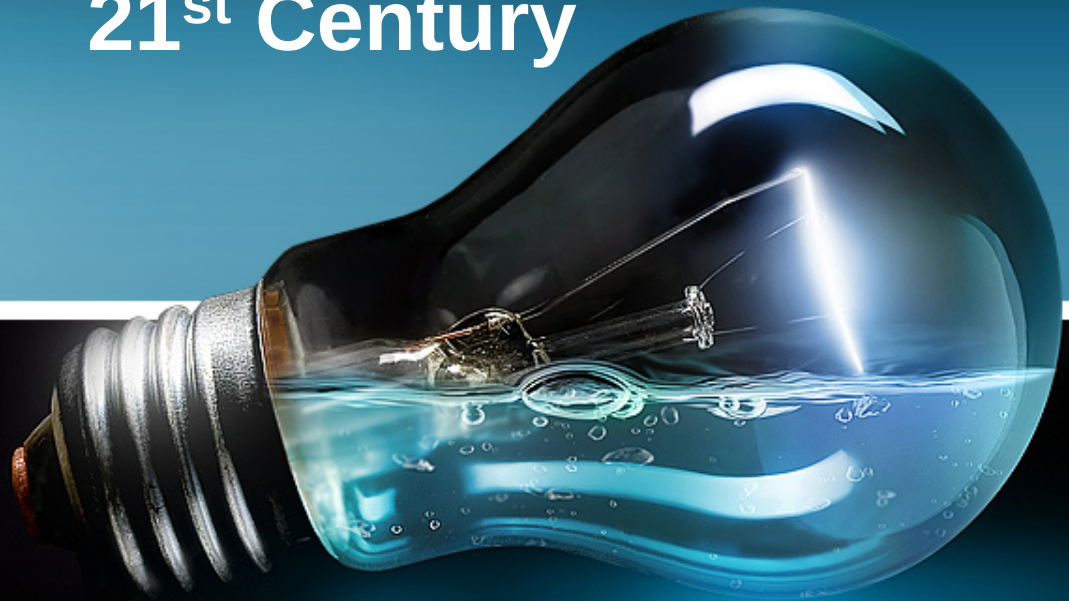


Minnesota Power Renewable Energy (& Engineering) for the 21st Century





The Prairie River Project



➤ Some background info...

– about me

- ✓ Attended UMD – EE (2000 grad)
- ✓ Started with MP as intern supporting hydro and steam
- ✓ Control systems my interest and study focus
- ✓ Worked for MP more than 15 yrs now – job responsibilities include Electrical Engineering, Project Management and Student Outreach
- ✓ Today's topics – Hydro Engineering & Electricity









Minnesota Power - Hydro System Overview

- 11 Hydro Stations, 34 turbine-generator sets
- 16 Reservoirs
- St. Louis, Kawishiwi, Mississippi River Watersheds
- 120 MW
- 560,000 MWh Avg. Annual Production
- MP Hydro = Largest Hydro Producer in State
- Hydro = 7-8% of MP Generation

Hydroelectric System

Winton

Kawishiwi River

Prairie River
St. Louis River

Mississippi River

Crow Wing River

Cloquet River

Whiteface River

Fond du Lac

Thomson

Scanlon

Knife Falls

Sylvan

Little Falls

Blanchard

Pillager

Rising from the Ashes: Redeveloping the Prairie River Project





The Prairie River Project



- A little project background...
 - Prairie River Hydro
 - Built in 1920 by Blandin Paper Company
 - Total capacity 1084 kW
 - Operator's residence – upper level



- MP Purchased in 1982
- Partially automated – run from Thomson Hydro
- Routine maintenance until 2008 when...

Minnesota Power - Prairie River Hydro
July 26th, 2004



The Prairie River Project



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- MP Purchased in 1982
- Partially automated – run from Thomson Hydro
- Routine maintenance until 2008 when...
- Fire destroyed the powerhouse



The Prairie River Project – Rebuild Study



- Original Project Background –
 - Selected HDR Engineering
 - Study included 4 Options
 - Option 1 – Rebuild “like-kind” no T1 work
 - Only for insurance settlement negotiation
 - Option 2 – Rebuild same generation, least cost structure & crane including T1 overhaul
 - Additional generation with turbine efficiency improvements, approximately 10% more MWh
 - Option 3 – Rebuild at most efficient generation for watershed
 - Not practical – licensing, reconstruction, lower generation
 - Option 4 – Decommission/Sell
 - Non-rate base, shareholder responsibility, negative public relations



