



McNeil Technologies

Red Lake Band of Chippewa Indians:
Biomass Energy Feasibility Study Update
Presented to DOE Tribal Energy Program

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October 19, 2004



Presentation Outline

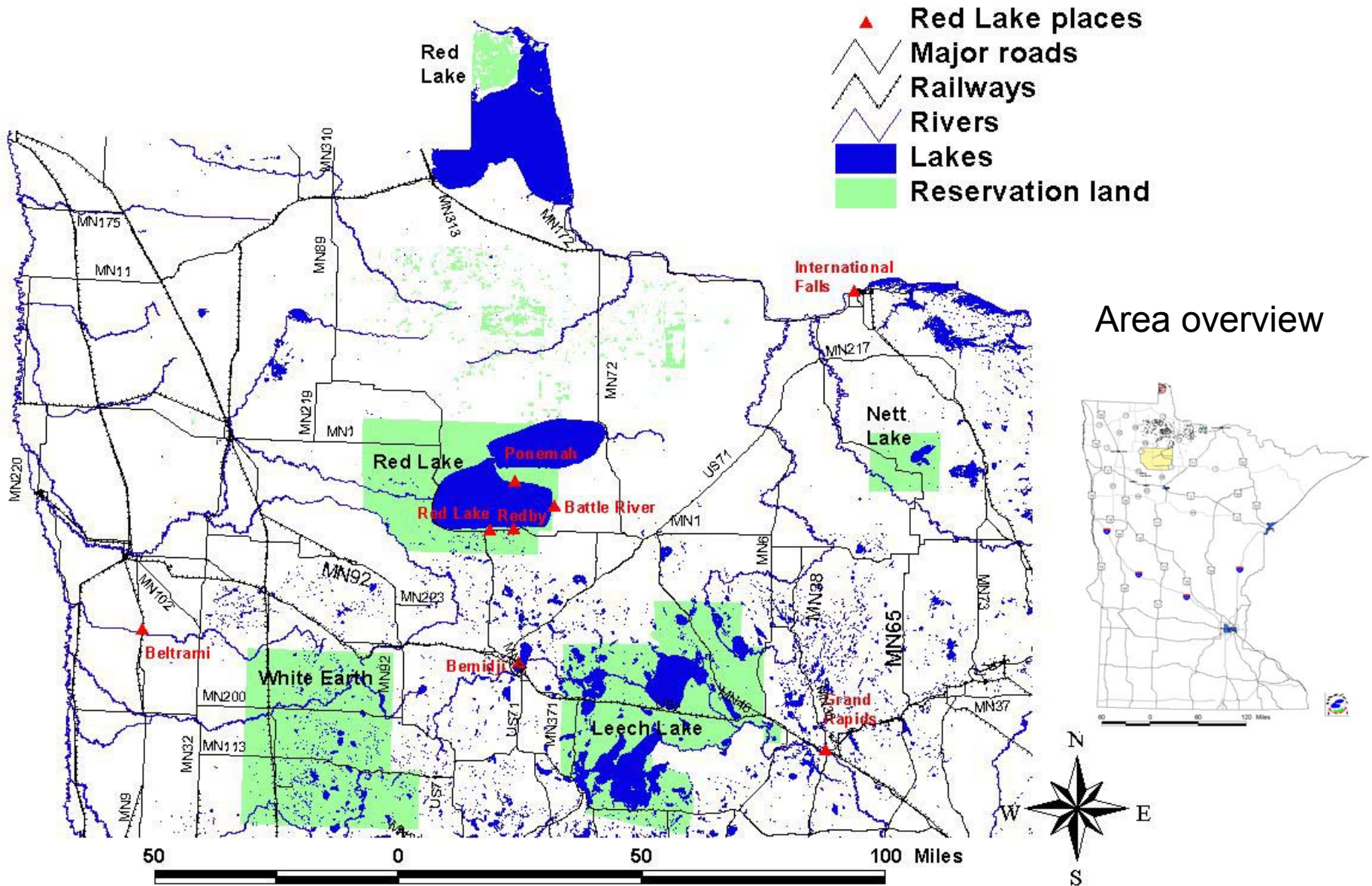
- Project overview
- Resource assessment
- Assess on-site electric and thermal applications
- Assess local/regional utility market
- Economic analysis
- Alternative products



