



GNWT Biomass: Past, Present and Looking Forward

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Presentation overview

- **Why Biomass?**
- **Where it started**
- **Building capacity**
- **Where We're At**
- **Performance Monitoring & Analysis**
- **Looking Forward**
- **Questions**

Why Biomass (Wood Pellets)?

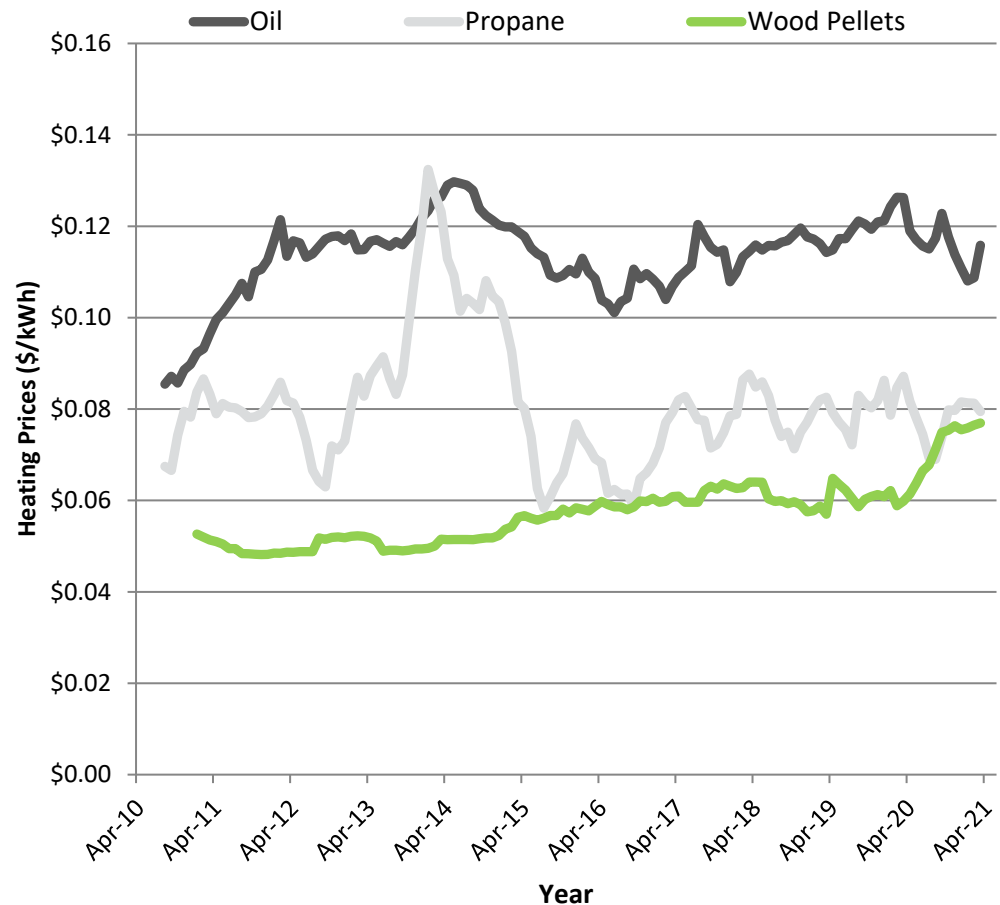
Reduce energy costs:

- Wood pellet heating costs half of fuel oil (in North and South Slave)
- Wood pellets from wood by-product, sourced in Northern Alberta, with a proposal to produce locally in Enterprise, NT.
- Compared to the volatile nature of the cost of fossil fuels, the price of wood pellets has remained stable.

