ELECTRIC TRANSMISSION 205:

Economic Stimulus and Jobs Benefits

July 15, 2011, 10:00 am – 11:30 am
U.S. Capitol Building, Visitors Center

FACULTY:

- **Hannes Pfeifenberger**, Principal, The Brattle Group
- **Jim Hunter**, Director, Utility Department, International Brotherhood of Electrical Workers
- **Eric Lantz**, Research Analyst, National Renewable Energy Laboratory, U.S. Department of Energy
- **Randy Fordice**, Project Communications Specialist, Great River Energy and CapX2020
- **Jim Hoecker**, Husch Blackwell LLP and WIRES Counsel; former Chairman, Federal Energy Regulatory Commission (Moderator)

Presented by WIRES - a national coalition of entities dedicated to investment in a strong, well-planned and environmentally beneficial electricity high voltage transmission system in North America.

The Recent Findings of Employment Study for WIRES

Johannes Pfeifenberger
The Brattle Group

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Study Overview

Study posted at: http://www.wiresgroup.com/images/Brattle-WIRES_Jobs_Study_May2011.pdf

- 1. Projected Transmission Investment Needs
  - Averaging $12-16 billion per year through 2030
- 2. Employment and Economic Stimulus Benefits
  - First nation-wide analysis; based on updated investment needs; includes Canada
  - Relied on industry-standard model (IMPLAN) also used by the U.S. Army Corps of Engineers, U.S. Department of Commerce, the Bureau of Economic Analysis, the U.S. Department of Interior, the Bureau of Land Management, and the Federal Reserve System member banks, among others
- 3. Electricity Market Benefits
  - Numerous benefits that increase reliability and lower the cost of generating and delivering power

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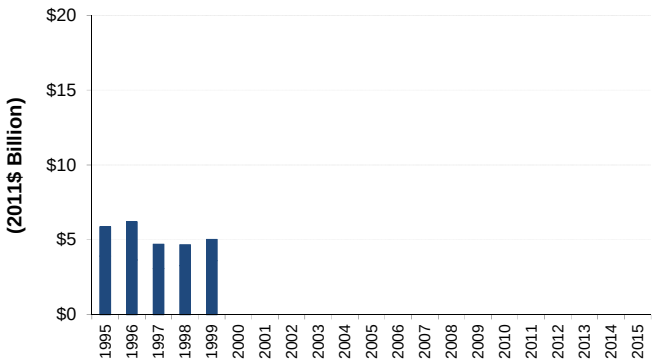
U.S. Transmission Investment – 1990's

- Period of minimal investment: 1980s and 1990s



- Minimal major investments after transmission expansion in 1960s and 70s
- Driven primarily by reliability needs
- Investment by individual utilities to serve their own load

Source:
The Brattle Group, Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada, prepared by J. Pfeifenberger and D. Hou for WIRES, May 2010.

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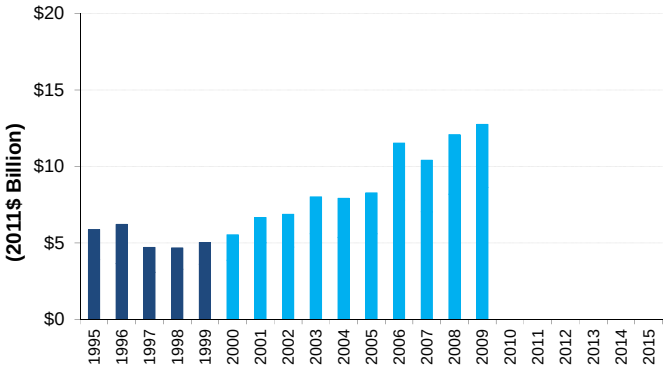
U.S. Transmission Investment – 2000's

•Increasing investment levels over the last 5-10 years



Source:
The Brattle Group, Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada, prepared by J. Pfeifenberger and D. Hou for WIRES, May 2010.

