White Earth Nation Biomass Feasibility Study

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White Earth Nation

Presentation Overview

- Study Objectives
- Accomplishments to Date
- Initial Findings
- Observations
- Plans Forward

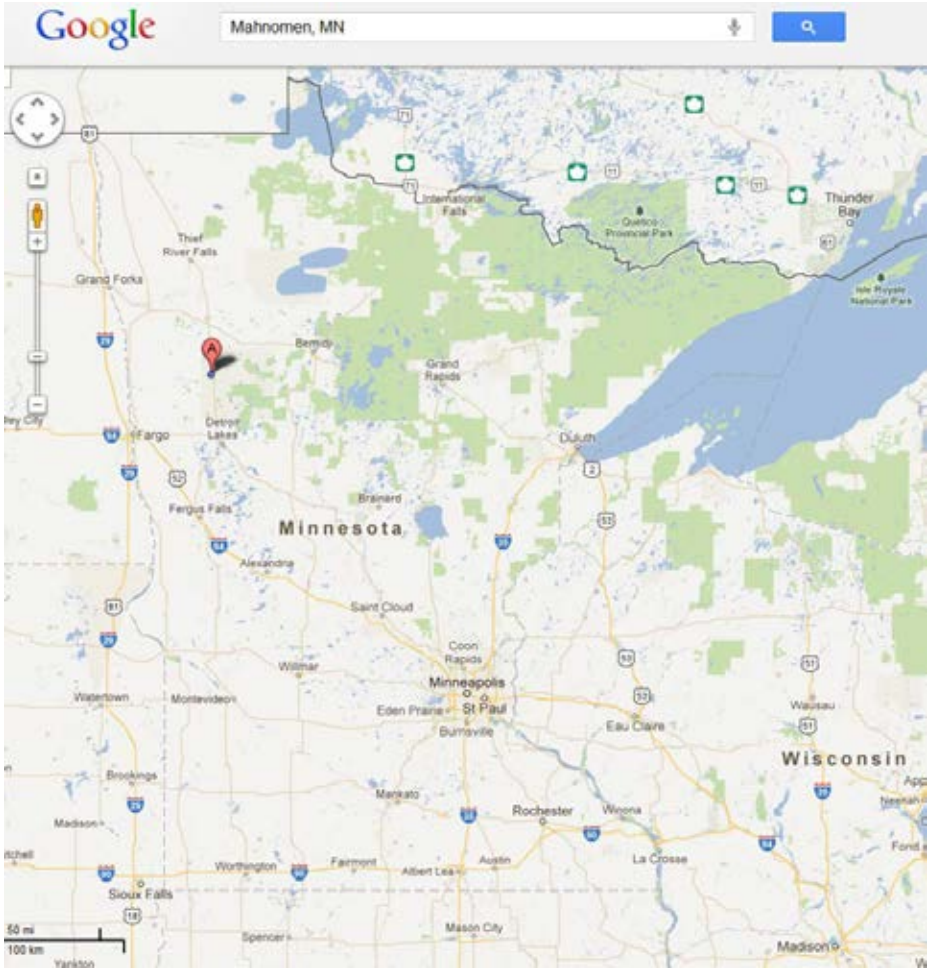
Study Objectives

- Primary Objectives:
  - Conduct a due diligence grade feasibility study to assess the opportunity to convert existing thermal and power systems at the Shooting Star Casino to a sustainable bioenergy system.

- Background
  - The Casino is utilizing fuel oil and propane fired boilers as primary source of thermal energy. Electricity is provided by the local public utility district (Otter Tail Power).

- Implementation Schedule:
  - Start – May 2012
  - Issue Final Report – September 2013

Shooting Star Casino Mahnomen, Minnesota



Shooting Star Casino Aerial View

Study Overview

Key Tasks:

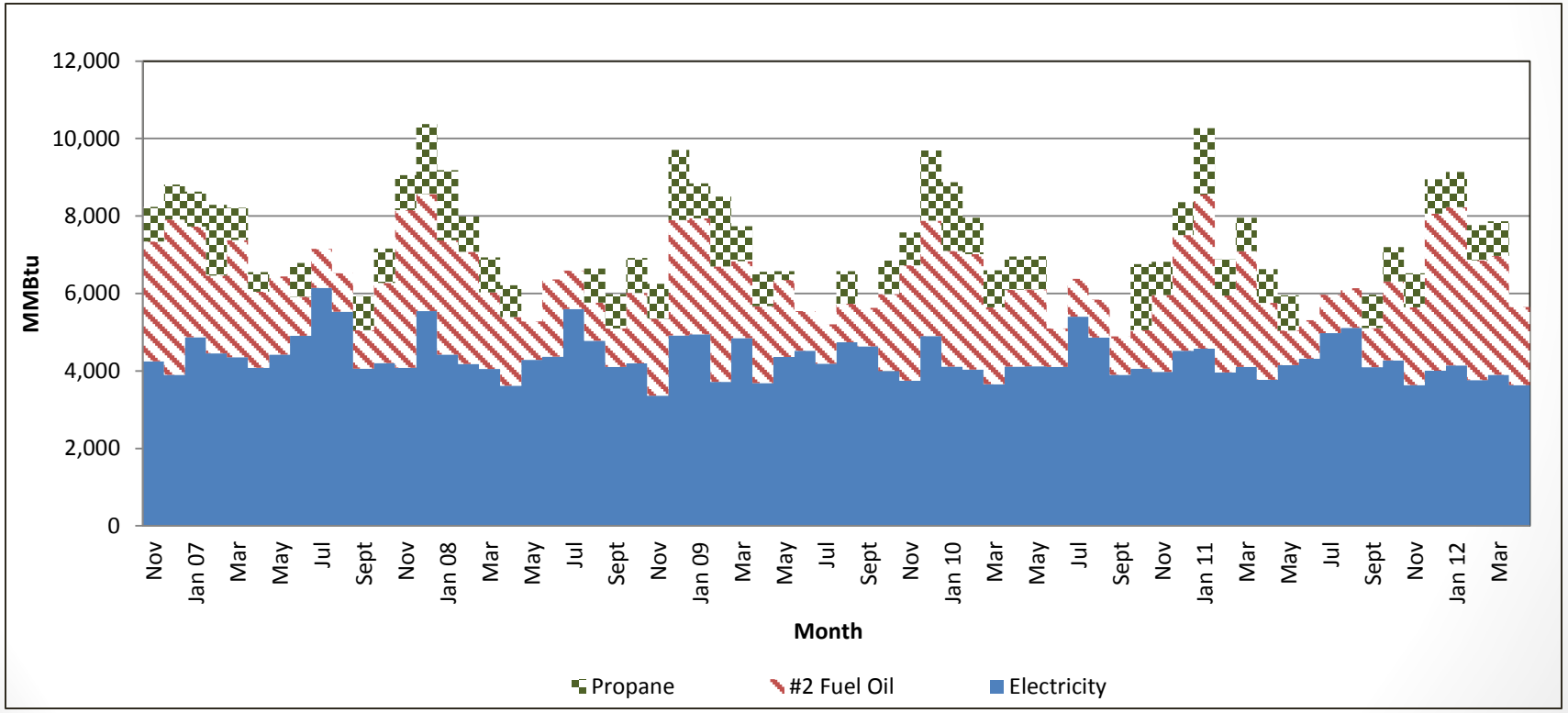
- Energy Load Assessment
- Feedstock Availability and Cost Assessment
- Conversion Technology Review and Selection
- Preliminary System Design
- Capital, Installation and O&M Costs
- Environmental Permit Review
- Energy Sales and Marketing
- Economic Feasibility Analysis
- Environmental Benefit Analysis
- Tribal Benefit Analysis
- Training and Professional Development
- Final Report