Reduce Carbon Emissions:

- Wood pellets are a green, carbon neutral fuel source.
- NWT at the Forefront of climate change, leading by example.
- GNWT 2030 Energy Strategy: **“Increase the share of renewable energy for space heating to 40%”**

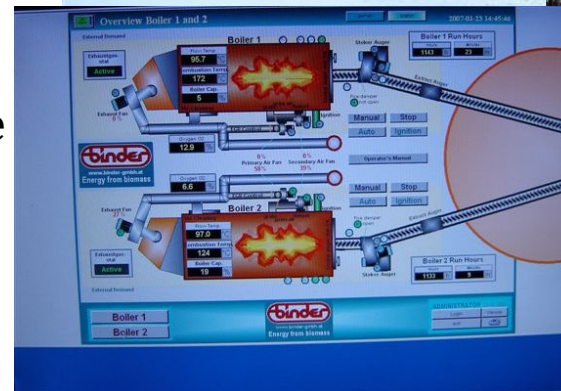
GNWT Historical Energy Price Comparison (2010-2021)



Where it started

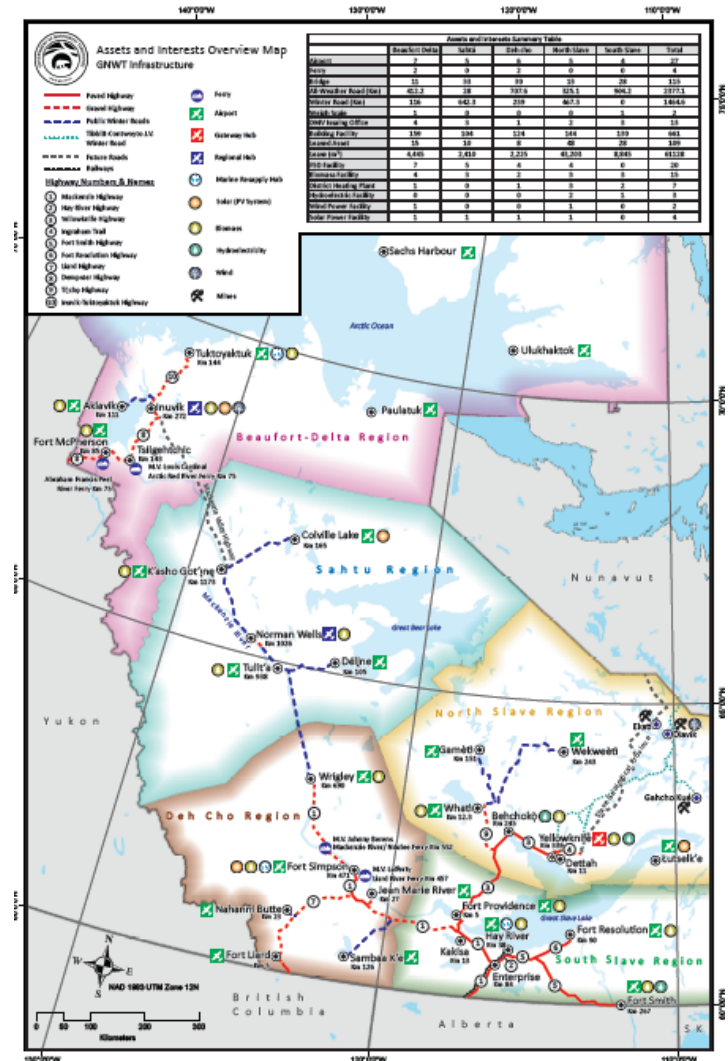
North Slave Correctional Facility (NSCF)

- In 2005 concerns were raised about the installed heating capacity at the (NSCF) wrt redundancy.
- In April 2006, PW&S and DOJ received a proposal from Arctic Green Energy (AGE), to provide 2 x 750kW wood pellet boilers for the NSCF in lieu of the third oil-fired boiler.
- The installation was at no cost to the GNWT. The GNWT agreed to purchase heat at a cost that is based on the price of oil. Savings were shared between the GNWT and AGE.
- The installation reduced GHG's by 1,550 Tonnes/yr and displaces approximately 568,900L of Fuel Oil/yr.