- Reliability, generation interconnection, and some market-efficiency transmission projects
- Nascent investment by non-incumbents
- Beginning of multi-utility, regional planning through RTOs

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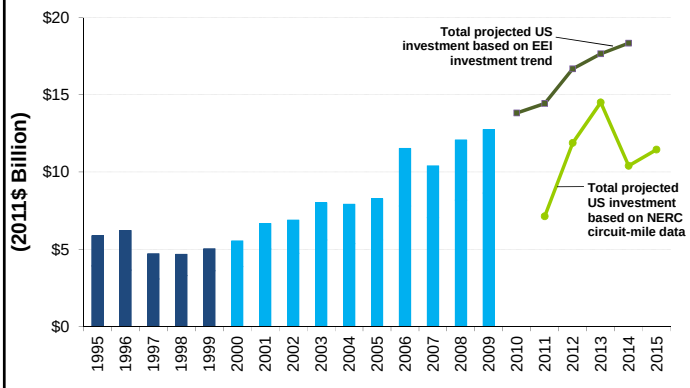
U.S. Transmission Investment – Through 2015

•Looking forward: renewables and regional drivers



Source:
The Brattle Group, Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada, prepared by J. Pfeifenberger and D. Hou for WIRES, May 2010.

- Reliability and some economic investments
- Nascent investment by non-incumbents
- Beginning of multi-utility, regional planning
- Averaging $12 to $16 billion/year
- Similar level of investments through 2030

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Key Findings: Investment Needs

- $240-320 billion total U.S. transmission need through 2030
  - Average range of $12-16 billion/year of investments likely needed through 2030
  - Integration of renewable generation to meet RPS requirement one of the major long-term drivers, requiring $50-100 billion in transmission investments
  - Base-level of investment needed to replace aging facilities, maintain reliability, interconnect generation, serve growing loads, and reduce congestion
- Canadian transmission investment plans: C$45 billion through 2030

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Key Findings: Jobs and Economic Stimulus

- $12-16 billion of annual transmission investment in the U.S. through 2030 will immediately support:
  - 150,000-200,000 full-time jobs each year as construction proceeds (direct, indirect and induced)
  - $30-40 billion in annual economic activity
- The expanded transmission infrastructure will also enable additional economic activity
  - For example: facilitate renewable generation development, supporting an additional 130,000-250,000 full-time U.S. jobs during each year over the next 20 years
- Planned Canadian transmission investment will on average support between 20,000 and 50,000 full-time jobs annually

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Key Findings: Investment Barriers

- The identified level of transmission investment is contingent on overcoming significant development risks and barriers
  - Lack of established regional and inter-regional transmission planning processes, particularly for public policy-driven projects (e.g., to integrate renewables)
  - Unresolved cost allocation and recovery for multi-state and inter-regional transmission projects
  - Largely uncoordinated and highly uncertain state-by-state permitting process
  - Uncertain state-specific public policy requirements and lack of meaningful regional coordination

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Key Findings: Electricity Market & Related Benefits

- Job and economic stimulus benefits do not include the many other benefits of transmission such as:
  - Reduced transmission congestion and generating costs
  - Increased system reliability
  - Reduced costs of building new power plants
  - Reduced cost of balancing intermittent renewable generation
  - Increased electricity market competition and liquidity
  - Reduced emissions and fossil fuel consumption
  - Fiscal benefits from increased federal, state, and local income taxes
- Quantifiable electricity-market benefits alone often exceed the cost of the transmission investments

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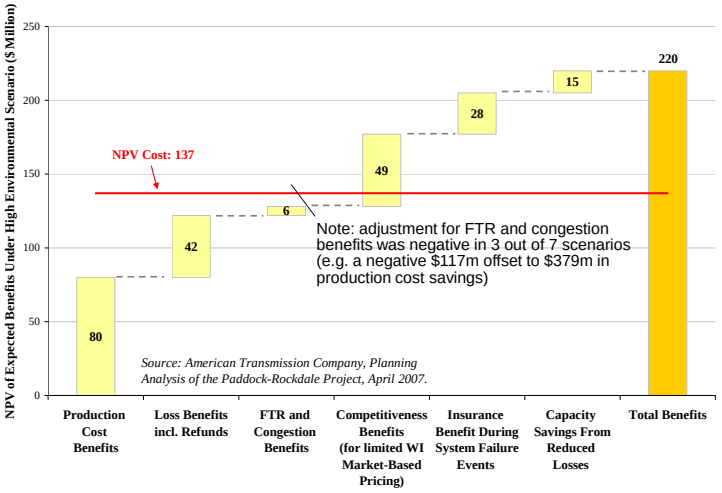
Example: Electricity Market Benefits vs. Costs