Project Overview

- Evaluate and determine potential options for creating value-added products from the Tribe's underutilized biomass resources
- Energy is primary focus
- Also looking at alternative products:
 - Liquid fuels
 - Pellets
 - Specialty wood products
 - Animal bedding
 - Others
- Work will be complete by the end of this year

Project Study Area



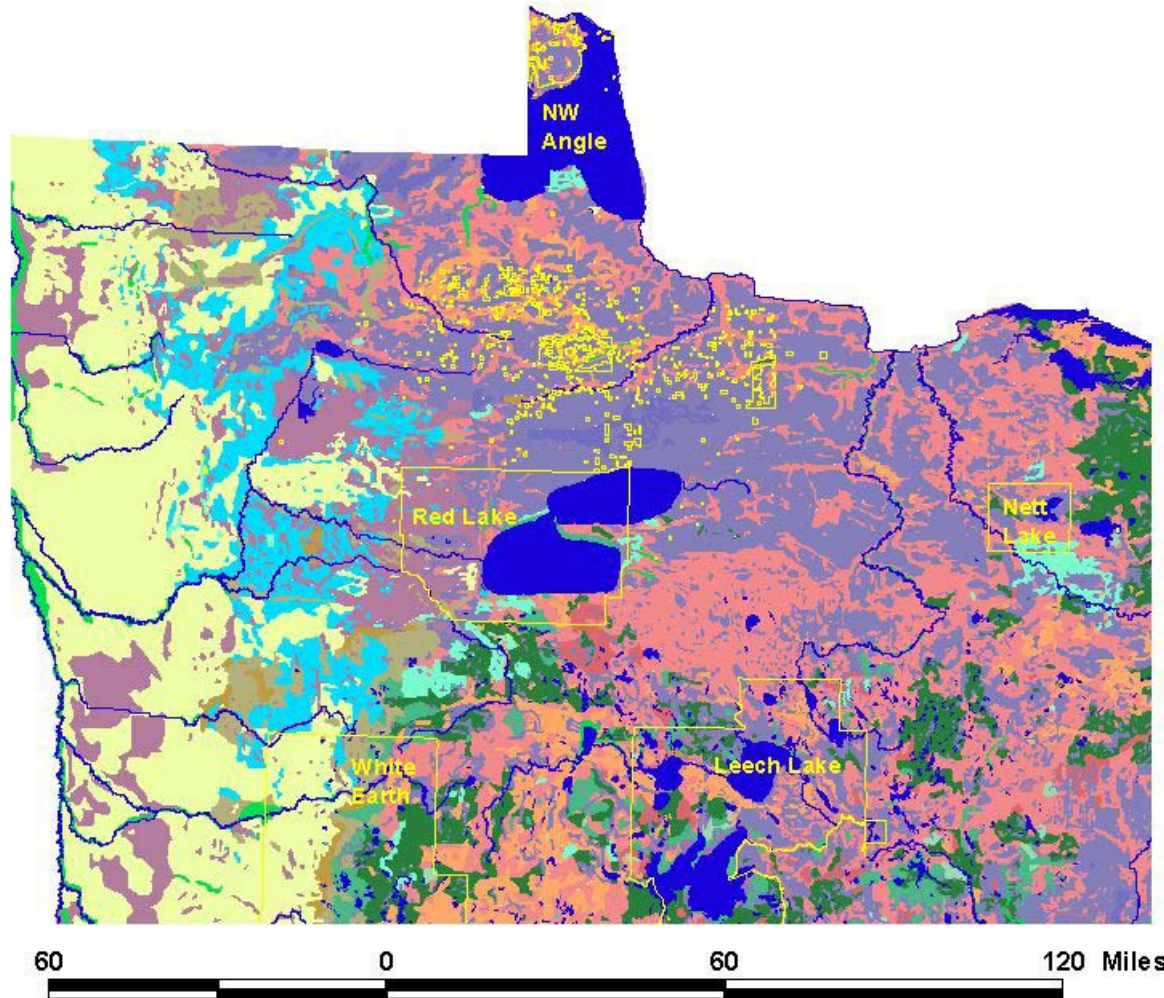


Biomass Resource Assessment Approach

- Quantify potential sources of biomass (primarily forest)
- Determine biomass availability
- Transportation infrastructure and costs
- Develop supply curves