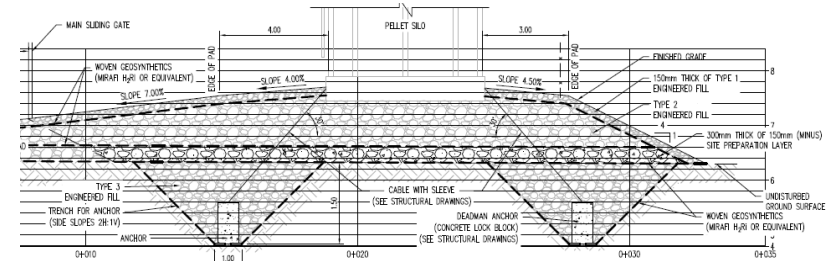
From NSCF

- Around the same time as the successful installation at the NSCF the GNWT embarked on several energy initiatives.
- Energy Priorities Framework 2008
- GNWT Biomass Strategy
- 2030 Energy Strategy
- Energy Action Plan
- Establishment of the Capital Asset Retrofit Fund, in 2010, of \$3.8 Million annual to upgrade the energy efficiency of existing GNWT assets.



Northern Biomass Challenges

- Often complex foundations are required on areas of continuous or non-continuous permafrost.
- All communities experience extended & high heating load seasons, on average, between 8,000 & 10,000 heating degree days each year.
- Winter road only communities require biomass storage for a full heating season.
- Technical skill for maintenance is often not available in the smaller communities.

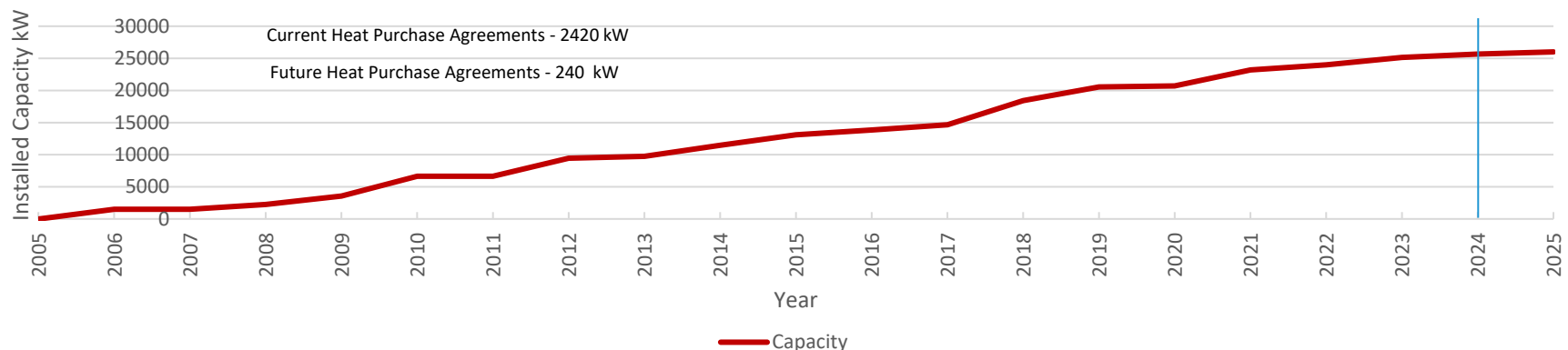


(Aklavik School Biomass Silo/Foundation)

Building Capacity

- **40 GNWT (INF) own & operated Biomass Installations**
- **4 Yellowknife School Districts owned & operated Biomass Installations**
- **6 Heat purchase agreements from third party Biomass Owners**
- **2 Heat selling agreements with adjacent owners (Housing NWT, Tlicho Gov)**
- **10 Biomass installations in the Planning, Design and Construction Phase**
- **4 future heat purchase agreements**
- **Integrating Biomass in all new Capital Projects**
- **Currently 37% of the heating energy for all Infrastructure controlled assets comes from Biomass**

GNWT Accumulative Biomass Capacity by Year



Where We're At

- Integrating Biomass into all new large capital projects.
- Revisiting and optimizing original Installations.
 - Providing thermal storage.
 - Updating control strategies with existing building systems to maximize load and extend seasons.
 - Revisiting and Optimizing heat exchanger sizes
- Looking at adjacent/grouped loads to optimize & extend full load into shoulder seasons for existing and new installations.
- Providing Training opportunities
 - MACA's School of Community Government Biomass Training Course
 - Manufacturers training for specific Wood Pellet Boilers