ATC's Paddock-Rockdale study: Significant net benefits (production cost savings alone exceeded costs in some scenarios)



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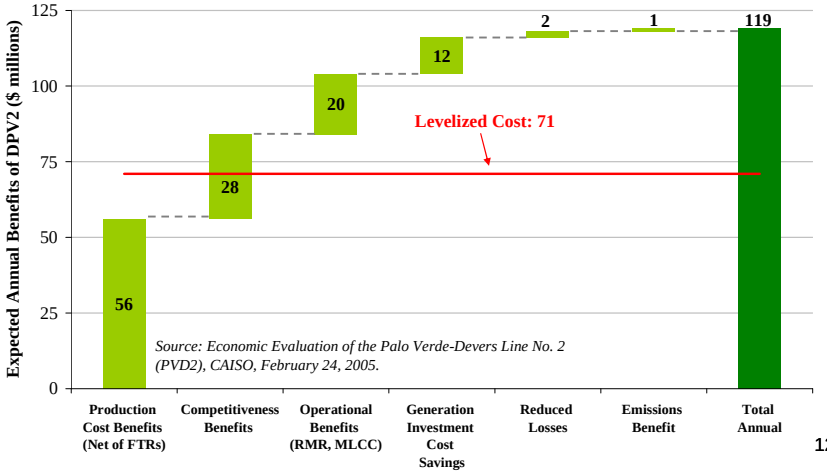
Example: Electricity Market Benefits vs. Costs

Total electricity market benefits of SCE's DPV2 project in CAISO exceeded project costs by more than 50%



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Additional Reading

Pfeifenberger, Hou, *Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada*, on behalf of WIRES, May 2011.

Pfeifenberger, Newell, *Direct testimony on behalf of The AWC Companies re: the Public Policy, Reliability, Congestion Relief, and Economic Benefits of the Atlantic Wind Connection Project*, filed December 20, 2010 in FERC Docket No. EL11-13.

Pfeifenberger, "Transmission Investments and Cost Allocation: What are the Options?" ELCON Fall Workshop, October 26, 2010.

Pfeifenberger, Hou, "*Transmission Planning and Cost Benefit Analysis,*" EUCI Web Conference, September 22, 2010

Pfeifenberger, Chang, Hou, Madjarov, *"Job and Economic Benefits of Transmission and Wind Generation Investments in the SPP Region," The Brattle Group, Inc.*, March 2010.

Pfeifenberger, Newell, *"Evaluating the Economic Benefits of Transmission Investments,"* EUCI's Cost-Effective Transmission Technology Conference, Nashville, TN, May 3, 2007.

Pfeifenberger, Testimony on behalf of Southern California Edison Company re: economic impacts of the proposed Devers-Palo Verde No. 2 transmission line, before the Arizona Power Plant and Transmission Line Siting Committee, Docket No. L-00000A-06-0295-00130, Case No. 130, September and October, 2006.

The Brattle Group **provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governmental agencies around the world.**

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The Workers' Perspective

Jim Hunter

Director, Utility Department

International Brotherhood of Electrical Workers

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About the IBEW

- We represent 720,000 members in the U.S. and Canada.
- Our members install and maintain a majority of the transmission infrastructure in both countries.
- We also work in the manufacturing of cable, transformers and other transmission components.

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Financial/Job Security

- Utility and Line construction jobs cannot be sent overseas.

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Skilled Jobs With Risks

- Line-work is physically demanding, requires people to work outdoors in inclement weather, and high up in the air. Did I say it is very dangerous also?
- Can you imagine grabbing an energized 34,000 volt line with only a pair of gloves on?

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Jobs Also Have Rewards

- The jobs are highly skilled and well paid. The average Utility lineman's salary tops $35 an hour in the U.S. and $33 an hour in Canada.

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Sustained Need for Skilled Labor

- Renewables like wind and solar need transmission lines.
- Wind is being curtailed in Texas due to transmission limitations.

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Serving the Public's Needs

- Transmission lines also provide reliability and security.

