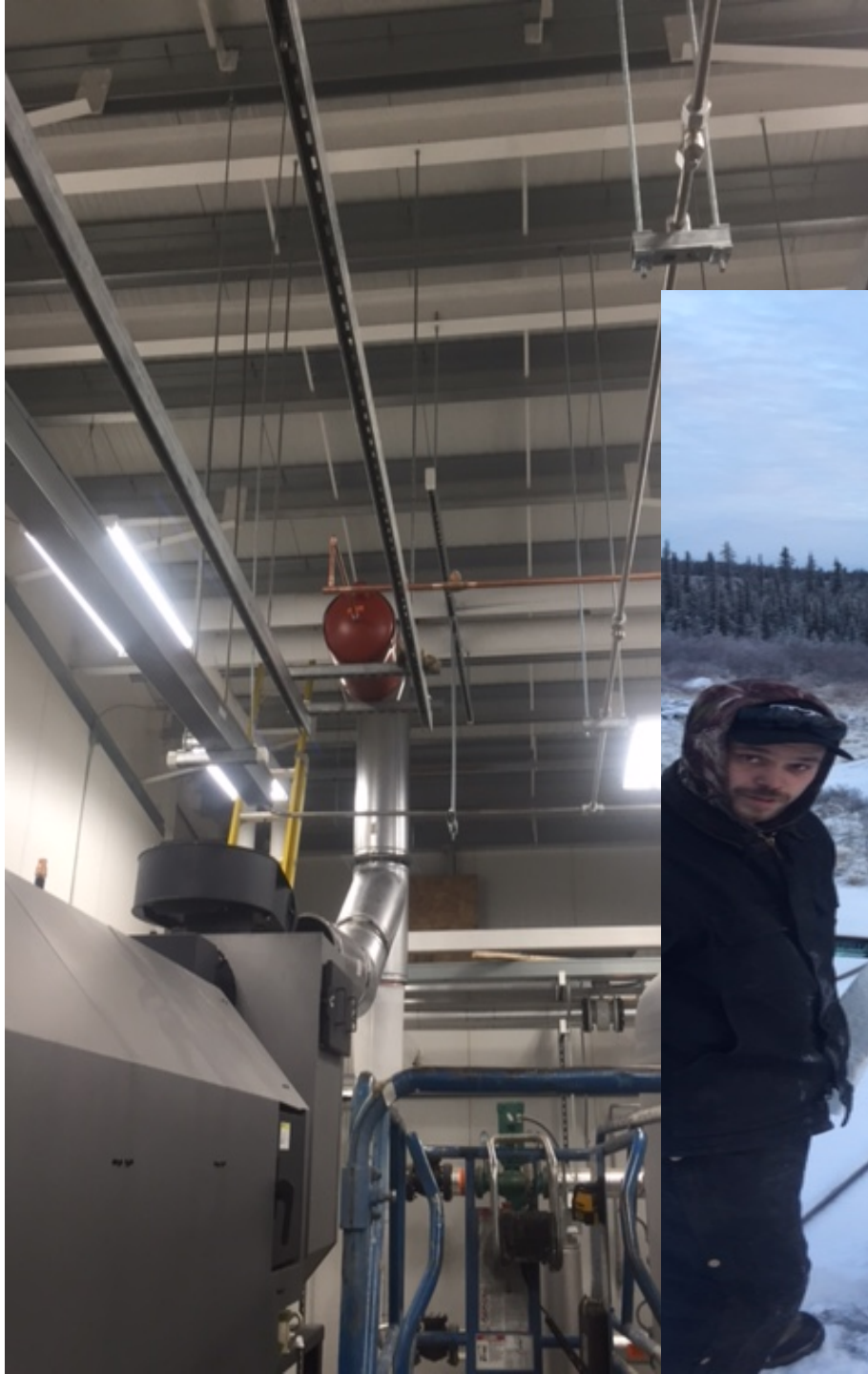


Boiler inside the bay



Our
boiler
at the
site in
boiler
bay

Biomass Boiler Stack installed



Continued
construction work
for the **Chipper
Bay**





**Our above the Arctic Circle Style
Chipper Bin beginning
construction**

A lesson learned: we needed more wall protection in the chipper bay than the design called for, we had to negotiate and got the wall protection for lasting effect.