BIOMASS TRAINING



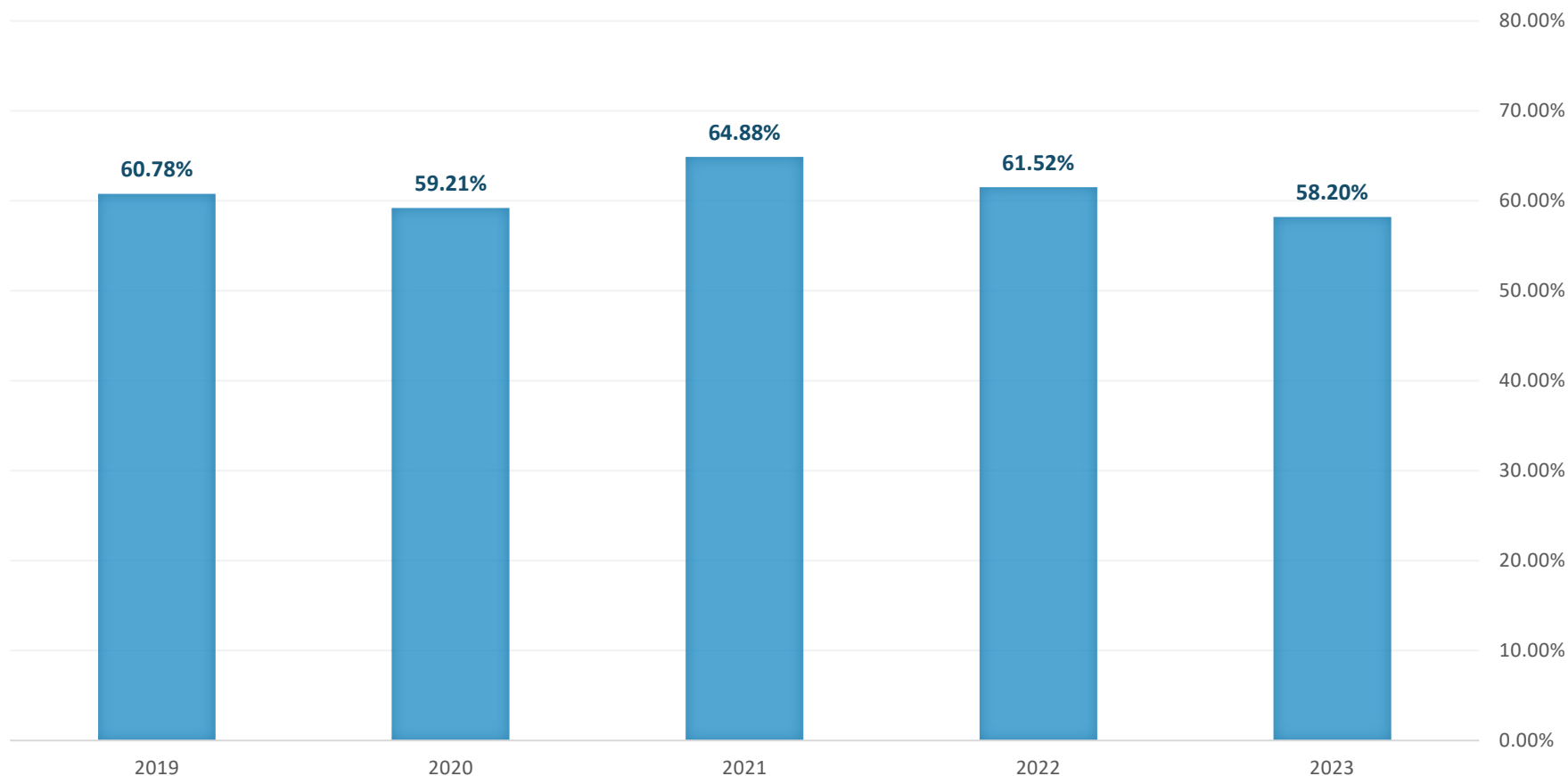
(Hay River Schools District Plant – Thermal Storage)

Performance Monitoring & Analysis

- **Potential Missed Opportunity**
 - Down time is directly related to increased operating cost
 - For a 200 kW system every 24 hrs at peak load is \$360
 - Using \$1.40/L for heating oil and \$300/tonne for pellets
- **Utilization**
 - Percentage of total energy/load provided through biomass
- **Continual monitoring**
 - Regularly assess system performance
 - How can we use the utility data?
 - Operator feedback
 - What can we do to improve system efficiency?
 - Do we need to take another look?

