



# Lignite: 101

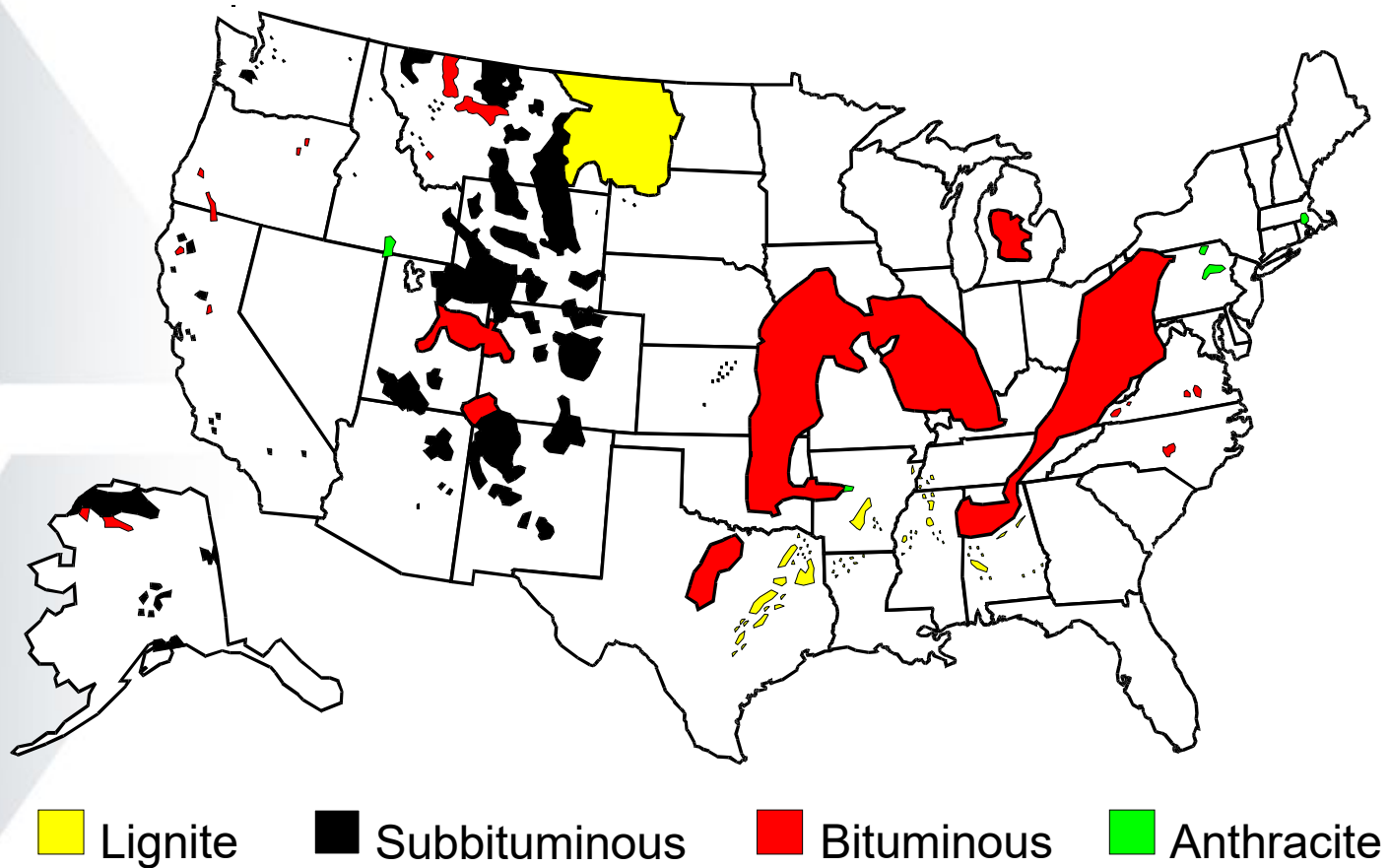
Daryl Hill

Retired Spokesman

Basin Electric Power Cooperative

6/13/2022

# U.S. Coal Deposits



# Lignite Energy Industry History

- Four distinct stages of coal mining in North Dakota
  - Birth of the coal industry, 1873 – 1900
  - Rise of commercial mining, 1900 – 1920
  - From underground to surface mining, 1920 – 1951
  - Emergence of lignite for electric generation, 1952 to present

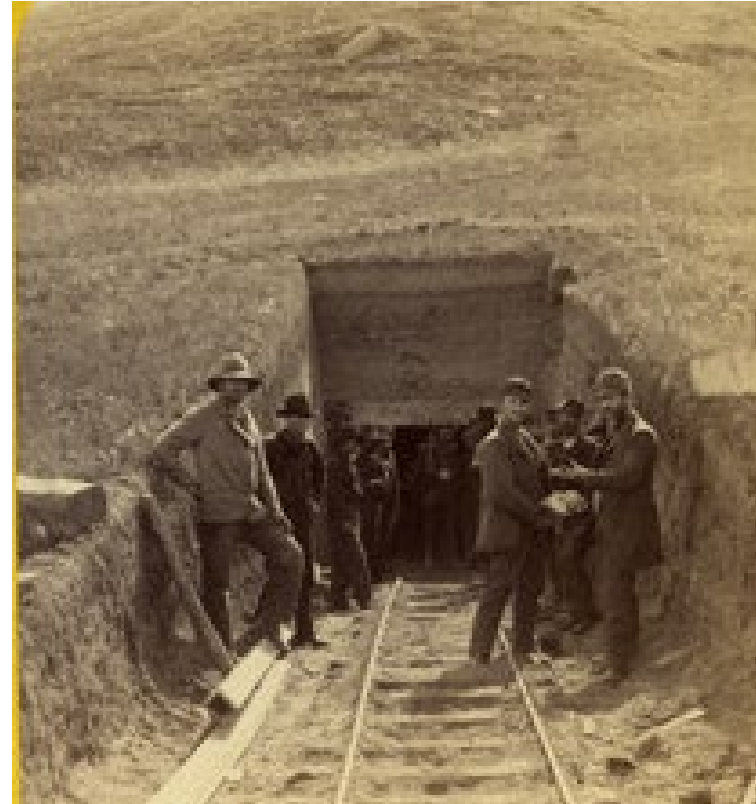
*Source: A History of Coal Mining in North Dakota by Colleen Oihus with North Dakota Geological Survey and North Dakota Public Service Commission*

# William Clark & Meriwether Lewis



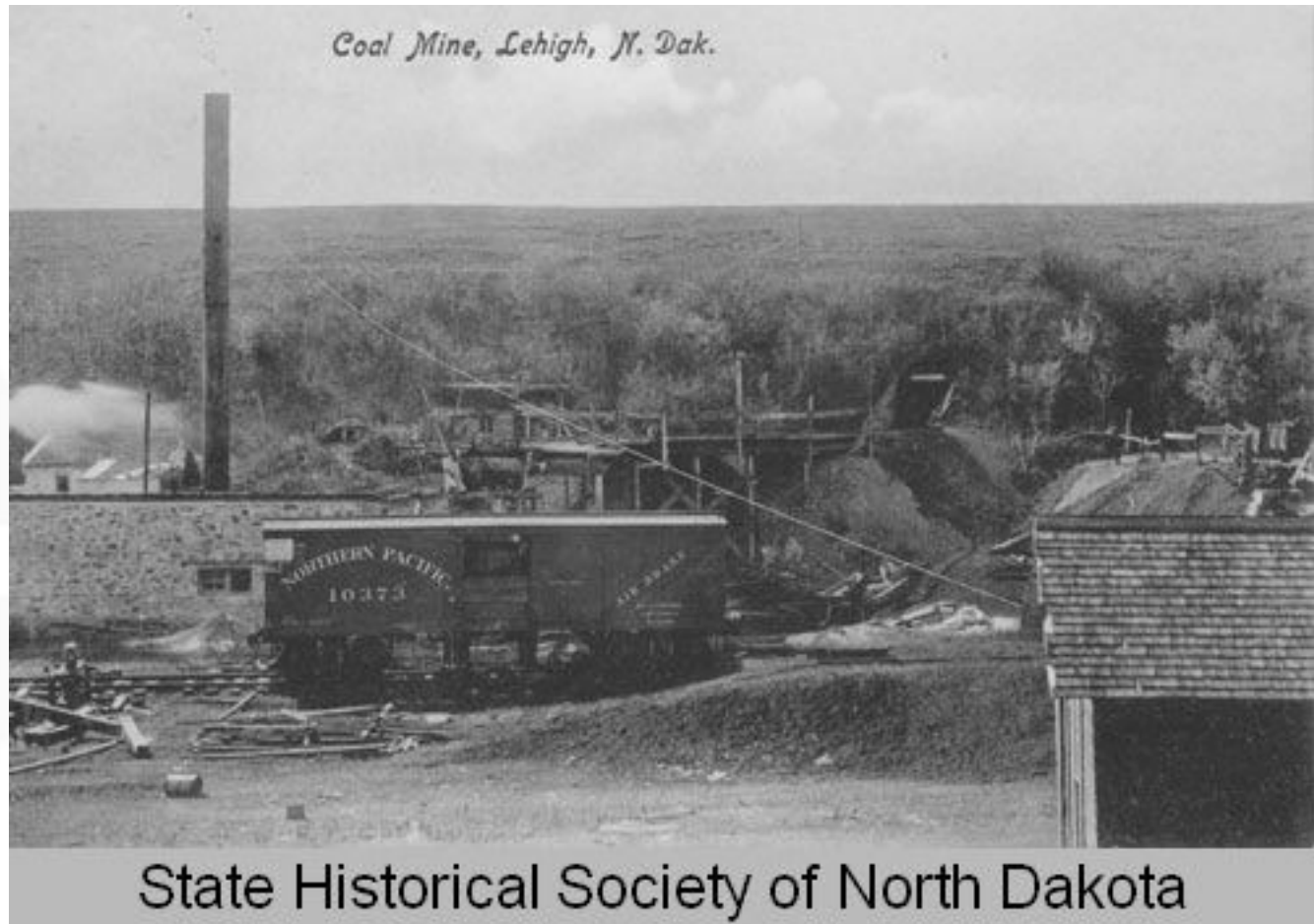
**President Jefferson's instructions included "recording their findings of pit coal" and other natural resources.**