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Economic Development from New Transmission and Generation

Eric Lantz
National Renewable Energy Laboratory

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Presentation Overview

1. Background on NREL work in this space
2. Context for transmission and generation development In Wyoming
3. Results from NREL's Wyoming Study

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Transmission Offers an Array of Attributes

- It increases reliability, reduces congestion, and allows access to low cost generation
- By opening up new generation resources, it has the potential to drive down system-wide production costs
- It is important for high penetration renewables deployment
- It reduces renewables integration costs by allowing balancing areas to capture increased geographic diversity
- ***It creates the opportunity for significant new investments in generation***

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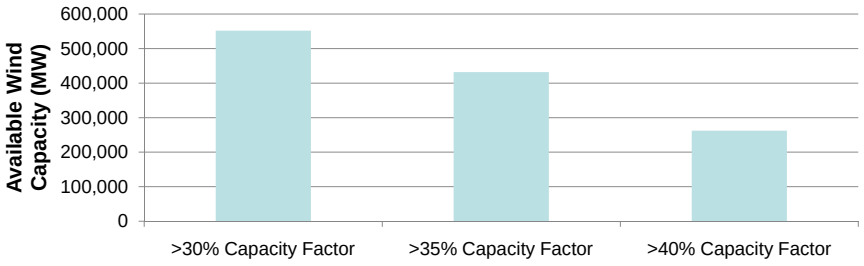
The Wyoming Context



- **In 2008, the U.S. DOE estimated roughly 300 GW would be necessary to supply 20% of U.S. electricity from wind by 2030**
  - ***Wyoming has more than 250 GW with capacity factors above 40%***
- **The DOE Study estimated that 20% wind deployment would support more than 500,000 jobs per year between 2020 – 2030**
- **233 GW out of the total 300 GW of wind added to achieve 20% Wind by 2030 are interconnected to new transmission lines**

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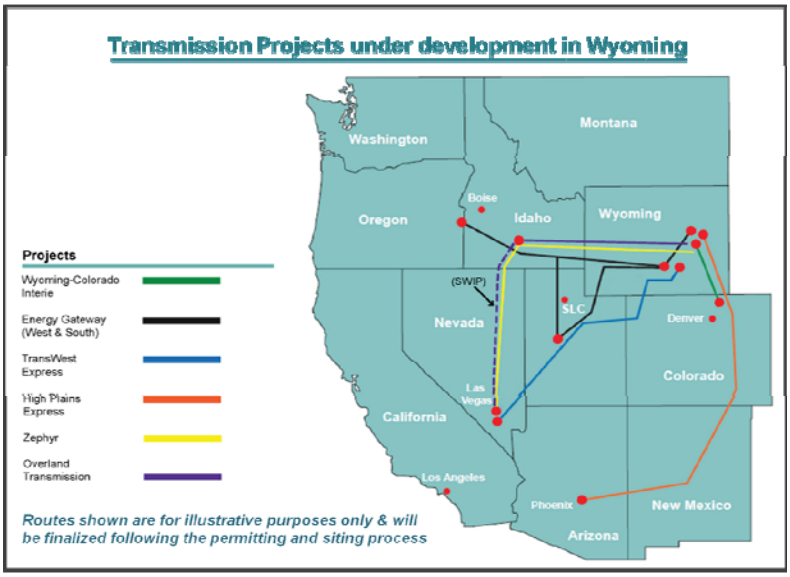
Scope of the NREL Study

- This study considers the question: What if?

  If deployment of new transmission occurs and it allows for significant new power generation, what level of jobs and economic activity might result?

WIA Infrastructure Scenario	*Units Installed*	*Total Installed Cost*	*Annual Operating Expenditures*
Wind Generation	9,000 MW	$18 billion	$225 million
Natural Gas Generation	1,800 MW	$2.3 billion	$42 million
500-kV HVDC Transmission Line	2	$2.2 billion	$60 million
500-kV HVAC Transmission Line	2	$1.3 billion	$35 million
230-kV HVAC Collector System	multiple	$660 million	$17 million