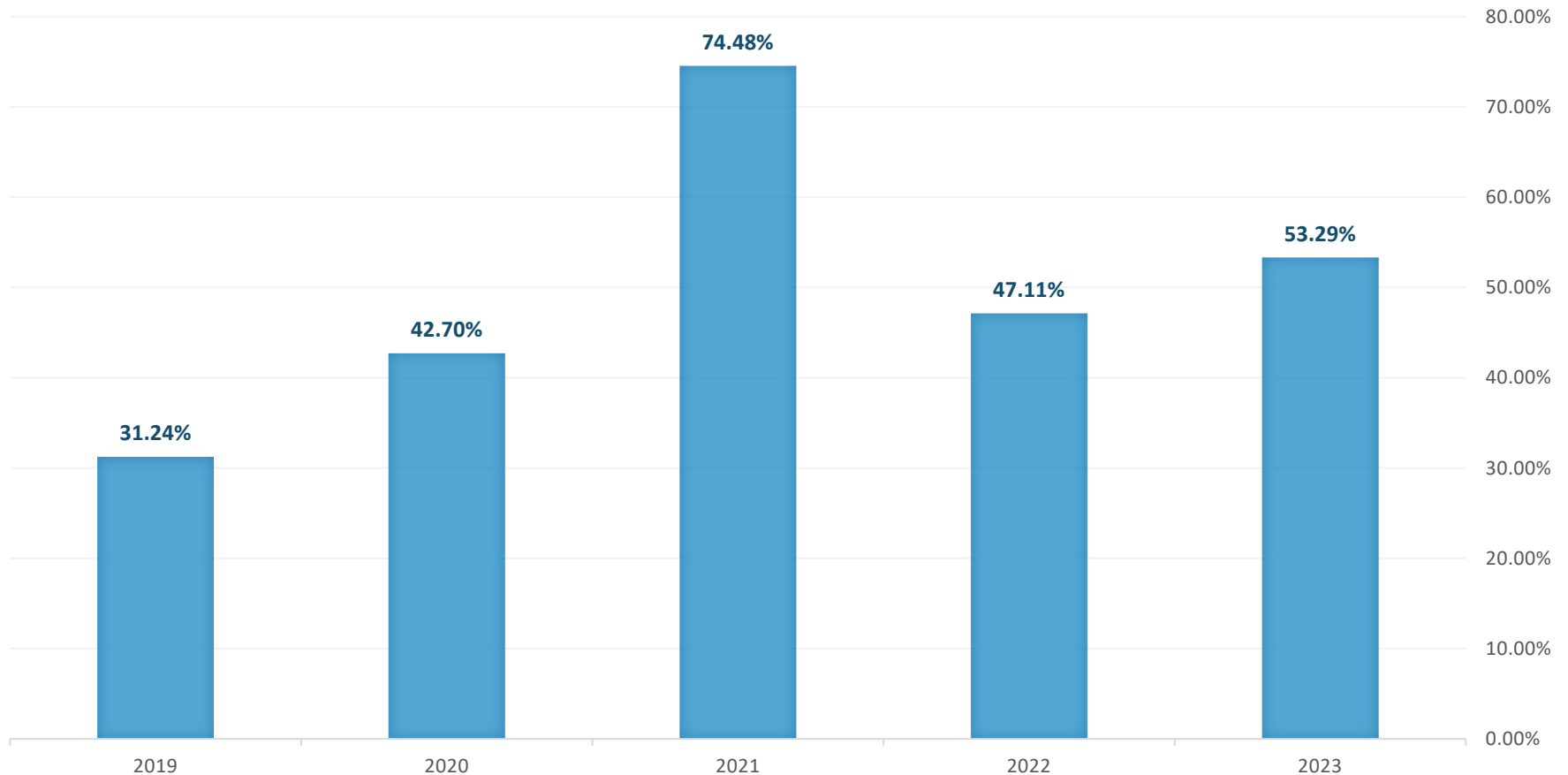
All Assets – Biomass Utilization

ALL GNWT BIOMASS ASSETS UTILIZATION AVERAGE