# General Custer



**General Custer escorted a group of men from Bismarck to open a coal mine near the present town of Simms, ND, in 1873**





**This mine east of Dickinson was named for an existing coal mining region in Pennsylvania.**

# Black Butte



**Natural outcroppings of lignite were always fair game for early mining activities by homesteaders**

# Digging From Out Crops



**Many of the early mines were family-owned as they helped supplement the earnings from farming**



# Wagon Mine



# Immigrant Train



**Many families arrived in North Dakota, thanks to the enticement and advertisements of railroads.**



# Lignite Energy Industry History

- Birth of the coal industry, 1873 – 1900
- Rise of commercial mining, 1900 – 1920

# Washburn Coal Co.



**Wilton, ND**



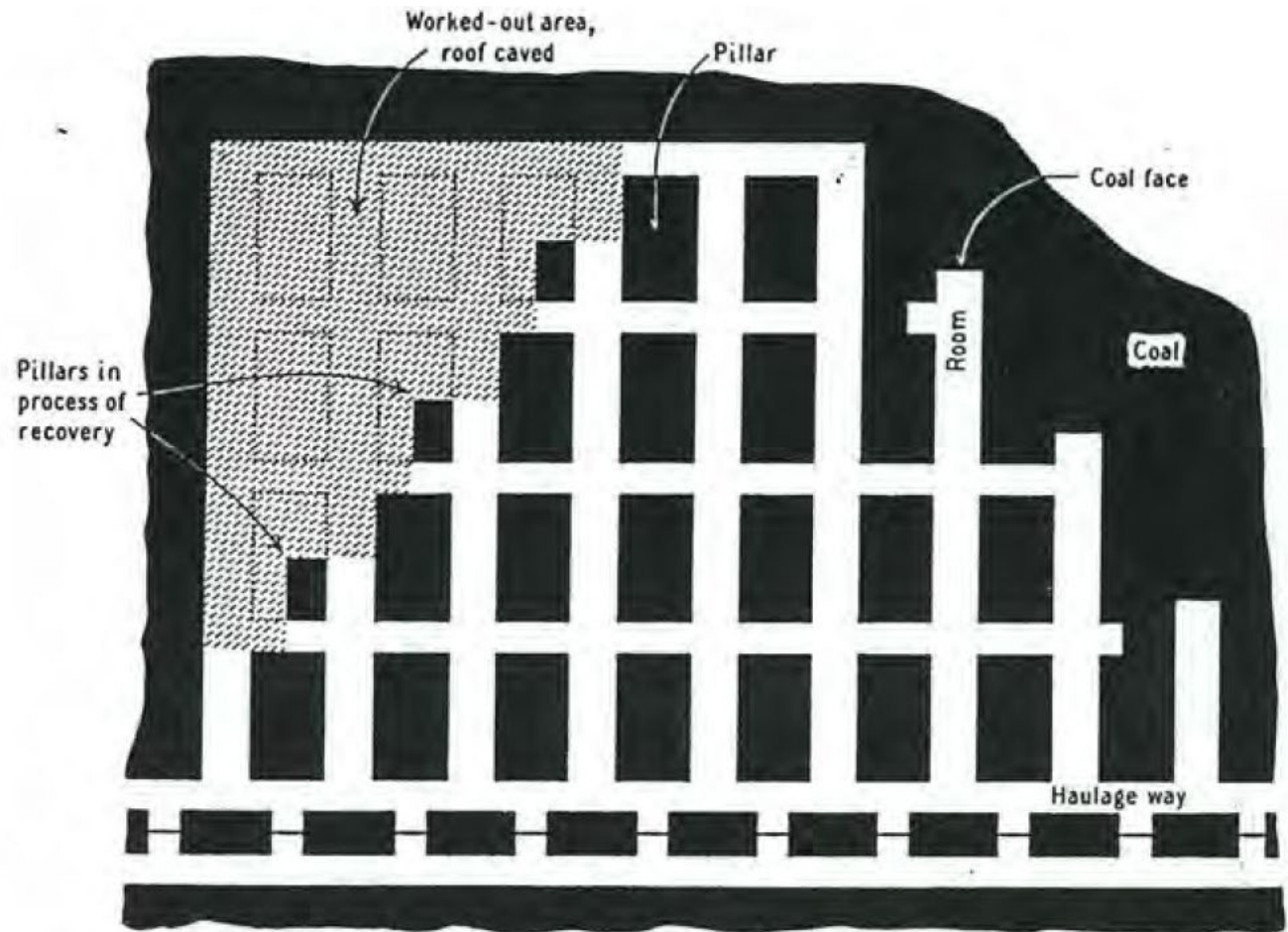
# Washburn Coal Co.



**Some of the first gambling in the state? Guess the weight of the coal and win the fuel.**



**“It's dark as a dungeon and damp as the dew,  
Where the dangers are double and the pleasures are few,  
Where the rain never falls and the sun never shines...  
It's dark as a dungeon way down in the mines.”**



**A typical horizontal mining plan – timbers and pillars were used to support mining activities. Consider the depth of the coal seams...might be just tall enough for a man to stand.**