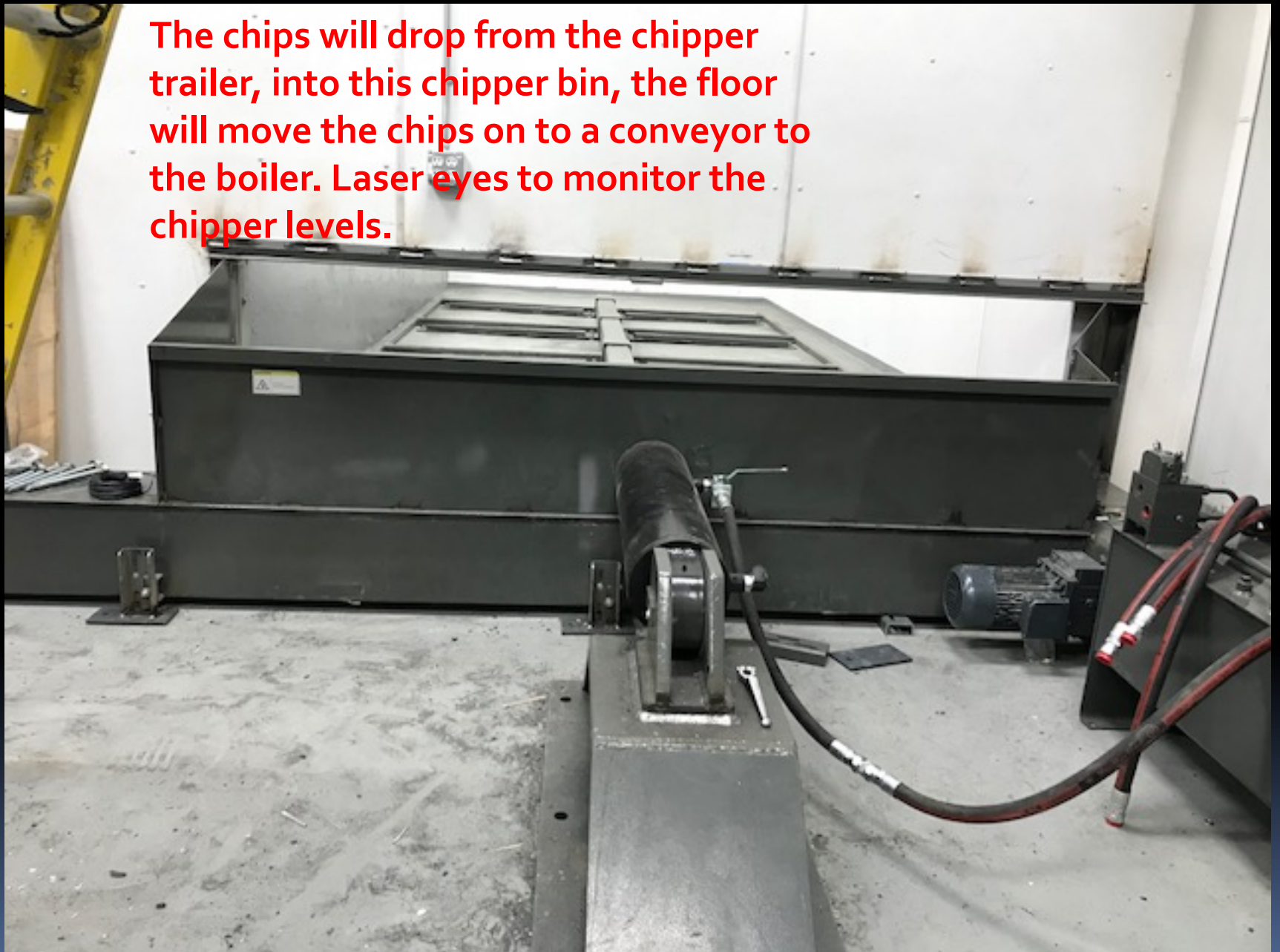


The opening to move the chips to the from the moving floor to an auger to convey directly to the biomass boiler



Chipper Bin here

The chips will drop from the chipper trailer, into this chipper bin, the floor will move the chips on to a conveyor to the boiler. Laser eyes to monitor the chipper levels.