Wyoming Transmission Projects



Source: WIA

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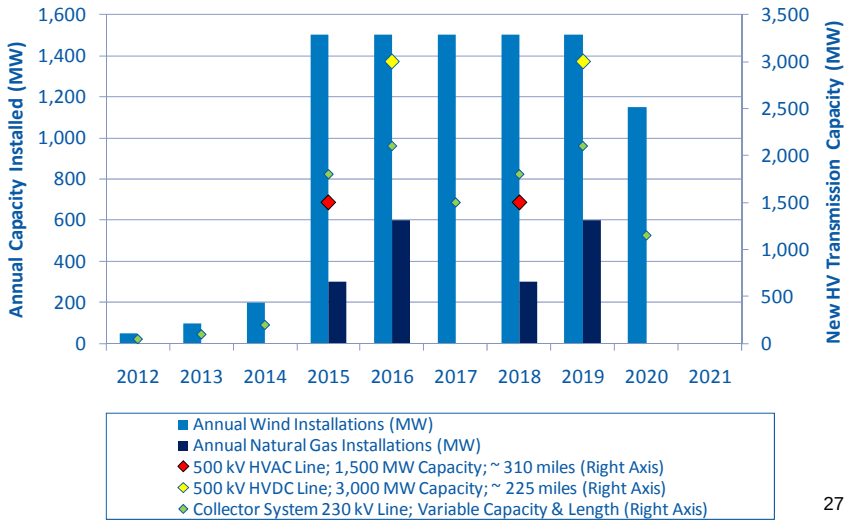
WIA Deployment Scenario (2012 – 2021)



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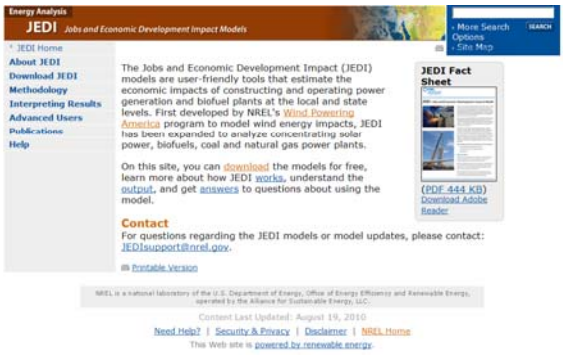
The JEDI Analysis Tools



JEDI is used by industry, government, academics, advocates, consultants, and others.

Currently public
- Utility-Scale Wind
- Natural Gas
- Coal
- Geothermal
- Ethanol
- Solar (CSP, PV)

In process
- Transmission
- Water
- Biopower
- Offshore, small wind

Jobs and Economic Development Impacts (JEDI) Model

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Economic Development at Multiple Levels

1. On-site labor and professional services

2. Equipment production and supply chain

3. Induced economic activity (household purchases due to injection of income)

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Combined Base Case Results

Construction *(Average Annual over 10 Years)*	**Total Jobs**	**Wages ($M)**	**Output ($M)**
Project Development and Onsite Labor	2,100	$140	$160
Equipment and Supply Chain Activity	2,000	$90	$280
Induced Activity	620	$20	$80
Total	**4,700**	**$260**	**$510**

Operations *(Annual for 20 years)*	**Total Jobs**	**Wages ($M)**	**Output ($M)**
Onsite Labor	680	$40	$40
Local Revenue and Supply Chain Activity	1,300	$50	$270
Induced Activity	530	$20	$60
Total	**2,500**	**$110**	**$380**