# Falkirk Reclamation Video



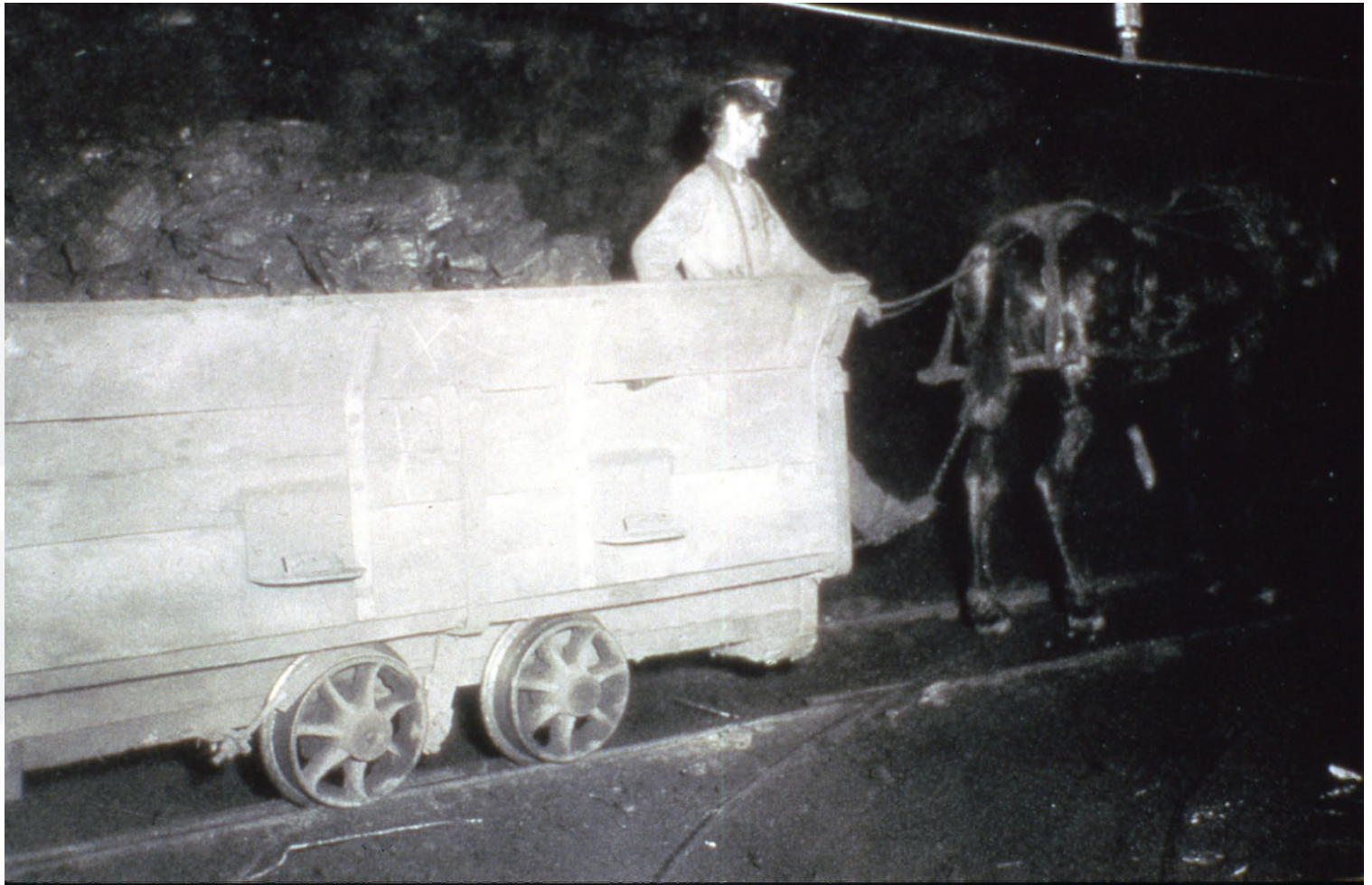


# Falkirk Mine 2014 Reclamation Award from ND PSC

6/27/2023



**“A foreman would grab your arm. If you had a sleeve full of muscles, you could get job as a miner.”**

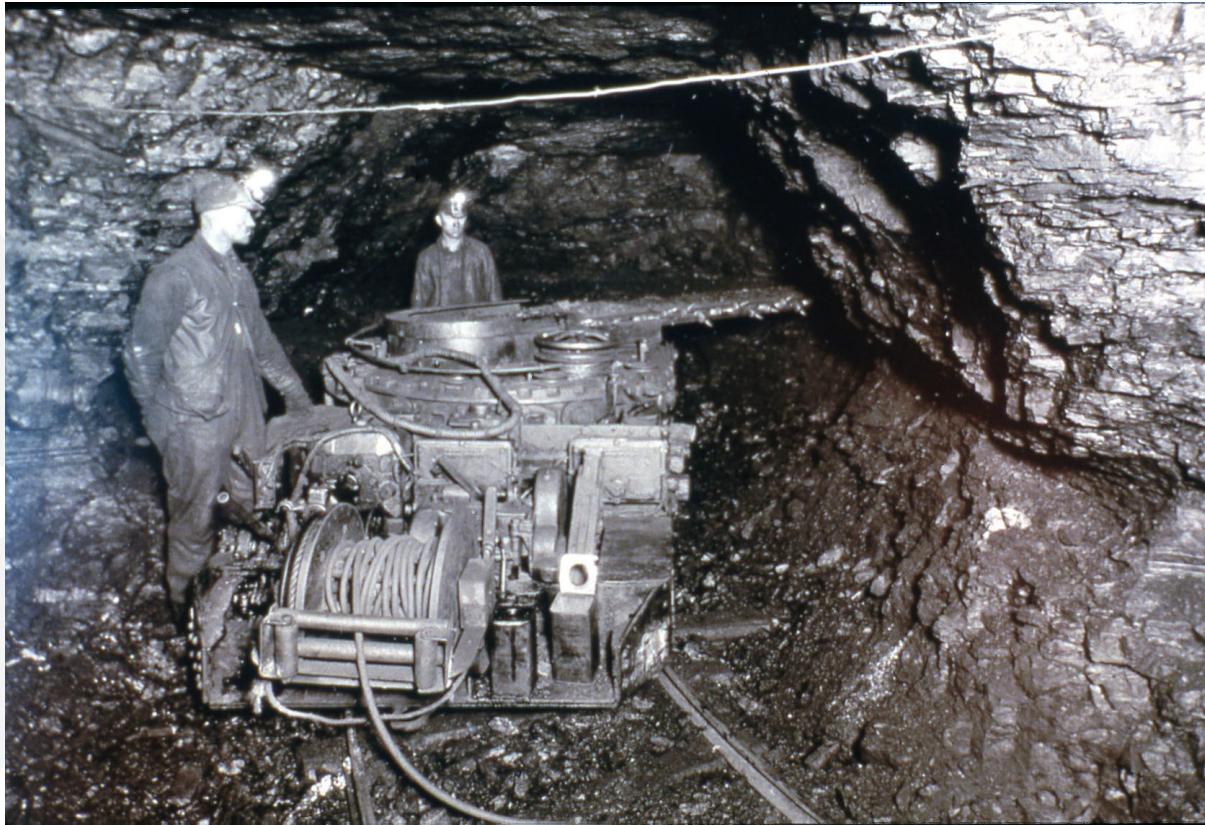


**Horses and mules lived underground. They would go blind if they ever saw the sun.**









**The Joy loaders made underground mining more efficient**



**Eventually, the mules were replaced by little engines.**



# Lignite Energy Industry History

- Birth of the coal industry, 1873 – 1900
- Rise of commercial mining, 1900 – 1920
- From underground to surface mining, 1920 – 1951

# Underground Miners

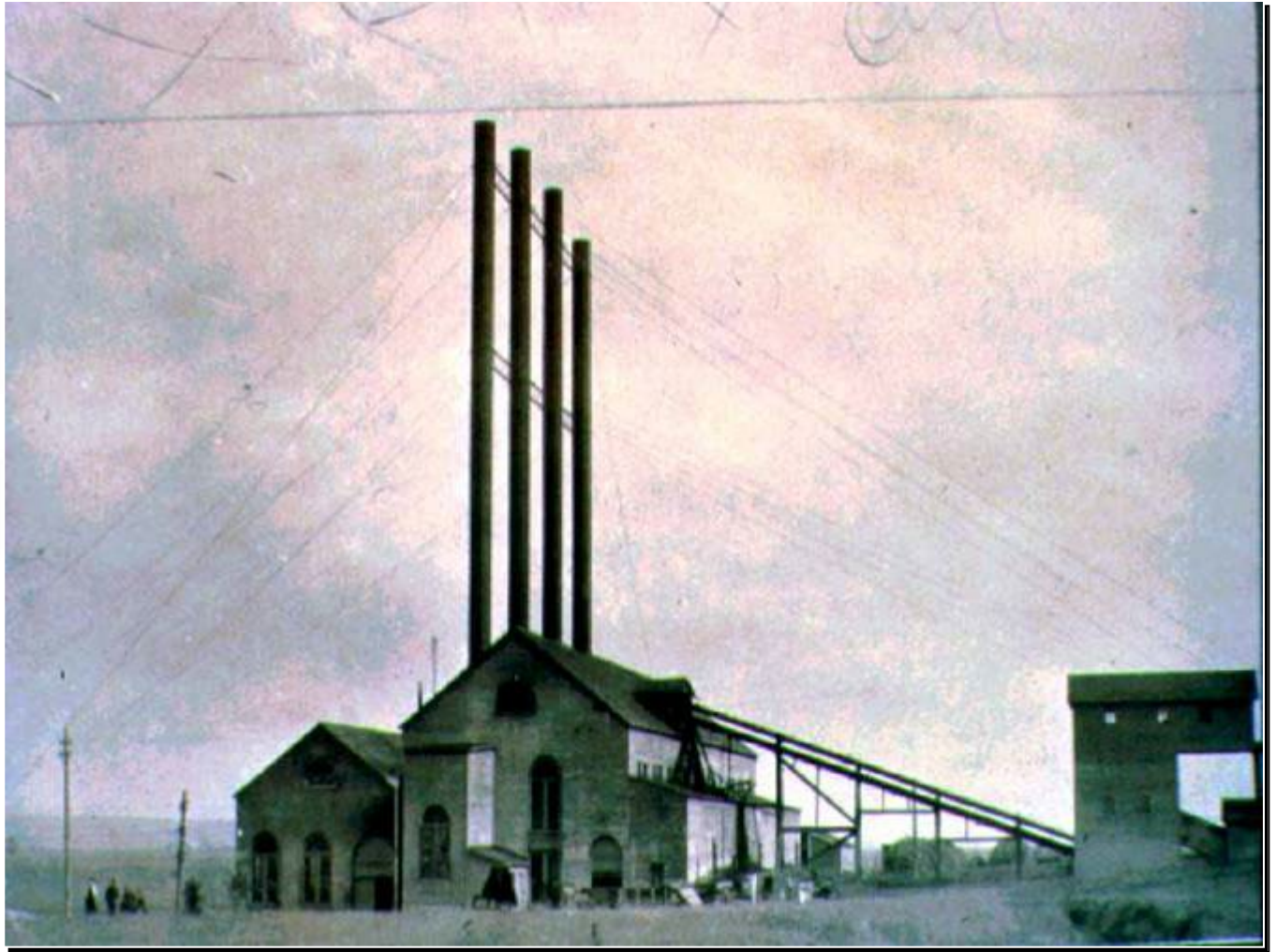




# Steam Shovel



# Williston Power Plant





# Knife River Station



# Lignite Energy Industry History

- Many factors affected the lignite industry over the years
  - The Depression – reduced economic activity
  - Opening the Garrison Dam – made hydro power readily available to co-ops and municipal electric systems
  - Drilling rigs found natural gas associated with oil