CHIPPER TRAILER ARRIVAL

We will back the
chipper trailer in
the bay up to the
chipper bin



The moving floor will push the
chips out of the trailer into the
chipper bin





Awe realized we needed to modify the rear of the chipper trailer, so we could chip directly into the trailer bin to transport to the power plant to connect chips into the chipper bin which will feed the biomass boiler



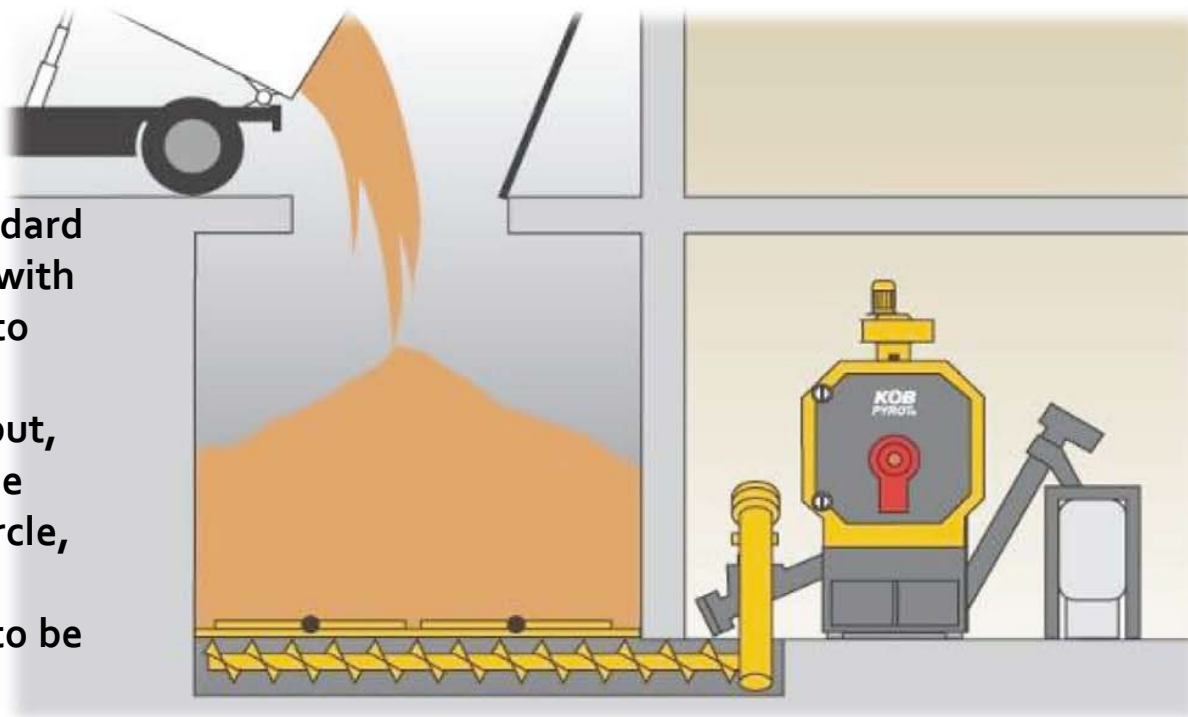


Chipper door added so we could chip directly into chipper trailer.

- Minor modifications made after design process

Fuel Conveyance Systems

The standard chip bin with hopper to feed the boiler...but, above the Arctic Circle, we must modify to be in compliance





MOVING FLOOR & HYDROLIC S Chipper Trailer



With the chipper trailer in:

Connecting hydraulics



Laser lines provide fill sensors



Getting the Biomass Chips

The Kubota grabs the wood product
To feed the Chipper at the chipping site

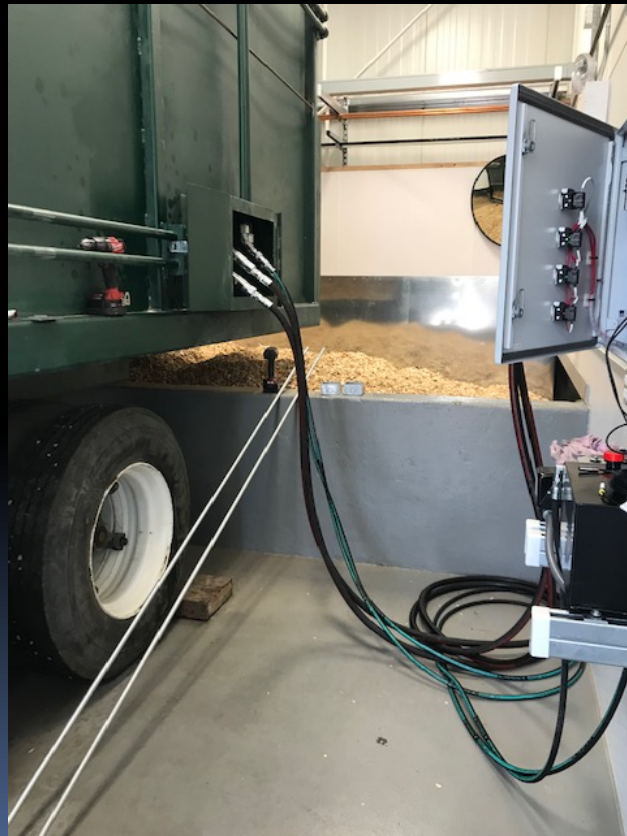


The Chipper then fills the
chipper trailer





The Chips are fed to the boiler



The BOILER gets commissioned



**April 6, 2018 Biomass
Boiler Commissioned!!!**



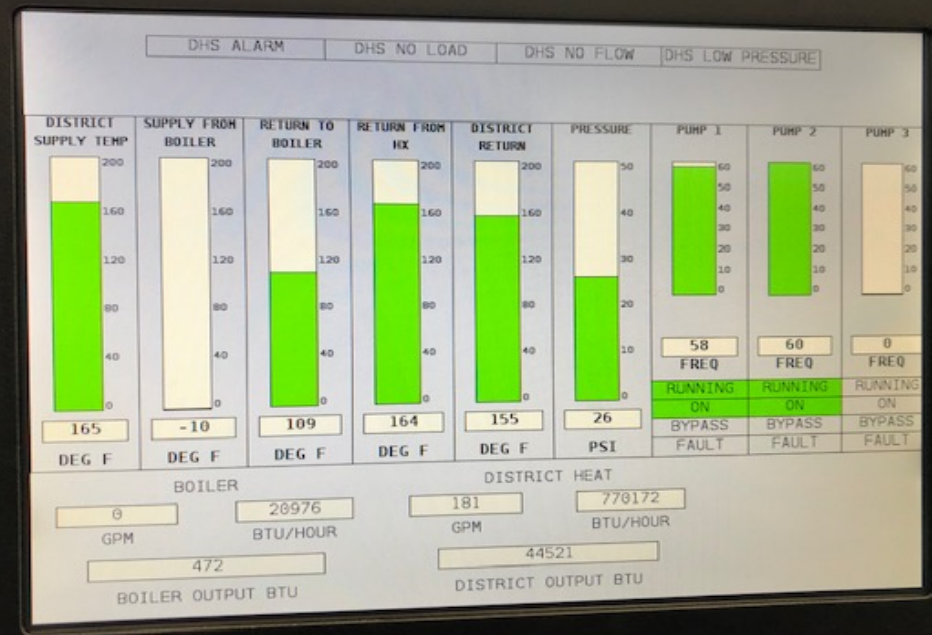
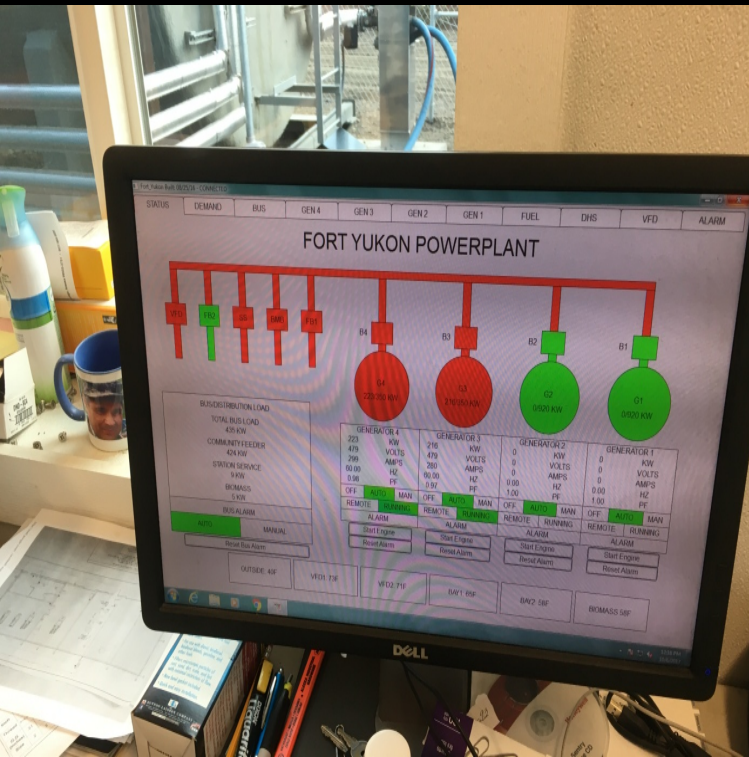
The Biomass Boiler Stack is going!!