Shooting Star Casino
Fuel Oil Boiler System

Shooting Star Casino Event Center Propane Boiler System

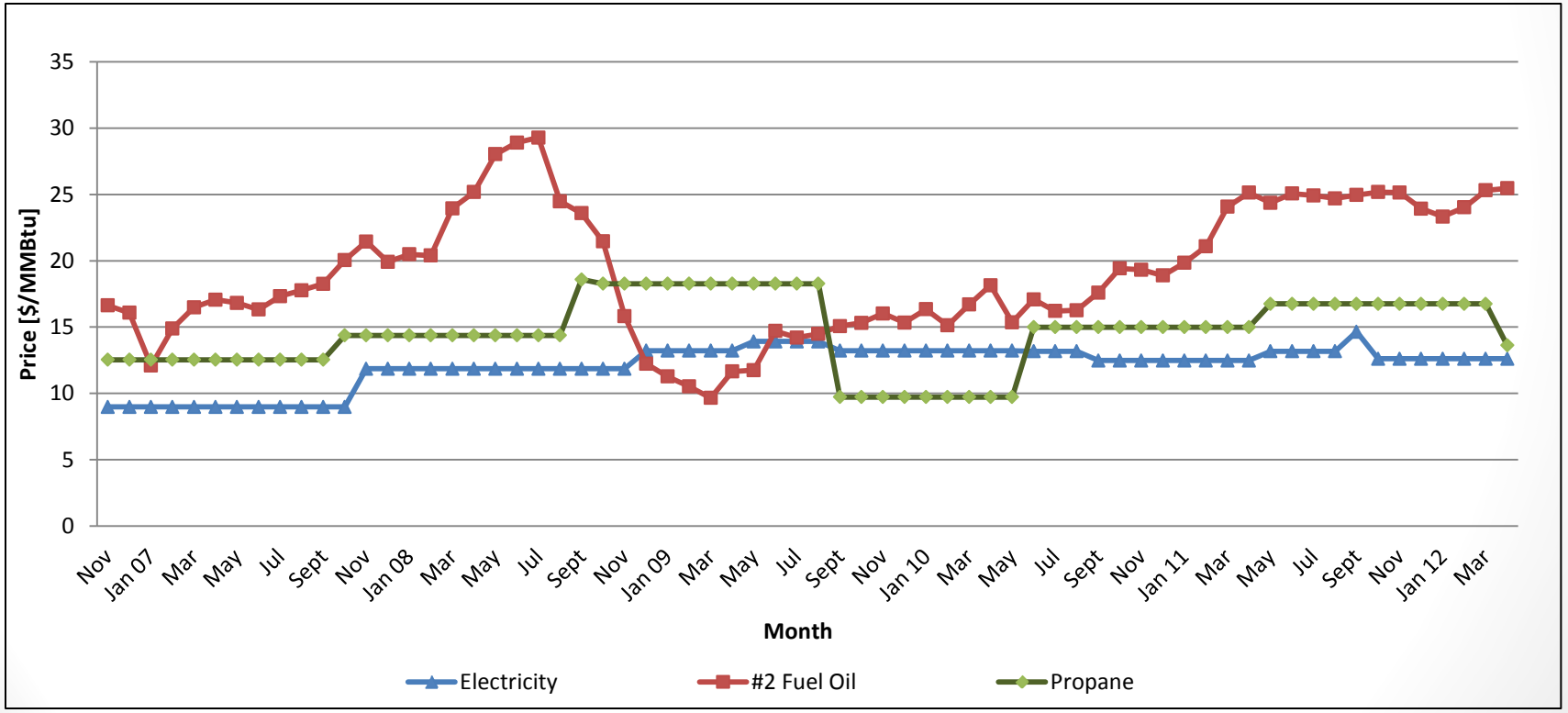
Energy Load Assessment Key Findings – Part I

Historic Energy Consumption



Energy Load Assessment Key Findings – Part II

Historic Energy Prices



Energy Load Assessment Key Findings – Part III

Cost of Energy

ENERGY SOURCE	CURRENT PRICE	CURRENT PRICE ($/MMBtu)	5-YEAR AVERAGE ($/MMBtu)
Fuel Oil	$3.510/gal	$25.34	$19.21
Electricity	$0.04304/kWh	$12.61	$12.09
Propane	$1.260/gal	$13.62	$14.64

Energy Sales and Marketing

Key Findings:

- Minnesota has a Renewable Energy Standard:
  - Enacted February 2007
  - Electric utilities serving customers in Minnesota are held to the RES:
    - Electric Utilities without nuclear power generation – 25% renewable generation by 2025
    - Electric Utilities with nuclear power generation – 30% renewable generation by 2025
- Due to significant market response from wind power generation systems located in North Dakota, renewable power is currently priced very low:

DESCRIPTION	CAPACITY PAYMENT (ON-PEAK ONLY)	ENERGY CREDIT ON-PEAK	ENERGY CREDIT OFF-PEAK
Summer (Firm Power and Non-Firm Power)	0.275¢ per kWh	3.699¢ per kWh	2.536¢ per kWh
Winter (Firm Power and Non-Firm Power)	0.275¢ per kWh	4.311¢ per kWh	2.433¢ per kWh

Conclusion – Opportunities to sell renewable power from a biomass combined heat and power system are very limited. Best to focus on thermal only system.