# Garrison Dam

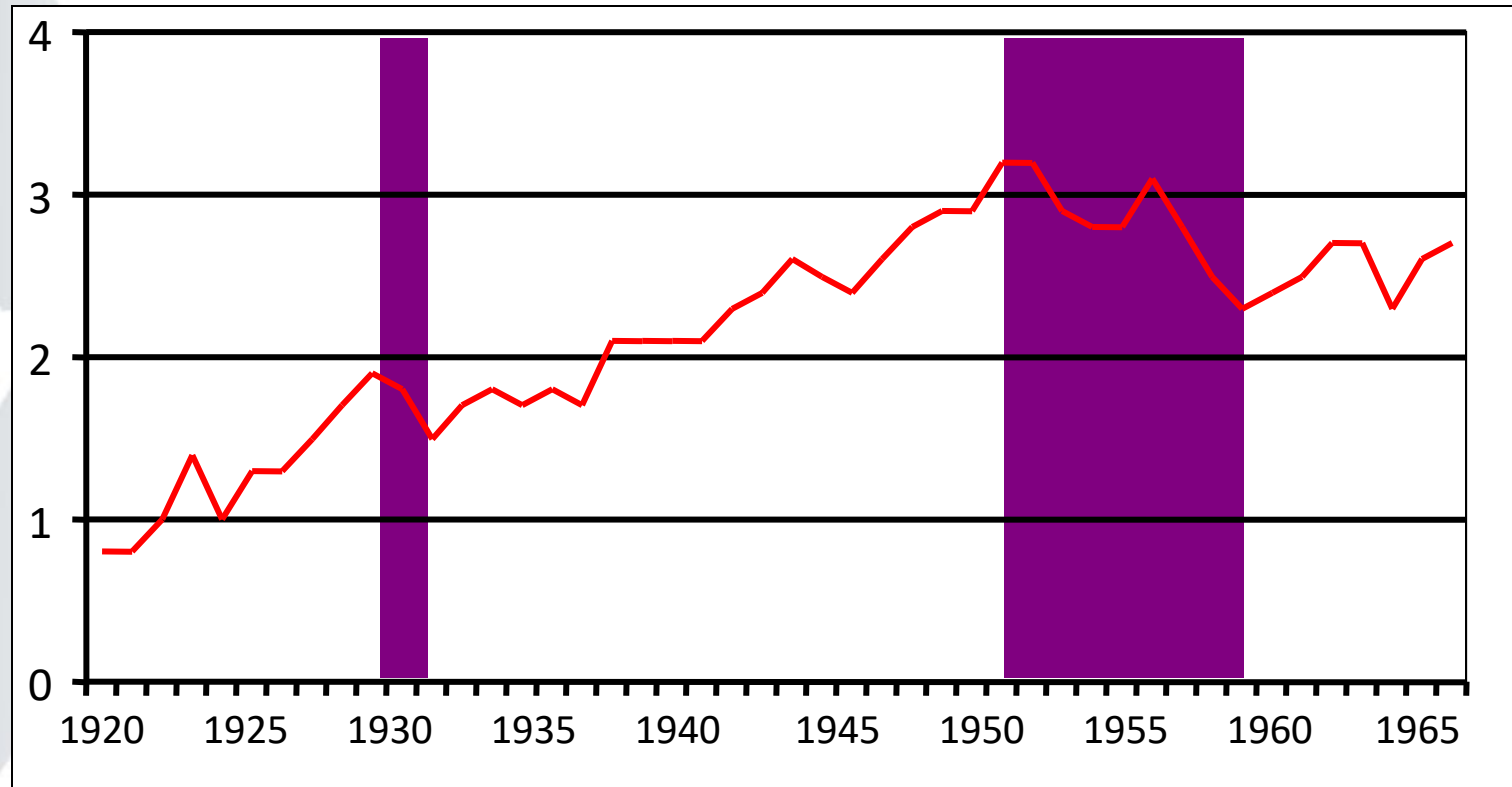


# Drilling Rig



# Lignite Production 1920-1965

## *North Dakota*



# History of Power Activity

- What was life like without electricity?
  - Research the local newspaper or utility archives to find when electricity came to town
  - Utility history books – Energizers of the Prairie, The Power People, etc.
  - Who were the “Edison’s” of your community

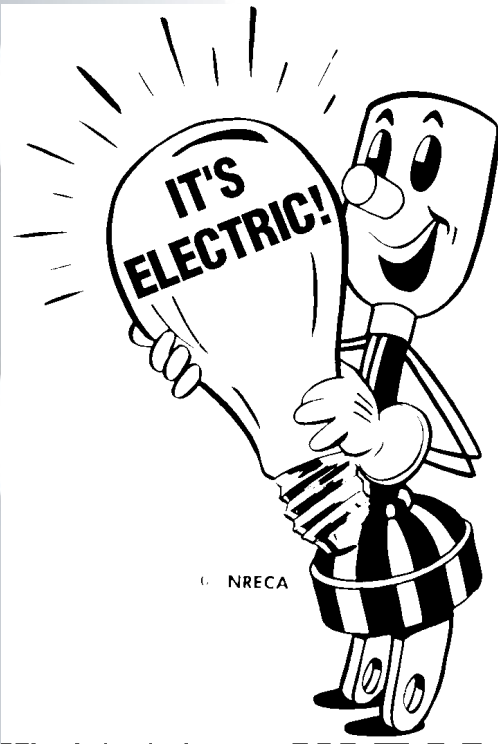


# Reddy Kilowatt (video)





# Willie Wiredhand



- The rural electric cooperatives had Willie Wiredhand as a mascot. He was advertised as a farm hand who showed up on time, worked for pennies a day, and took over the milking, grain handling, water pumping and other chores...and he didn't talk back to the boss.
- Do we still think of electricity as a servant or is it something we take for granted?



# **‘One of the Happiest Days of My Life’**



- Rose Frohlich lived on a farm between Center and Mandan with her family in the 1940s. Mor-Gran-Sou electrified her farm house on June 8, 1949. She called it “one of the happiest days of my life.”
- Laundry, bathing children, feeding her family, cleaning her home and preserving her fruits, vegetables and meat got a lot easier.

# Did You Know?

The typical U.S. home has, on average, at least 25 electronic products – 99 percent of which must be plugged in or recharged

99% have televisions

99% have refrigerators

82% have clothes washers

80% have clothes dryers

92% have at least one computer

75% have central air conditioning

68% have dishwashers



# Willie was Right!

- Modern production agriculture is powered by electricity
    - Farm irrigation systems are major consumers of electricity – irrigated crops accounted for 40% of all the ag products sold in 2012
    - Electricity is the largest single energy expense for dairy farmers. The automatic milking parlor is powered by electricity and the milk is chilled on site
    - The milling of wheat includes cleaning, grinding, sifting for size and density, material handling and packaging. In flour production, the largest single operating expense is electricity used to run motors
- Nearly all activities supporting production agriculture requires energy

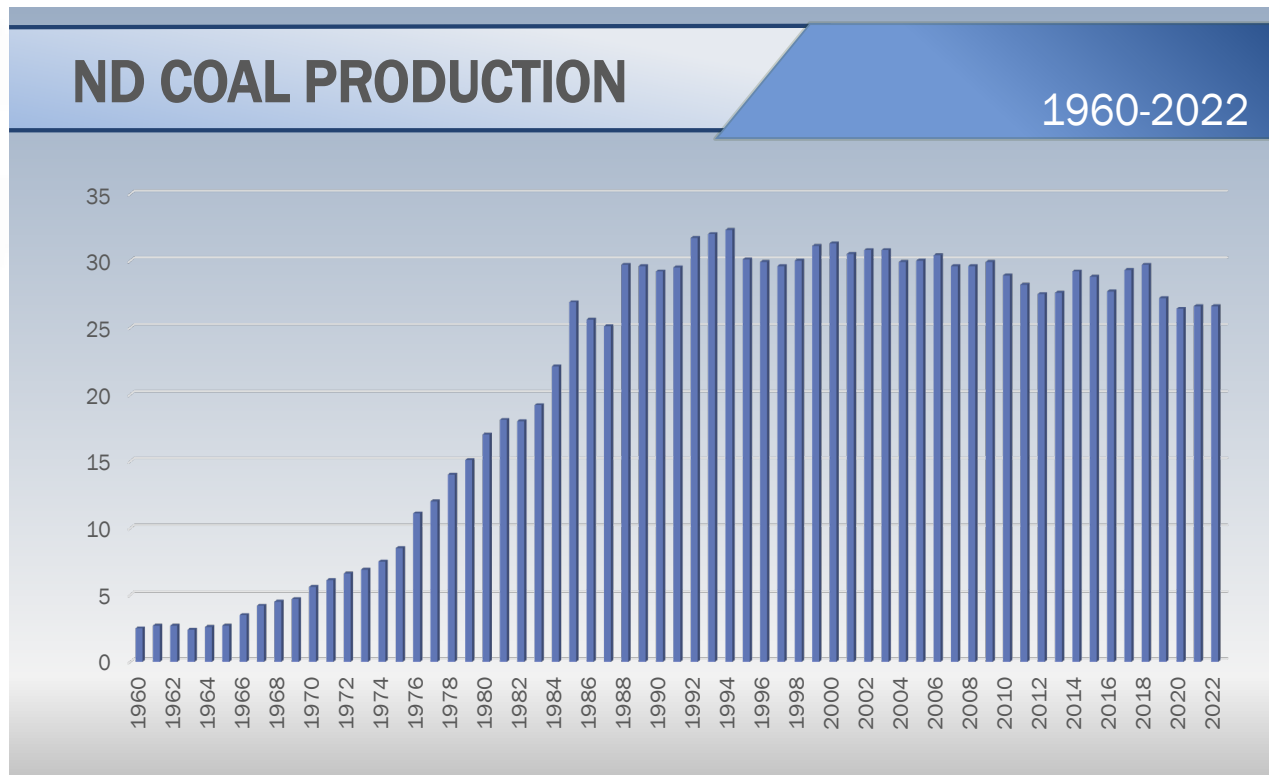




# Lignite Energy Industry History

- Birth of the coal industry, 1873 – 1900
- Rise of commercial mining, 1900 – 1920
- From underground to surface mining, 1920 – 1951
- Emergence of lignite for electric generation, 1952 to present