Forest Cover

- Reservation land
- Rivers
- Vegetation type
 - Aspen-Birch (trend to Conif.)
 - Aspen-Birch (trend to hardwoods)
 - Aspen-Oak Land
 - Big Woods - Hardwoods
 - Brush Prairie
 - Conifer Bogs and Swamps
 - Jack Pine Barrens
 - Lakes (open water)
 - Hardwood/Pine
 - White/Red Pine
 - Oak Openings, Barrens
 - Open Muskeg
 - Pine Flats
 - Prairie
 - River Bottom Forest
 - Undefined
 - Wet Prairie
 - White Pine



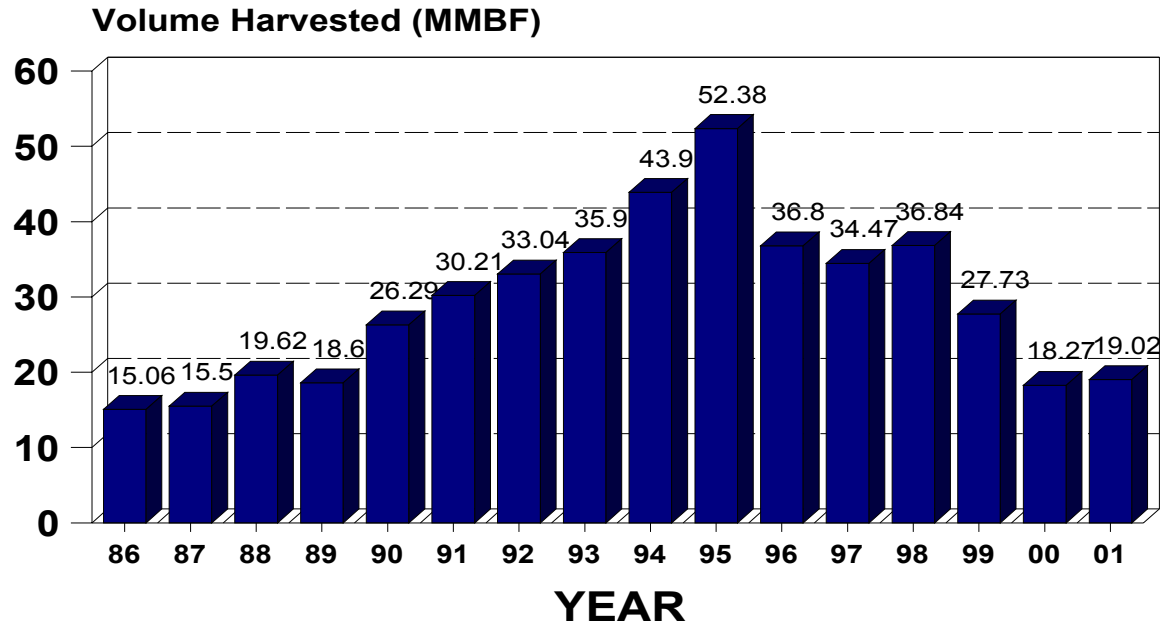
Forest Acreage and Annual Allowable Cut (AAC) by Type

Cover type	Acreage	Annual allowable cut (cords)
Reservation land		
Aspen/birch	98,710	36,625
Red & White pine	10,364	3,253
Swamp Conifer	66,630	11,274
Swamp Hardwood	50,836	9,875
Upland Hardwood	33,561	1,698
Total Forested Acres	260,101	62,725
Non-productive Acres	158,925	
Water	230,000	
Total Diminished Reservation Acres	649,026	62,725
Ceded land and Northwest Angle land		
Forested Acres	83,354	17,727
Non-productive Acres	72,713	
Total Ceded and Northwest Angle land	156,067	17,727
Total Tribal forest land	343,455	80,452
Total Tribal land	805,093	80,452

Acreage based on Operations Inventory (OPINV) data and AAC based on Continuous Forest Inventory (CFI) plot data from BIA.