Feedstock Availability and Cost Assessment Key Findings – Part I

Feedstock Availability

FEEDSTOCK TYPE	POTENTIALLY AVAILABLE FEEDSTOCK (GT)	PRACTICALLY AVAILABLE FEEDSTOCK (GT)
Corn Stover	229,792	63,193
Wheat Straw	264,900	72,848
Sugar Beet Tailings	23,000	46,000
Animal Waste	186,674	18,667
Food Waste	590	1,600
Forest Operations	66,625	34,640
Forest Product Manufacturing	14,000	14,000
Urban Wood Waste	21,329	2,000
TOTALS	**806,910**	**252,948**

Feedstock Availability and Cost Assessment Key Findings – Part II

Feedstock Pricing

FEEDSTOCK TYPE	ESTIMATED PRICE RANGE ($/GT)	
	LOW RANGE	HIGH RANGE
Corn Stover	$55.00	$75.00
Wheat Straw	$50.00	$70.00
Sugar Beet Tailings	$15.00	$22.00
Animal Waste	$14.00	$24.00
Food Waste	$14.00	$85.00
Forest Operations	$23.00	$55.00
Forest Product Manufacturing	$20.00	$28.00
Urban Wood Waste	$20.00	$28.00

Feedstock Availability and Cost Assessment Key Findings – Part III

Woody Biomass Feedstock Pricing Forecast
(Assumes primary Feedstock is a blend of forest operations and sawmill byproducts)

FEEDSTOCK PRICE SCENARIO	2013	2014	2015	2016	2017
Best Case $/GT	$33.90	$33.90	$33.90	$34.58	$35.27
Worst Case $/GT	$37.90	$39.23	$40.60	$42.02	$40.06

Conversion Technology Review and Selection

Key Findings:

- Optimized technology is conventional biomass combustion system
  - Considered:
    - Anaerobic digestion
    - Gasification
- Primary feedstock is a blend of sawmill residuals and forest operations generated woody biomass
  - Compelling feedstock attributes considered:
    - Feedstock quality – Btu/pound, ash content
    - Pricing - $/GT delivered to Mahnomen
    - Availability year round

Conversion Technology Review and Selection

Several vendors are currently being considered for the request for proposal process, including although not limited to:

Solagen

Hurst

Economic Feasibility Analysis

Initial Findings:

- Attractive Payback compared with alternative fuel sources

Simple Payback (years)						
	Costs	Existing Boiler (Assumes these Boilers are already installed and operating)				
	Annual Fuel Expense	All #2 Fuel Oil	All Propane	Fuel Oil & Propane	All Natural Gas	Electricity
Annual Fuel Expense	-	$960,335.50	$522,126.62	$785,051.95	$351,616.55	$394,647.46
High Range Wood Feedstock	$264,812.58	1.44	3.89	1.92	11.52	7.70
Low Range Wood Feedstock	$85,081.59	1.14	2.29	1.43	3.75	3.23

- Note: While the Shooting Star Casino does not have a Natural Gas or Electric Boiler, the Simple Payback Chart reviews the hypothetical situation that these boiler options are already installed and operating at the Casino.
- Note: The Fuel Oil & Propane column represents the Casino's current state of operations.

Economic Feasibility Analysis

Initial Findings:

- Simplified

Simple Payback (years)		
	Annual Fuel Expense	Fuel Oil & Propane
Annual Fuel Expense	-	$785,051.95
High Range Wood Feedstock	$264,812.58	1.92
Low Range Wood Feedstock	$85,081.59	1.43

- **Current analysis is showing that a wood fired biomass boiler will pay for itself in about a year and a half with ongoing savings of..... (drum roll) over $500,000 annually!**

Study Overview

Key Tasks:

- Energy Load Assessment - Complete
- Feedstock Availability and Cost Assessment - Complete
- Conversion Technology Review and Selection – Underway
- Preliminary System Design - Underway
- Capital, Installation and O&M Costs - Underway
- Environmental Permit Review - Underway
- Energy Sales and Marketing - Complete
- Economic Feasibility Analysis - Underway
- Environmental Benefit Analysis- Upcoming
- Tribal Benefit Analysis- Upcoming
- Training and Professional Development- Upcoming
- Final Report- Upcoming

Questions?

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