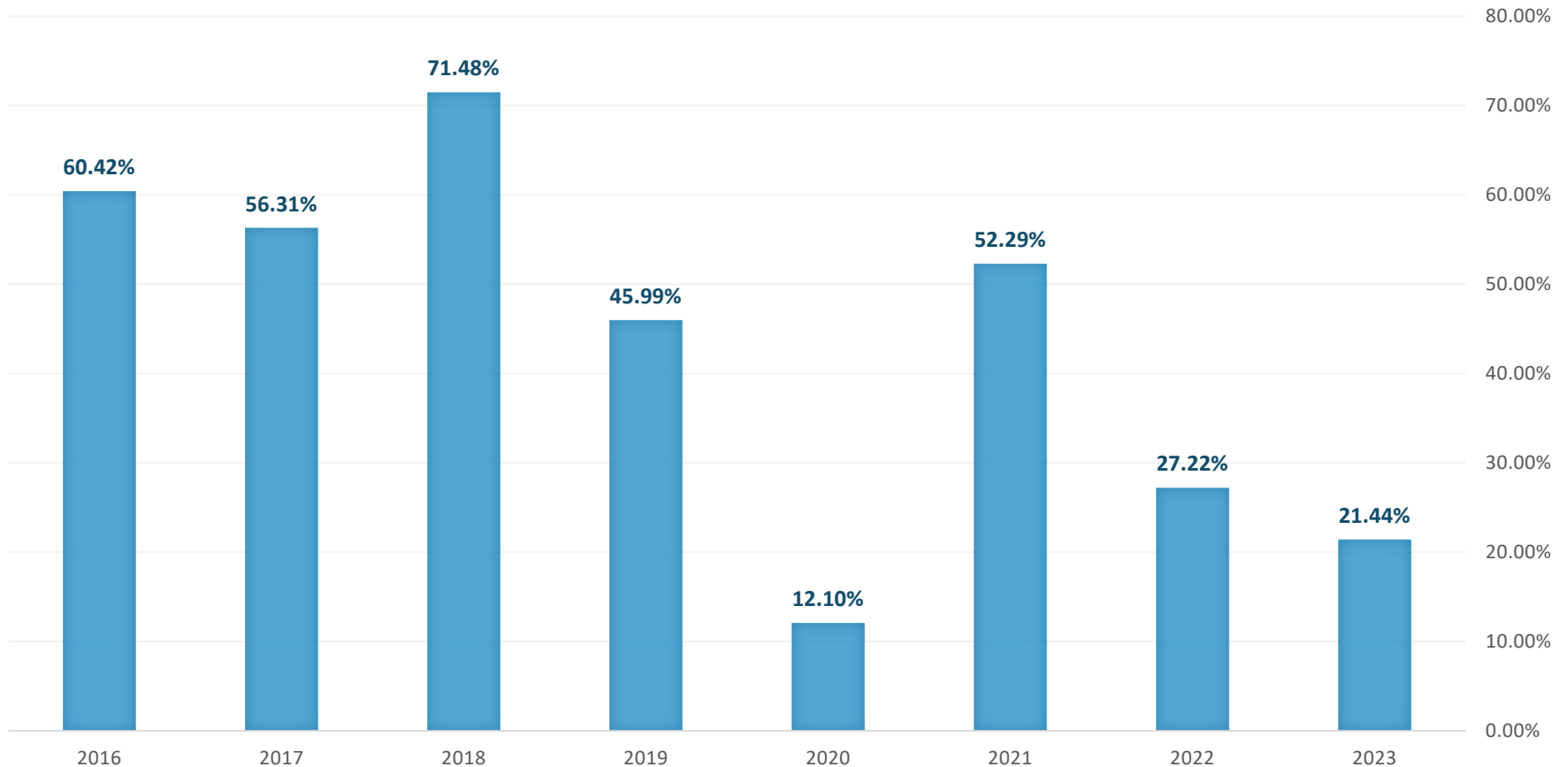
Asset 1 - 5 Year Biomass Utilization

ASSET 1 BIOMASS UTILIZATION
(Normalized for Heating Degree Days)