- North Dakota produced 26.6 million tons of lignite in 2022
- For decades, the industry averaged 30 million tons – recent reductions resulted from wind generation; renewable mandates; plant closures

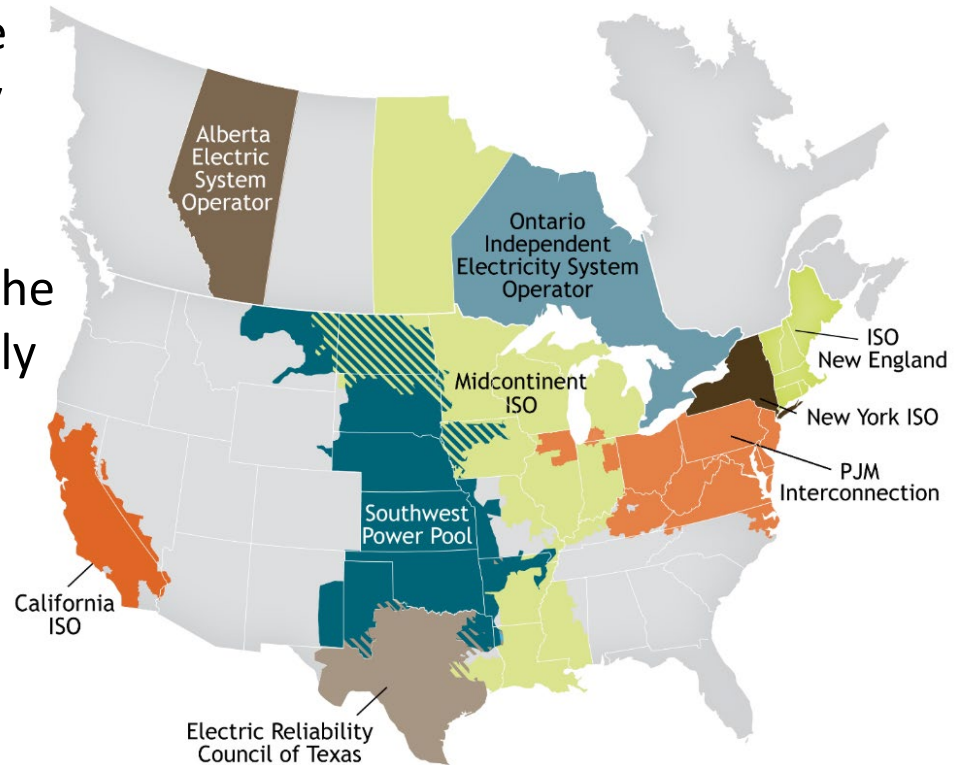


# Regional Transmission Organizations

RTO markets are now the dominant form of energy dispatch in the country.

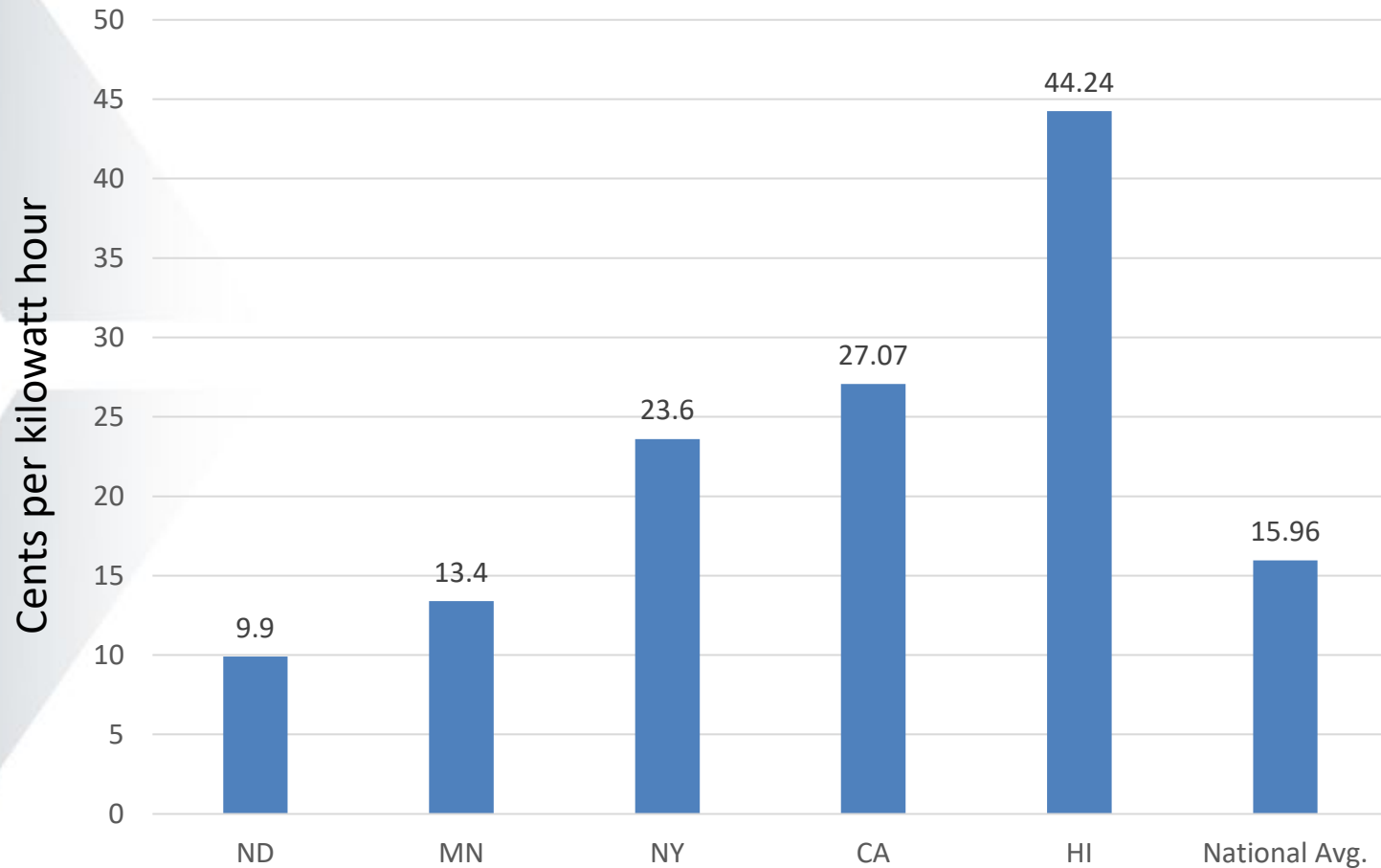
Why? An RTO can serve the loads more cost effectively vs. stand alone utilities.

Thus, saving customers money.



# Regional Low-Cost Electricity

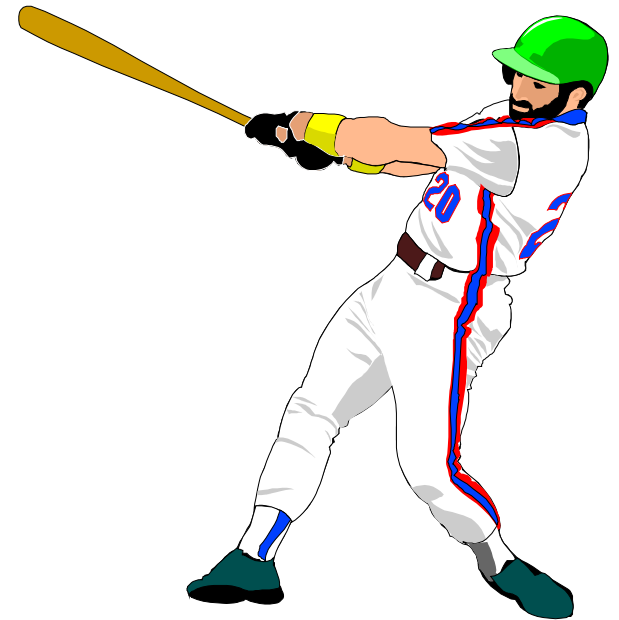
Average 5/2/23 residential electricity prices



Source: [choseenergy.com](https://www.chosenenergy.com)