Management History

CUTTING HISTORY RED LAKE RESERVATION



■ Volume Harvested

From Annual Forestry Reports

- Much of pine forest destroyed through fires and illegal logging in 20th century
- Regeneration primarily in Aspen type the current commercial harvest species
- In 1980s Aspen harvest increased as OSB plants expanded operations
- Timber harvest less than AAC historically
- Even-aged management is predominant though all-aged used in hardwoods

Wood Markets for Red Lake Band of Chippewa

Species	Company	Location	Products
Aspen	Ainsworth	Bemidji	Sawlogs for studs and OSB (pine)
	Northwoods Panelboard	Bemidji	Panels
	Boise Cascade	International Falls	Pulp
	Blandin Papermill	Grand Rapids	Pulp
	Champion International	Sartell	Sawlogs
	StoraEnso	Duluth	Pulp
Red and White pine	Ainsworth	Bemidji	Sawlogs for studs
	Sappi	Cloquet	Pulp
Paper birch, red maple, burr oak	Residential use	NA	Firewood (35,000 to 40,000 cords/year)
Northern White Cedar	TRIBAL RESOLUTION AGAINST CUTTING		

Note: 80% goes to Ainsworth



Resource Assessment Summary and Next Steps

- ~ 78,000 green tons unmerchantable biomass/year generated from forestry operations on reservation,
 - More will be generated when Tribe begins converting 1,000 acres/year to White Pine
- Could generate 3-5 MW
- Firewood delivered to Red Lake nursery for \$50 cord (~\$50/bdt) uncut in 8 foot lengths
- Biomass costs will be in the \$10-\$20/GT (\$20-\$40/bdt) from good lands
- Next steps
 - Develop supply curves showing cost and quantity of biomass



Demand (Energy Load Analysis)

- No large industrial facilities on the Reservation
- Sawmill shut down
- Entire Reservation load ~ 5 MW
- Electricity
 - Difficult economics
 - Requires capital, expertise, institutional arrangements
- Thermal
 - In many places, economics are often favorable
- CHP often favorable



Beltrami
Electric
Coop.

- Local utility provider
- Adversarial relationship with Tribe
- Commercial rate ~ \$0.06/kWh
- Residential avg. \$0.062/kWh
 - Regional residential avg. \$0.065/kWh
 - Beltrami ~5% lower
- National residential rate average \$0.084/kWh
 - Beltrami ~26% lower



Minnkota and MNPA IRP, 2002-2006

- Beltrami Electric Co-op purchases through Minnkota
- Primary source is Milton R. Young Unit #1 & 2 (250 MW and 455 MW coal) (Center, ND)
- Two-year agreement with Potlatch for biomass power
- Winter peaking
- Very low avoided costs



Minkota IRP Highlights

- 2.2% forecast for annual growth
- Interruptible load important
- Will exercise Square Butte options in 2006-2009 to meet demand. Provides 95MW of baseload by 2009.
- DSM provides 340MW of control
- Next supply side option is peaking or firm hydro from Manitoba Hydro



MN Biomass Experience

- Operational
 - 368 MW (almost all at wood products companies)
- Potlatch OSB, Bemidji
 - 12.5 MW, sell power to Otter Tail
 - “free” fuel
- Planned
 - Fibrominn, 50MW, turkey litter
 - ~100MW to fulfill Xcel mandate
- Biomass legislative mandate
 - Closed loop provision
 - Difficult to address, (Itasca Power trying to build 15 MW plant for years)
 - 6 year window to allow for closed loop
 - Year 2000 “closure”