THE HEAT LOOP HAS A READING OF 180 degrees GOING OUT OF THE CHP & A RETURN OF 165 degrees.

WHEN TEMPS DROP TO MINUS 20 degrees, WE WILL NEED THE BIOMASS BOILER to KEEP THE HEAT LOOP TEMP UP.

- THE Pyrotec 390, requires at least 35% Moisture Content
- Our Poplar Wood Harvest has been drying for 3 years
- We will have to Harvest Birch as Galena , AK is doing



Design Considerations

- ❑ - 4-Bay Generator Power Plant
- ❑ w/ 2 Detroit Diesels and 2/ 35.08B CAT
- ❑ – Biomass Bay, Biomass Chipper Bay & Garage
- ❑ – 20,000 gallon fuel tank
- ❑ - 14 days + 5-day fuel reserve at peak loads
- ❑ - District Heating System to Serve 7-10 Commercial Buildings

Design Accomplishment

- ❑ Displaced 100,000 gallon diesel per year
- ❑ Forestry Management Plan
- ❑ Harvest Plan
- ❑ Allows energy monies to stay in the community

Future Expansions

- Use the chip boiler set up with remote sites
- Share this knowledge with surrounding communities

Integrated Biomass Program

Rural
Economic
Development

Energy Cost
Reduction

Wildfire
Mitigation

Community Biomass
Utilization Program

Habitat
Enhancement

Environmental
Improvement

Grants / Bookkeeping


- RUS USDA
- DOE Tribal Energy
- AEA REF
- REAP USDA
- 3rd Party Accounting



Our chip site, we will cross water ways to our harvest site upon freeze up so the equipment can cross safely.



Must cross this Yulotta Slough



Equipment Training New Holland Tractor and Kubota

Kubota Training:

- Cutting and Loading Capabilities
- Maintenance
- Falling Debris
- Proper timber cutting layout

New Holland Training:

- Safety
- Maintenance
- Proper functions, in the woods and around other machinery and hazards
- Proper log skidding techniques



Fort Yukon Wood Energy Program

Lessons Learned

Be Vigilant

Monitor the overall project
Budget

Be willing to stop project to
Get the updates & answers

Always & Always check the
Weather!