# Who Are the Players?



# Lignite Energy Council

*Member-driven association*

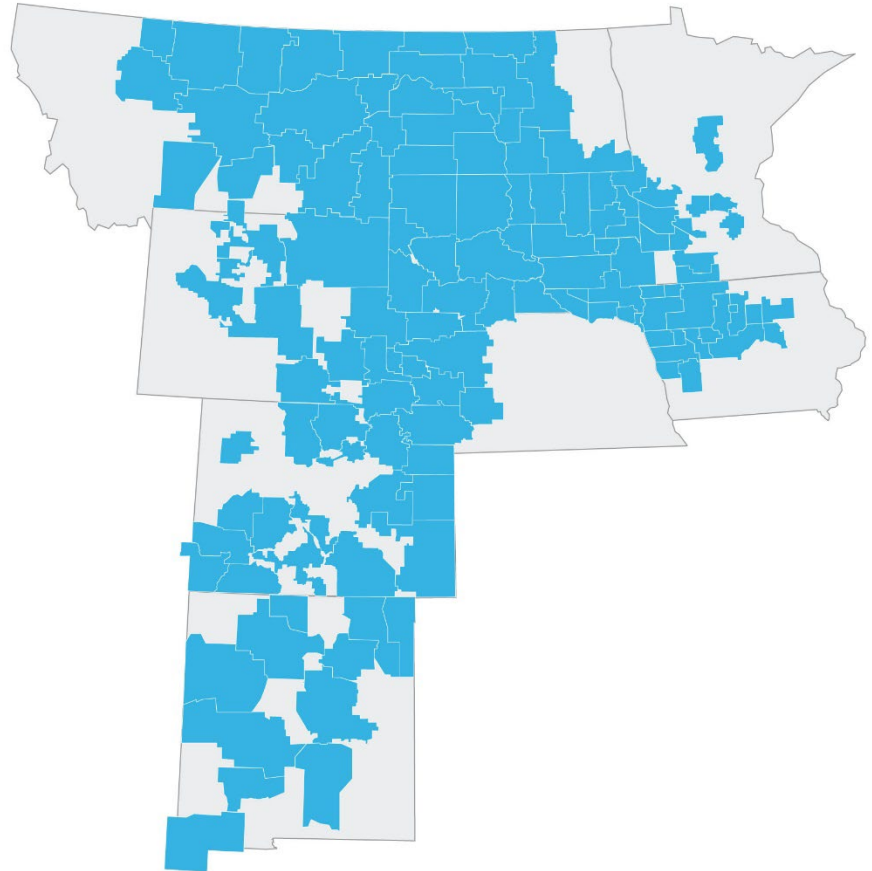
- 250+ Contractor/Suppliers
- 6 Utilities
- 4 Producers, 1 Reserve Holder, 1 Research Member
- 1 Development Member
- 1 Gasification Company



# Basin Electric Power Cooperative

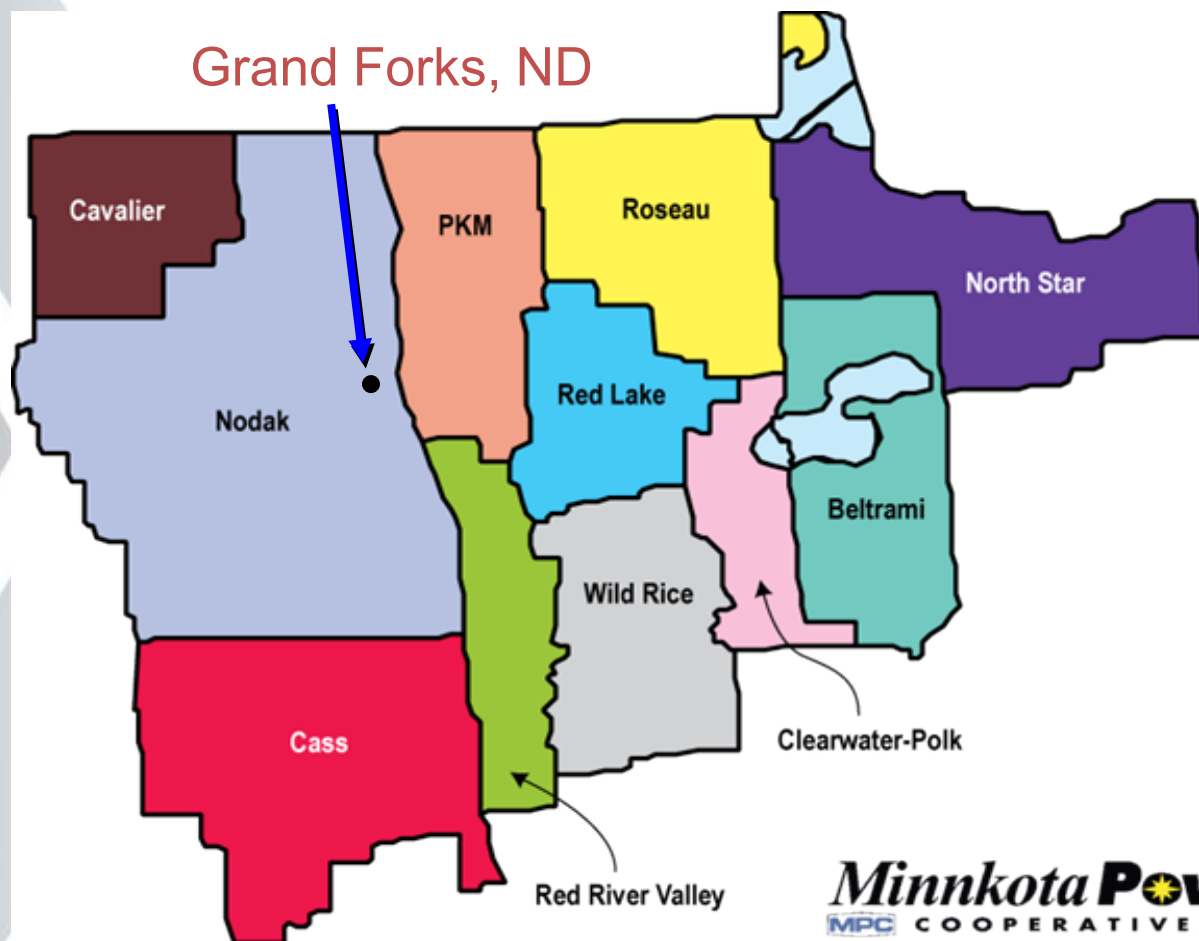
## *Service Area*

- Serves 131 distribution co-ops
- 3.0 million customers
- 1,569 MW from lignite
- ~ 2,000 MW from sub-bituminous
- 2,300 employees including 500+ at BEPC headquarters – 700+ at Synfuels plant
- BEPC owns Dakota Gasification Company



# Minnkota Power Cooperative

## *Service Area*



- Serves 11 distribution co-ops
- 140,000 customers
- 708 MW from lignite
- 361 employees including 175 at HQ

**Minnkota Power**  
MPC COOPERATIVE, INC.

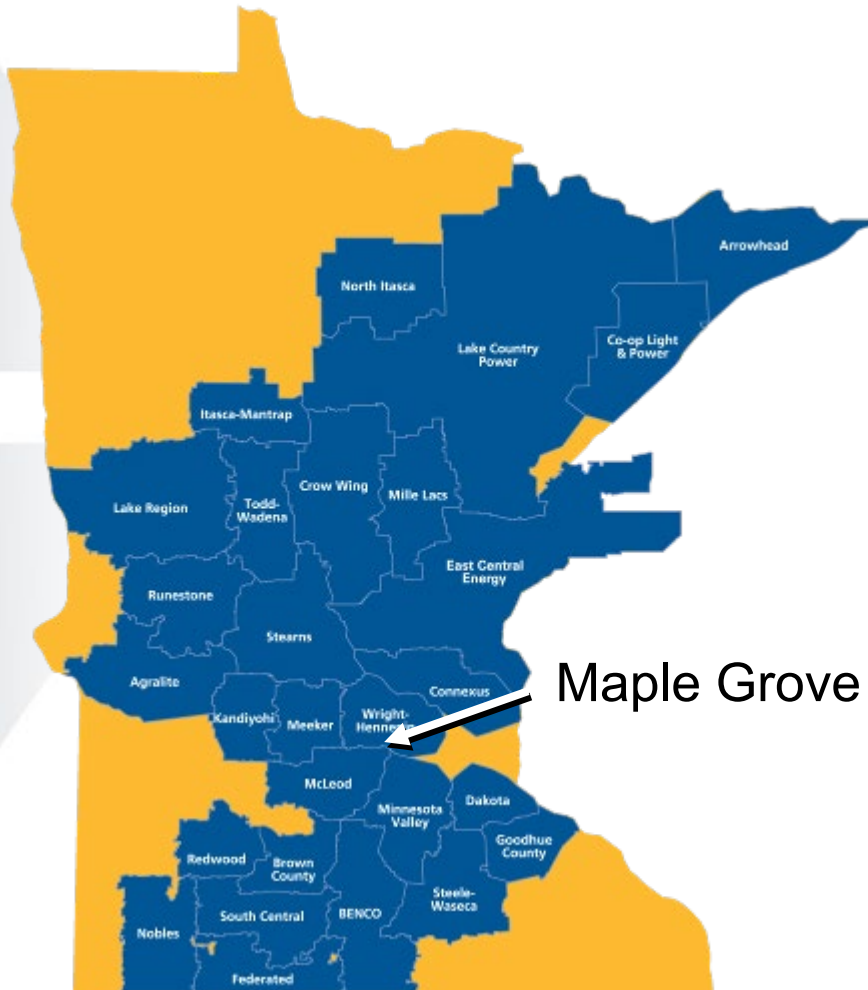
Your Touchstone Energy® Partner





# Great River Energy

## *Service Area*



- Serves 28 distribution co-ops – about 60% of Minnesota geographic area
- 650,000 customers
- 33 employees at Spiritwood Station