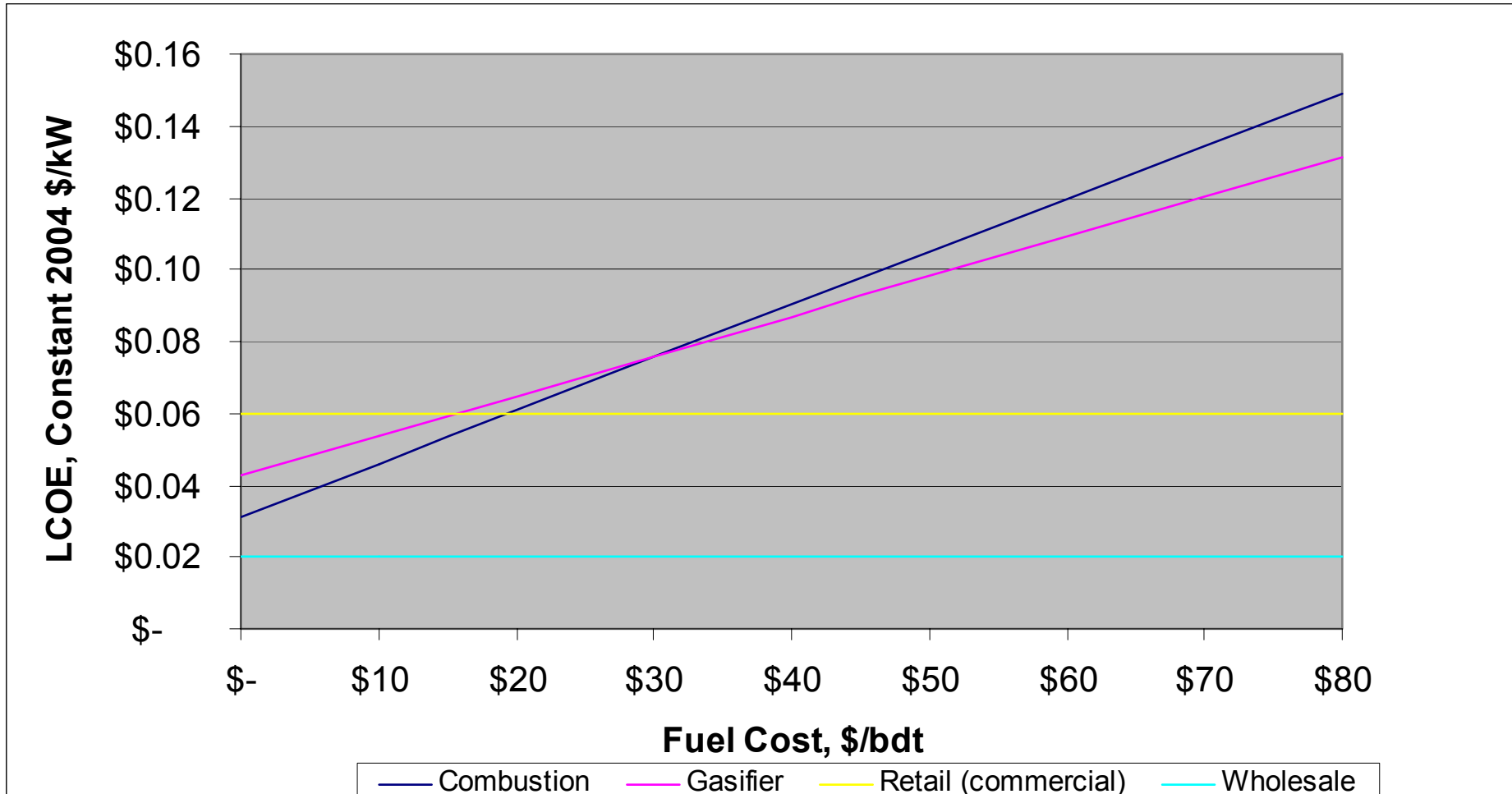


Minkota Biopower Summary

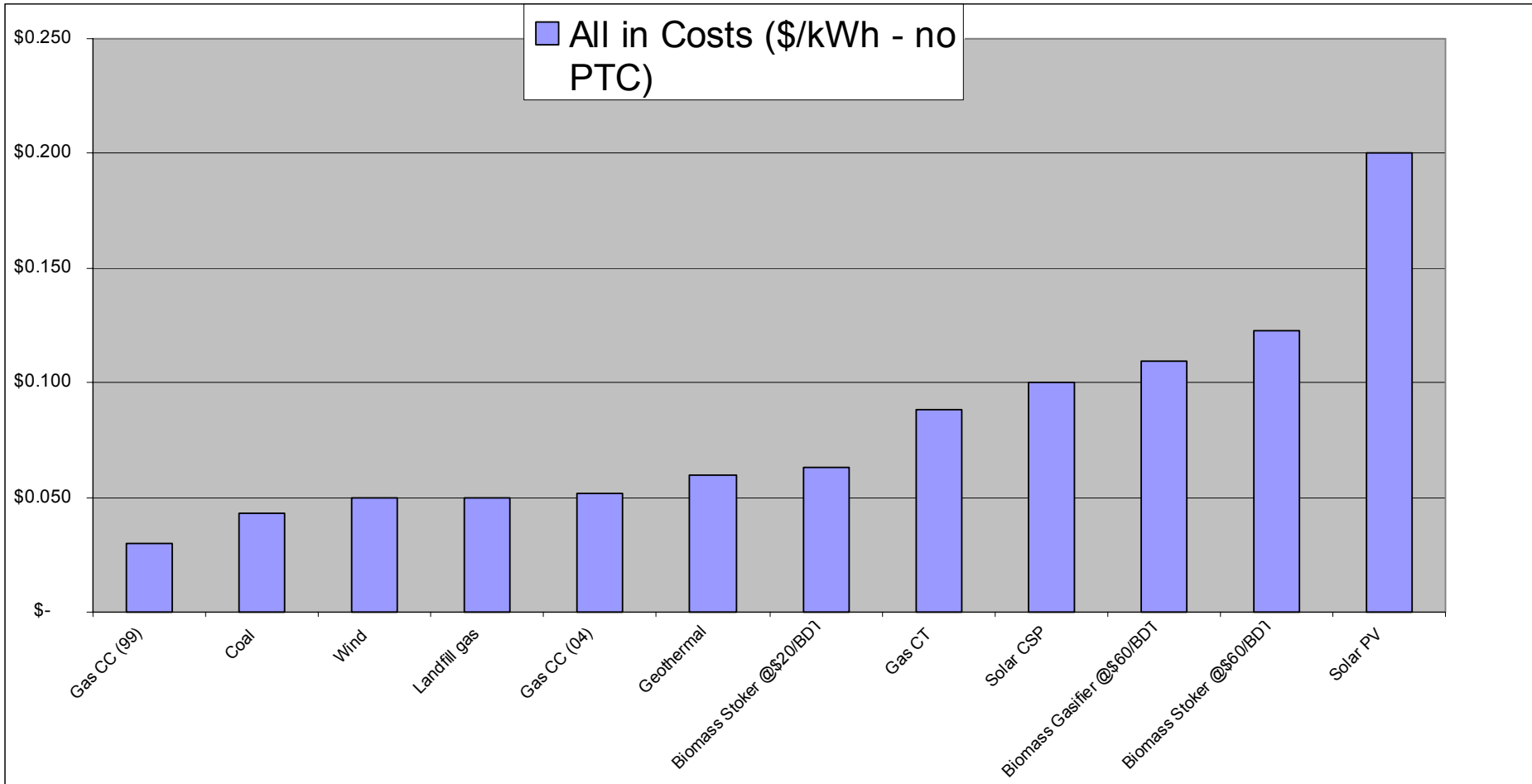
- Buy back rate for QF, ~\$0.02/kWh
- Capacity payment, ~\$25/kW-yr.
- IRP's don't mention biomass
- Legislative mandate toothless at this point

Economic Analysis of Power Generation

(Stoker=5MW; Gasifier= 3MW Net)