The Prairie River Project – Rebuild Study



- Recommendation and Decision -
 - Rebuild the facility
 - “Least cost” powerhouse with overhead crane
 - Improved Safe Work Practices
 - Overhaul Turbine 1
 - Arc Flash Compliance
 - Modern Equipment/Automation/PDM/Reliability
 - Security Enhancements
 - Benefits
 - Increased renewable generation over “as was” condition
 - Positive impact on shareholders, ratepayers maintain renewable energy diversity
 - Lower ongoing operational costs
 - Positive public relations
 - Local Construction jobs



The Prairie River Project – Powerhouse



- Expanded 'Least Cost' Structure -
 - Design & Engineering
 - SHPO
 - Exterior Aesthetics



- Security - Access
- Crane – Truck Bay
- Switchgear, Generator & Mezzanine Levels



The Prairie River Project – Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project – Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project – Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project - Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project – Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project - Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project - Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project – Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project – Out of the Ashes



- Rebuilding the Powerhouse





The Prairie River Project – Out of the Ashes



- Rebuilding the Powerhouse





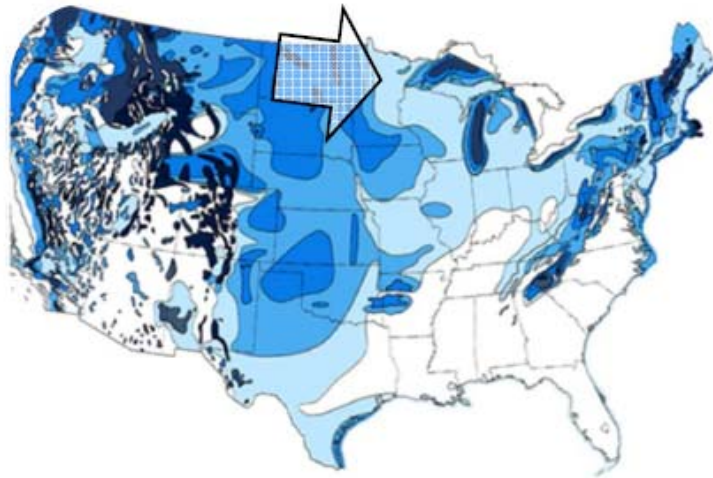
The Prairie River Project – Out of the Ashes



- Rebuilding the Powerhouse



Taking advantage of our strategic location



Access to Quality Wind Sites in U.S.

- North Dakota capacity factor 45%±, double the U.S. average
- 130,000 acres in North Dakota



Access to Canadian Hydro Generation

- Minnesota Power has signed a new 250 MW contract with Manitoba Hydro from 2020 through 2035
- Minnesota Power has other contracts in place with Manitoba Hydro through 2022
- Manitoba Hydro has 2,000 MW under development

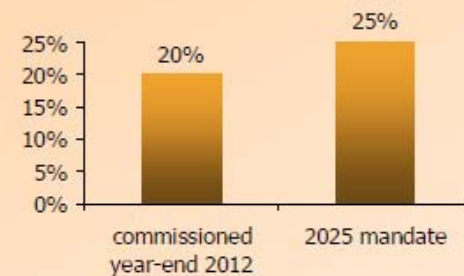
ALLETE plans to develop additional wind generation in North Dakota



North Dakota Wind

- Bison 1, 2 and 3 – 300 MW
- \$226 million for new wind generation in cap-ex table for 2016-2017
 - Approximately 100 MW
 - Evaluating acceleration to 2013 and increase in size due to PTC extension
- Potential Minnesota Power and/or ACE future investments
- Expect announcement through a mid-year filing with the MPUC

Renewable Milestones (MW)



Wind investments support low cost position:

Bison wind projects will deliver electricity at an average cost below 3¢/kVh

ALLETE plans to develop additional wind generation in North Dakota



Bison 4 Wind Project

205 MW

\$345m
total project cost

\$246.6m spent through Q2 2014

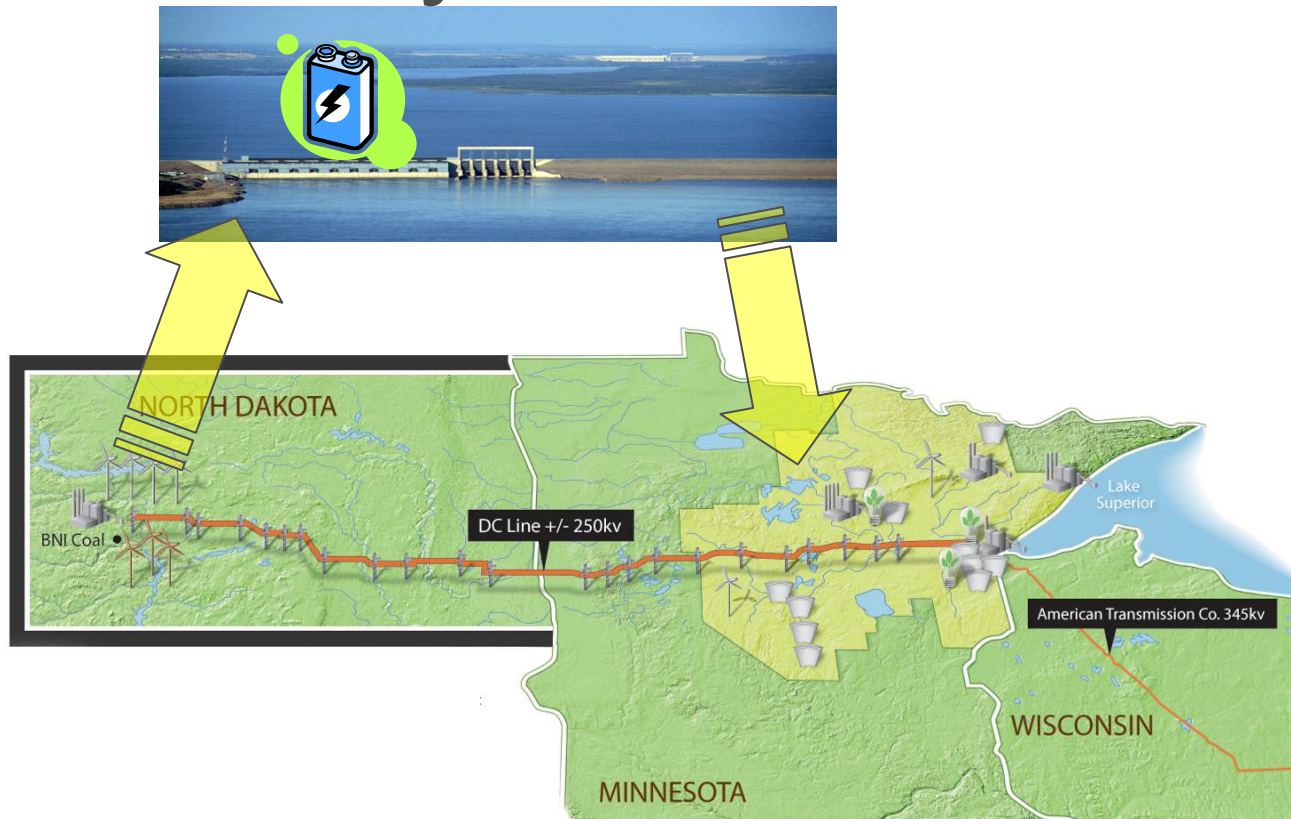
Cost recovery eligible

Completion by end of 2014

Completion of Bison 4 will make
Minnesota Power's
Bison Wind Energy Center
the largest single wind energy
center in North Dakota
Approximately 500 MW

Land to support 200-300 MW under control for future use

Manitoba Hydro Purchase



- Long term power purchase agreement with Manitoba Hydro for carbon free hydroelectric energy
- Leading the industry with a “wind storage provision”

ALLETE will connect renewable energy sources to end users



Strategic geographic location between high quality sources of renewable energy and end users