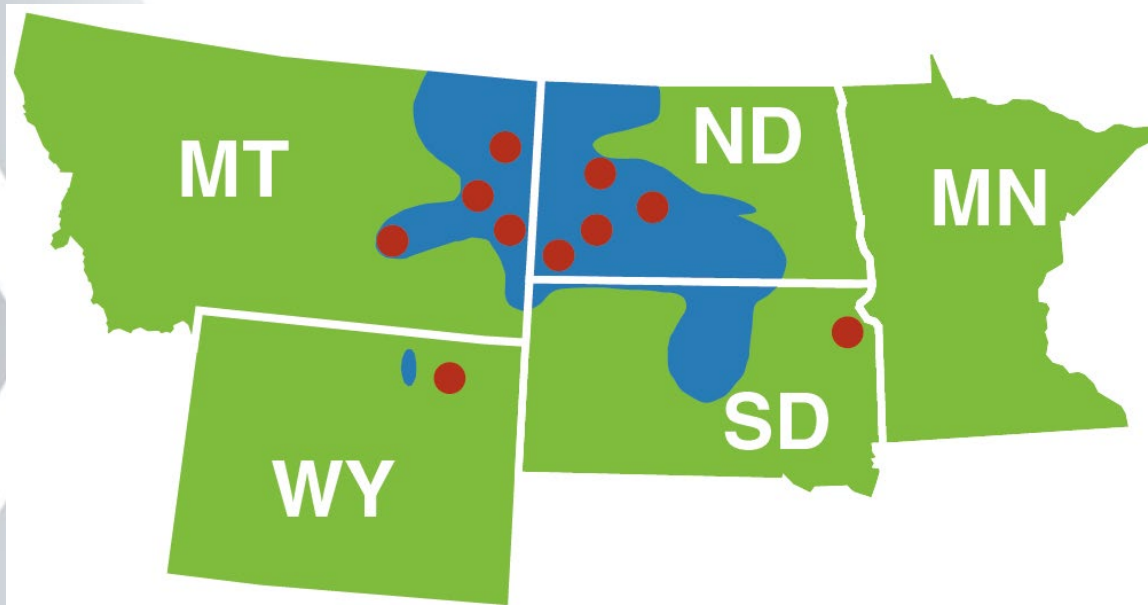
Maple Grove



- Officially became owner of Coal Creek Station last month
- Part of a family of companies that comprise United Energy Corporation
- GRE to purchase power
- Specializes in providing customers with energy services and products
- Customers in U.S., Canada & Mexico

# Montana-Dakota Utilities Co.

## *Electric Service Area*

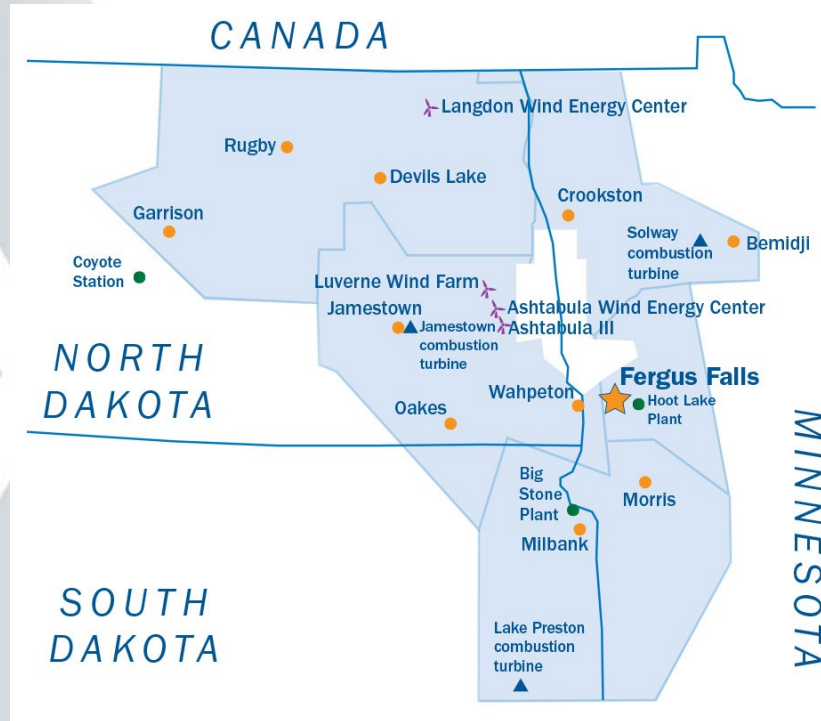


Serves 135,000  
electric customers  
250 MW from lignite  
252 employees at HQ  
(Bismarck),

Blue represents service territory and red  
dots denote generation sources – MDU's  
electric customers have grown along with  
Bakken oil boom

# Otter Tail Power Company

## *Service Area*



- Serves 130,000 electric customers
- 149.5 MW from lignite
- 315 employees at HQ (Fergus Falls) and 82 employees at Coyote Station



# Minnesota Power *Service Area*



- Serves 144,000 electric customers
- 225 MW from lignite
- 1,000 employees in electric operations