Comparative Costs of Electric Generation



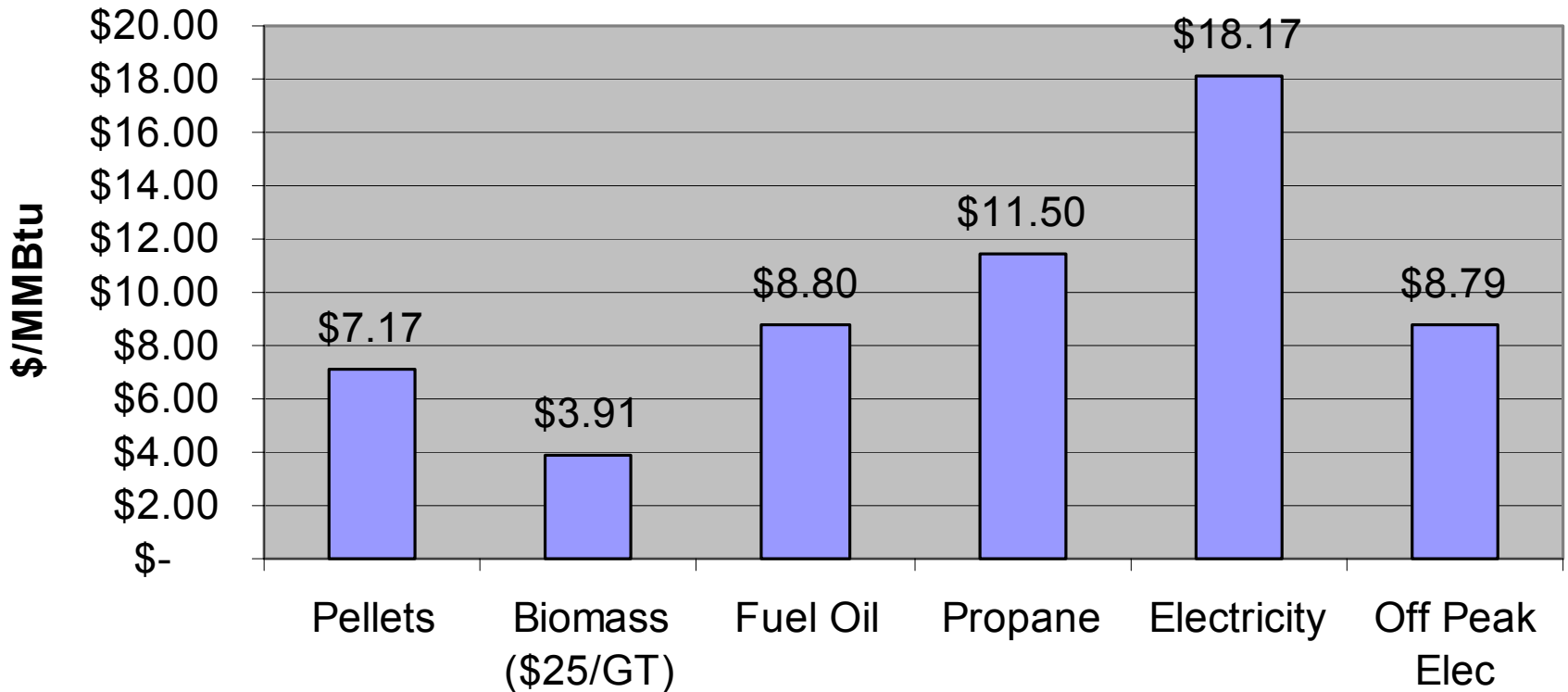


Red Lake Facility Heating Analysis

- Both retrofit and new opportunities
- Technology is efficient and environmentally friendly
- Need to assess
 - Competing fuel costs
 - Thermal loads (seasonality)
 - Existing equipment
- Still looking at economics based on recent increase in oil prices

Local Comparative Fuel Costs

Cost of Local Heating Fuels



Note: Pellets = \$86/ton delivered; Oil = \$.95/gal; Propane = \$.79/gal; Electric = \$0.062/kWh; Off peak electric = \$.03/kWh



Major Thermal Loads

- Evaluated all major buildings (schools, prison, administration, casino, meeting hall)
- Each building has challenges, including:
 - New facility and/or heating equipment, principally propane or fuel oil
 - Poor prior experience with cubed garbage
 - Competitive prices for propane and fuel oil
- No existing building has yet emerged as a strong candidate
- **BUT.....Proposed tree seedling greenhouse is an ideal candidate**
 - Not slated to be built until 2007



High School Example

- Initially a good candidate
 - Large load
 - Hydronic system
 - Central facility
 - Plenty of space
- However,
 - Prior unsatisfactory experience with biomass = major resistance from maintenance staff
 - Almost new equipment and low propane prices make payback period fairly long
 - Energy efficiency measures have been successfully implemented
- Conclusion
 - HS is not a strong candidate absent rapid and prolonged increase in propane prices



Energy Summary

- Biopower is not presently competitive
 - Low cost existing producers
 - Regulatory landscape not favorable
 - Relatively high fuel costs
- Thermal applications
 - Focus on new installations (e.g. new tree seedling greenhouse)
 - Still running the numbers on the hospital and a few other buildings given oil price increase