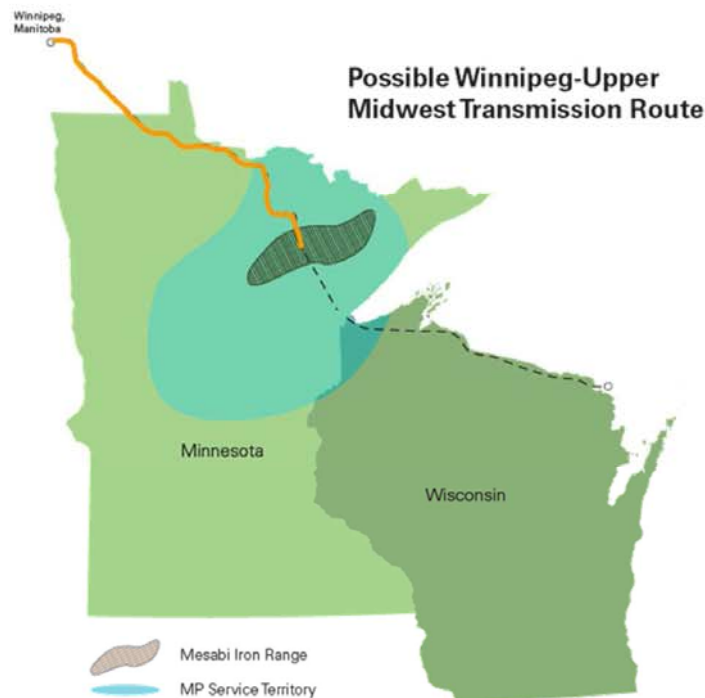
and improve regional reliability...

Great Northern Transmission Line



Deliver hydro power and bolster regional reliability

- Transmission from Manitoba Hydro to Minnesota Power needed by 2020
- Proposed 500kV Winnipeg to Iron Range line
- Will require significant capital investment; total cost and allocations to be determined



Project overview

The project will consist of two transmission lines:

- 500 kV transmission line from Canadian border to Minnesota's Iron Range.
- 345 kV double circuit transmission line from the Iron Range to near Duluth, Minnesota.

Who is Minnesota Power?



Minnesota Power's Area of Operation

- We serve 144,000 retail customers and 16 wholesale municipalities.
- We are an investor-owned utility.
- Our interconnected transmission network promotes reliability in the upper Midwest.

Project timeline



Meeting regional needs

DIVERSITY

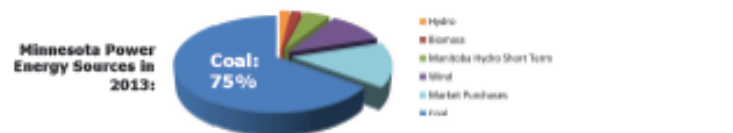
Provides access to clean, affordable, reliable energy for Minnesota Power customers and the region.

INCREASING DEMAND

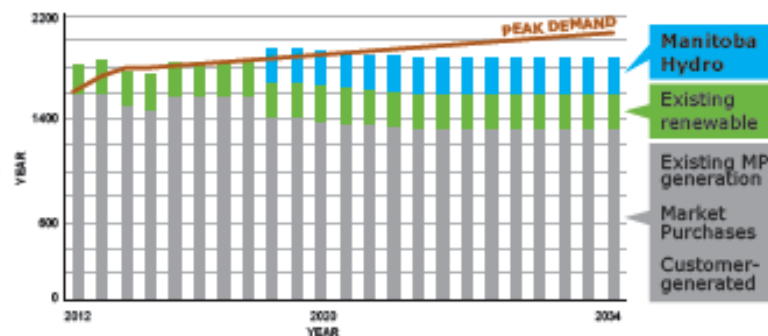
Helps to meet increased energy demand from Minnesota's Iron Range.

RELIABILITY

Strengthens system reliability for Minnesota Power and the region.



Minnesota Power Energy Sources in 2026



Local economic benefits



The University of Minnesota Duluth Labovitz School's Bureau of Business and Economic Research conducted an [independent economic study](#) for the Great Northern Transmission Line. The analysis includes estimated economic impacts to the project area from start-up activities in 2012 through construction completion in 2020.

GENERATE MORE THAN

\$62^M

STATE & LOCAL
TAX REVENUE

- **\$62.5M** in state and local taxes are estimated to be generated through compensation, business, household, and corporation taxes.

CREATE OR SUPPORT

**500
JOBS**

- **315 jobs** are estimated to be directly created for construction activities.
- **185 jobs** are estimated to be added in industries like food service, healthcare, building and professional services, retail, wholesale, etc.

CONTRIBUTE NEARLY

\$2.2^B

TO THE LOCAL
ECONOMY

- **Nearly \$1.4B** are estimated to impact the local economy through direct and indirect spending on goods and services needed to support construction activities.
- **Nearly \$714.4M** are estimated to impact the local economy through direct and indirect spending on wages, rents, interest, and profits.



Minnesota Power – Energy & Engineering

Engineering

- Problem Solvers
 - Experts?
 - Responsibility
 - Team
 - Knowledge & Information Seekers
 - Continuous Improvement
 - Black Box Thinkers?

Main Ingredient to be successful??

Thank you!