Asset 2 - 8 Year Biomass Utilization

ASSET 2 BIOMASS UTILIZATION
(Normalized for Heating Degree Days)



Looking Forward (and Farther North)

- As GHG emission reductions have become the focal point of many energy saving initiatives, biomass projects in remote communities are more feasible and though they may not save with respects to fuel costs, they reduce GHG and offset fuel oil use.
- Now that the Inuvik to Tuktoyaktuk highway (ITH) is complete. Pellets can be trucked as far as the Artic Ocean.
- Partnering with private industry to become customers (heat purchase) in privately developed district systems.
- Partnering with other government departments/agencies such as Housing NWT to develop small district systems with adjacent facilities.
- **The GNWT continues its efforts to conserve energy, reduce costs and offset GHGs through the installation of Wood Pellet Boilers.**

Thank you

- To our maintenance staff and operators who keep our boilers running and helping us realize cost savings and GHG reductions!
- To our Regional Project Staff who continue to deliver new Projects under challenging conditions!

Providing Opportunities

- Becoming an anchor load for private Biomass District Systems.
- Providing local capacity to encourage:
 - Private storage and distribution
 - Develop local delivery infrastructure
- Develop local maintenance expertise and parts/sales representation.



The End

QUESTIONS?

Where We're Going

- Building capacity means expanding to remote communities such as:

- The Beaufort Delta

- Beau Del communities experience, on average, 9,715 heating degree days each year.
 - Greatest impacts of climate change
 - Most energy intensive region.
 - Currently over 2MW of installed capacity between the East Three School and The Inuvik Regional Hospital.
 - Aklavik – Moose Kerr School finalizing commissioning February 2023
 - Tuktoyaktuk – Mangilaluk School currently in construction.
 - Tuktoyuktuk – Health Centre and adjacent Seniors Complex in the planning phase
- Tlicho communities in the North slave.
 - Jean Wetrade School in Gameti



Stanton Hospital Biomass

- In May 2019, the new Stanton Territorial Hospital in Yellowknife, NT opened its doors to the public. The 27,500 m² building is primarily heated with wood pellets.
- There are two 1,250 kW KOB Viessman wood pellet boilers combining for a total plant capacity of 2.5 MW, designed to handle 80% of the heating and domestic hot water load.
- It is predicted that the plant will produce 7,000 MWh of heating energy, burn 1,200 tonnes of pellets, and offset 1,500 tonnes of GHG emissions, annually.
- By displacing 1M Litres of propane, the wood pellet boiler will save \$600,000 annually.



Inuvik Hospital Biomass

- A 1,250 kW KOB Viessman wood pellet boiler was installed in the Inuvik Hospital in March 2019, and will burn approximately 1,100 tonnes of wood pellets annually.
- Handling 80% of the heating and domestic hot water load, biomass will displace 22,000 GJ of natural gas, and offset 1,020 tonnes of GHG annually.
- The installation of the boiler cost \$1.5M. With annual savings of \$90K, the project has an 11 year payback.
- Design of the pad for the silo and pellet offloading area required careful consideration to factor in the unique geotechnical conditions associated with a permafrost environment.



Stanton Legacy Biomass

- Two 1,250kW KOB Viessman wood pellets boilers were installed in 2020 during the base building construction of the Stanton Legacy Building in Yellowknife, NT.
- The boilers are installed as part of an auxiliary heating plant adjacent to the main Stanton Legacy Building. House both the Biomass and Fuel Oil Boilers. This allows for ease of operations and maintenance. It also reduced maintenance cost due to not having the facility staffed 24/7.
- At full occupied building load, the biomass plant will capture 80% of the annual heating consumption, offsetting fossil fuel requirements of 820,000 Litres of propane and 22,300 Litres of fuel oil annually.
- These fossil fuel displacements will result in savings of \$232,000 and offset 1,300 Tonnes of GHG, annually.
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