# Mines and Power Plants

## Mine

- Center
- Freedom
- Falkirk
- Coyote Creek
- Beulah

## Plant(s)

Milton R. Young

Great Plains / AVS / Leland Olds

Coal Creek / Spiritwood

Coyote Station

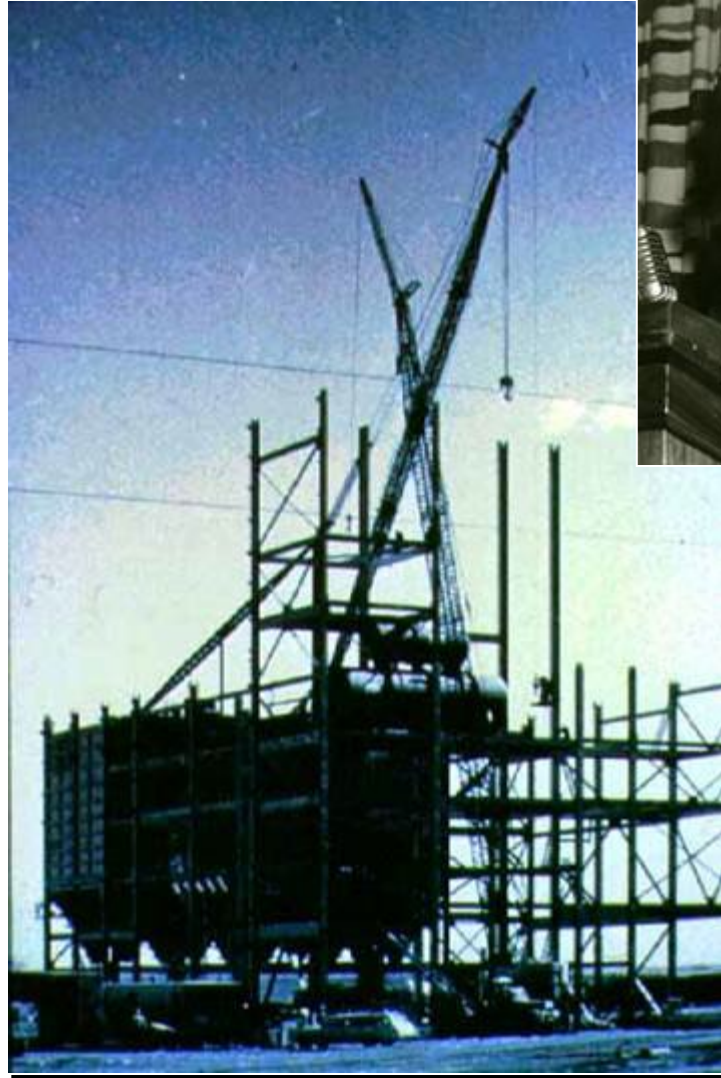
Heskett

# Heskett Station

- Named for MDU's founder – R.M. Heskett



# Leland Olds

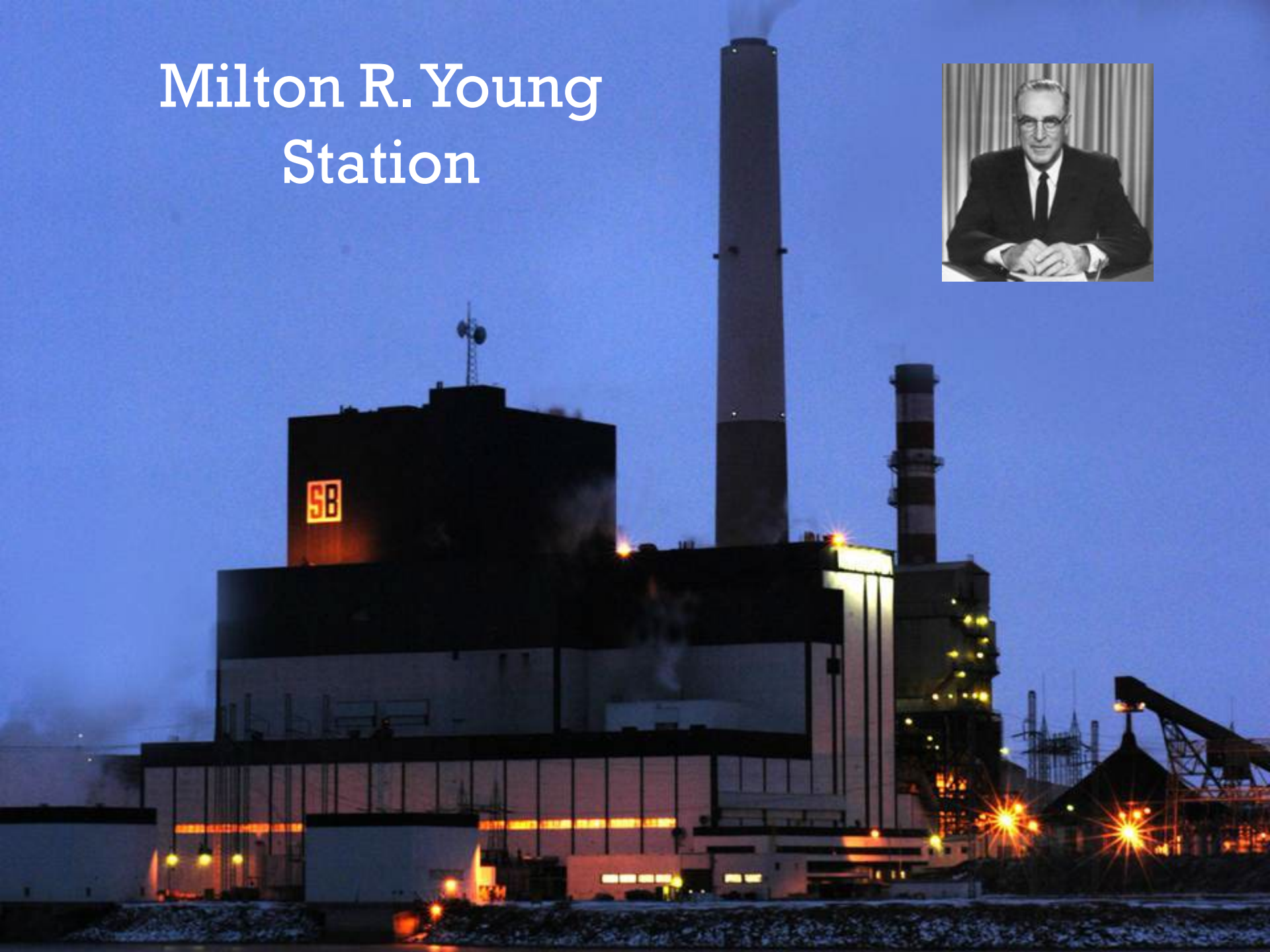




# Leland Olds Station

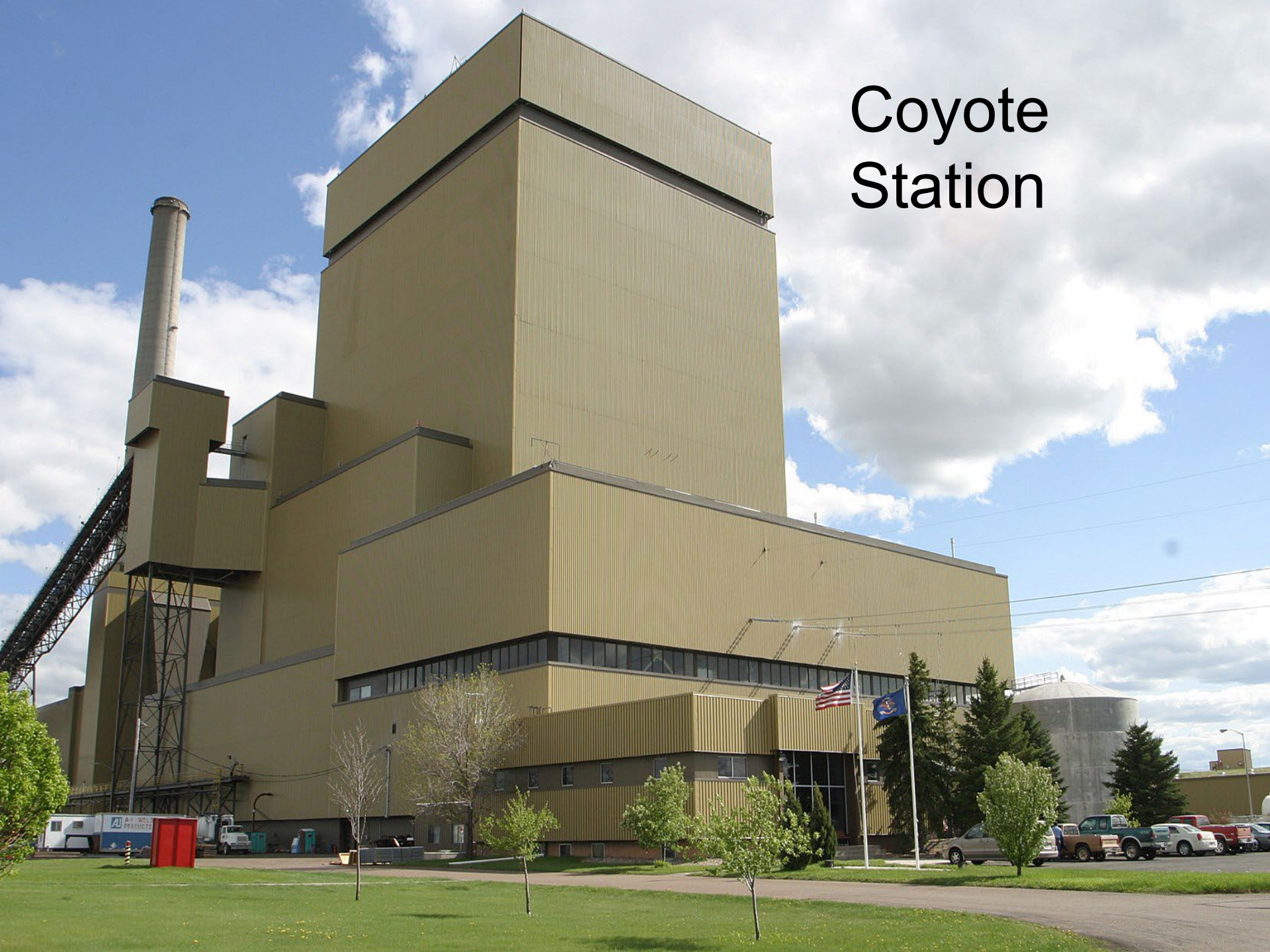


# Milton R. Young Station





# Coyote Station





# Coal Creek Station





# Antelope Valley Station



# Spiritwood Station

- A unique combination – heat and electricity
  - 99 MW base load
  - 22 MW steam peaking
  - 610,000 ton/yr. beneficiated lignite
  - Investment...\$400M





# Great Plains Synfuels Plant





Exported 50%-75%





# Economic Impact





# Inputs

## North Dakota's economy

### 1. Agriculture



# Inputs

## North Dakota's economy

1. Agriculture
2. Oil & gas development



# Inputs

## North Dakota's economy

1. Agriculture
2. Oil & gas development
3. Tourism



# Inputs

## North Dakota's economy

1. Agriculture
2. Oil & gas development
3. Tourism
4. Manufacturing





# Inputs

## North Dakota's economy

1. Agriculture
2. Oil & gas development
3. Tourism
4. Manufacturing
5. Lignite

# 3,500 Direct Employees





# 10,000 Indirect Employees

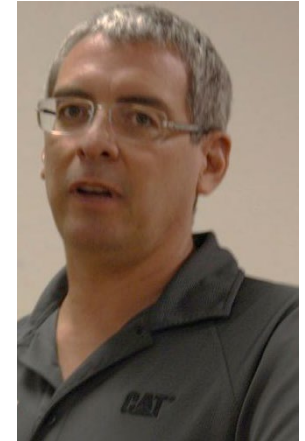
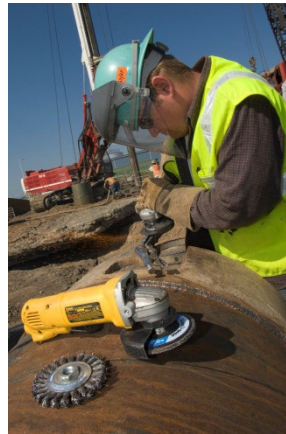


# Jobs Created by the Lignite Industry



Direct Job

=



Indirect Jobs



\$1.1 Billion = \$5.7 Billion





# Dollars Created by the Lignite Industry



=



# Total State Taxes (Biennium)

## \$200 Million



# Classroom Activity

## ECONOMICS!!!





# Lignite Industry Contractors & Suppliers

- Heavy equipment supplier
- Coal testing lab
- Fuel supplier
- Engineering services
- Earthwork contractor
- Legal services
- Machine shop services
- Maintenance services
- Utilities (electricity)
- Transportation services
- Parts supplier
- Explosives supplier
- Environmental consultant
- Tire supplier





# Lignite Industry Business Activity Generated

- Doctor
- Rent
- Dentist
- Bank (car or house payment)
- Grocer (food)
- Credit card payment
- Telephone
- Insurance payment
- Gas / electricity
- Home improvements
- Water
- Vacations
- Clothing
- Sporting events
- Car repair/maintenance
- Toys for children
- Gasoline
- New car or truck
- Movies

# Classroom Activity: Lignite Economics

- Jobs



Direct Job

=



Indirect Jobs

- Business activity



=



- Tax revenue

**Tax \$ = Services**



# Industry Overview

THANK YOU VERY MUCH!

6/27/2023



6/27/2023