Activities Yet to be Completed

Complete Heat Sales
Agreement W City

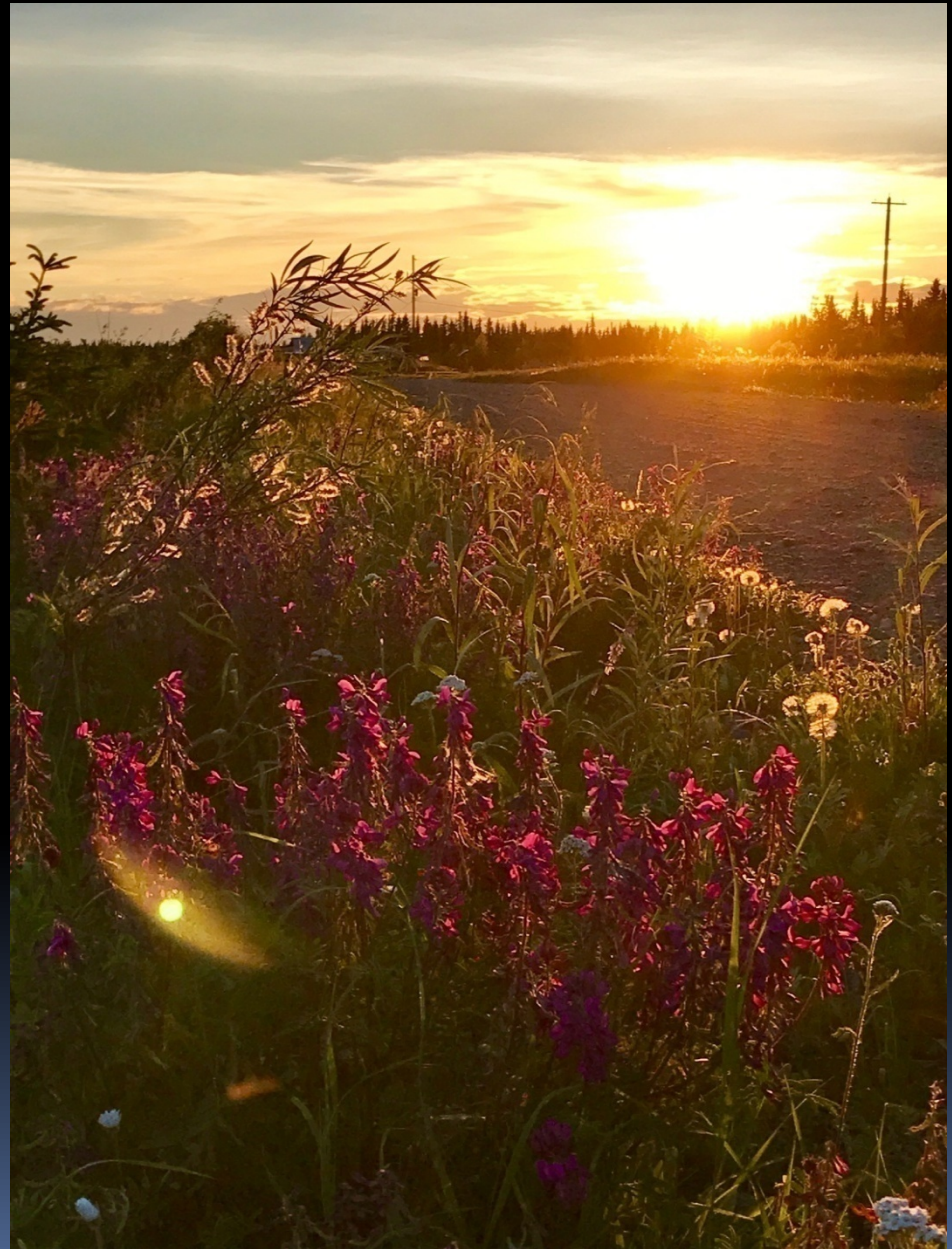
Update Heat Utility Business
Plan.

For-Profit Wood Energy Business Model Fort Yukon

- ❑ Forest Management Service- CATG
- ❑ For-Profit Wood Utility Company-Vertically Integrated
- ❑ Gwitchyaa Zhee Native Corporation
 - ❑ Wood Harvest Company
 - ❑ Village Wood Yard/Distribution Company
 - ❑ Wood Energy Utility- Diesel Biomass
 - ❑ Wood diesel hybrid power plant CHP – still dreaming for 200 – 700 Kwh technology

Future Plans

Once a program has been established in Fort Yukon, it is the intent of CATG Natural Resource Department in collaboration with the Village Tribes, Native Corporations and Private Lands to support the installation of programs in each of the villages in the Yukon Flats Region. The model program being developed in Fort Yukon will serve as the basis for all projects in interior Alaska



Fort Yukon's new Combined Heat and Powerhouse (CHP)





**FORTYKON CHP STARTED DIESEL ELECTRICAL
GENERATION DEC 2016**

BIOMASS BOILER INSTALLATION END OF NOVEMBER 2017

COMMISSION BIOMASS BOILER April 2018

Fort Yukon's Old Power Plant





Mashii Choo for the new CHP and Biomass System for Fort Yukon & the Yukon Flats

A photograph of the Aurora Borealis (Northern Lights) over a lake at night. The sky is dark blue and purple, with numerous stars visible. The aurora appears as vibrant green and yellow-green curtains of light, some of which are reflected in the calm water below. The horizon shows a dark silhouette of a forest and a body of water.

Questions & Answers