Other Products

- Bio-Oil
 - Emerging market
 - MN uses large quantities of fuel oil, as does Tribe
 - Applications not well defined as yet, primarily due to regulatory concerns and some technological considerations
 - Warrants a further look
- Pellets
 - Substantial overcapacity relative to demand in the industry
 - Would need to develop local markets for high ash pellet
- Animal bedding material
 - Potential candidate for utilization of Red Lake small diameter material
 - MN leading turkey producer



Shavings

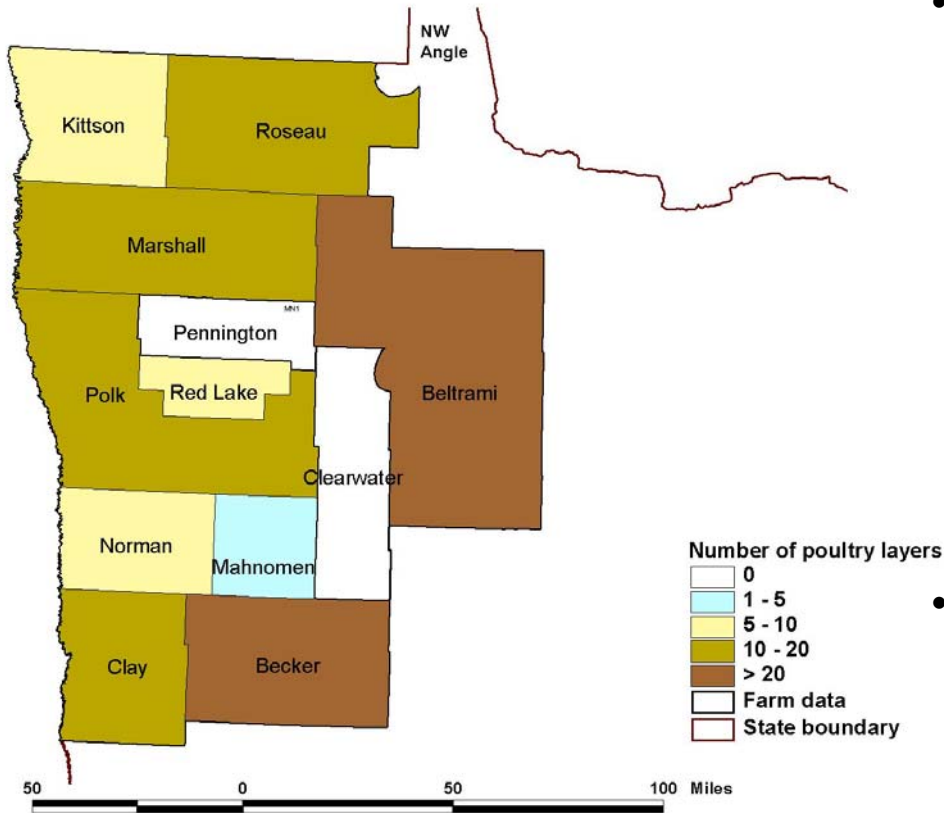
- Product = wood shavings from low value biomass materials
- Possible constraint based on quality of the material
- Animal bedding for
 - Livestock
 - Laboratory animals
 - Small pets



Other Products

- Ground cover at fairgrounds, circuses, rodeos, race tracks, livestock shows, etc.
- Compost, soil conditioner, mulch
- Fireplace logs
- Molded products (composites)
- “Green” packing material (meats, fruit, gifts, etc.)

Animal Bedding Markets



- Animal bedding is another potential biomass outlet
 - 222 poultry farms w/ 4,262 layers
 - 91 broiler farms w/ 3,038 broilers
 - 76 turkey farms w/ 659,383 turkeys
 - 354 dairy farms w/ 28,448 head
 - 1,428 horse farms w/ 8,917
- Higher end bedding markets for pets and laboratories could be more profitable



Substitutes (Competition)

- Shavings from urban wood waste
- Shavings from sawmills
- Sawdust (bedding)
- Newsprint, paper waste (bedding)
- Straw (packing, bedding)
- Styrofoam (packing)



Summary

- Biopower is not feasible at this time
- Explore heating the future (2007) seedling greenhouse with wood
 - We will begin preliminary assessment pending available design data
- Final look at additional heating opportunities
- Explore other products/markets until we find something with potential
 - Shavings
 - Bio-oil
 - thermal?
 - Co-fire with coal at utility boilers?



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