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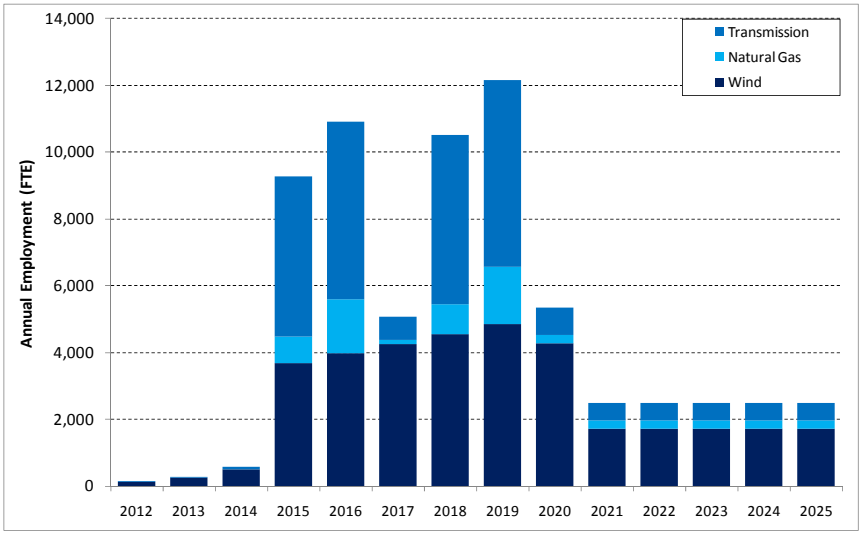
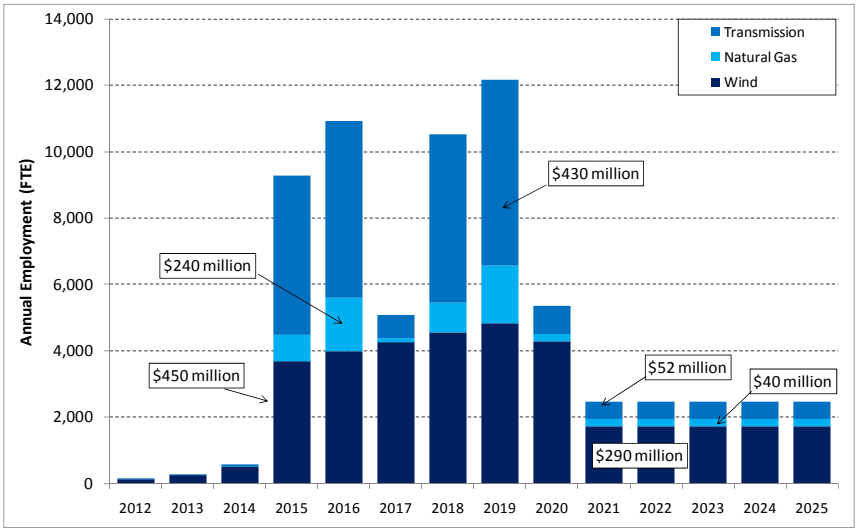
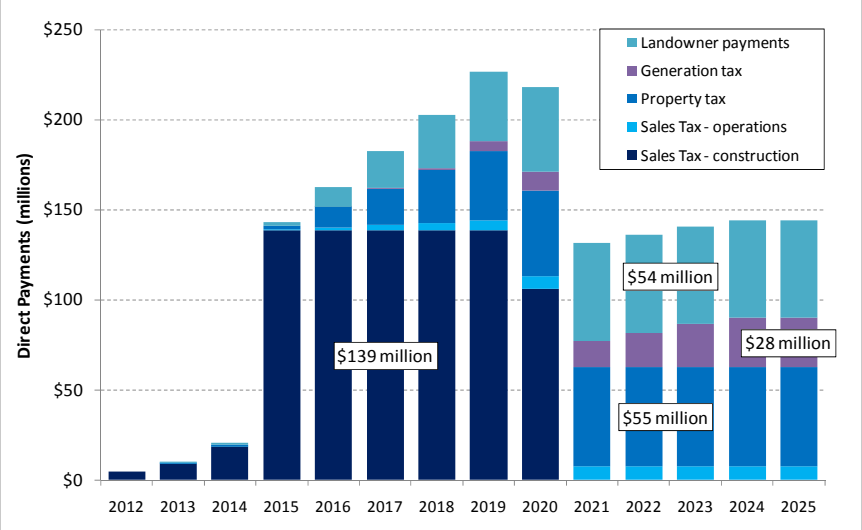
Base Case Employment by Infrastructure Type



Base Case Employment by Infrastructure Type



Wind Direct Payments to Government and Landowners



Wyoming Study Conclusions

- Over the duration of the construction period, an average of 4,000 to 5,900 workers per year are employed as a result of construction-related economic activity.
  - Wages and benefits average $200 million - $330 million per year during construction.
  - **Transmission = 44% of construction period employment**
- Ongoing operation of infrastructure is estimated to employ 2,300 - 2,600 Wyoming workers for at least 20 years.
  - Wages and benefits average $100 million - $120 million per year during operations.
  - **Transmission = 21% of operations period employment**
- Economic output peaks at $1.2 billion in 2016 and $1.4 billion in 2019 before settling to about $380 million per year during operations-only years.
  - ***Transmission = $340 million per year between 2015 and 2019***
    - ***(Construction-period average = $190 million)***
  - ***Transmission = $52 million per year each year of operations (14%)***
  - ***Transmission = 22% of overall total economic output***
- Total Wyoming economic activity from these investments is expected to be on the order of $12 billion - $15 billion (construction plus 20 years of operations).
  - Approximately 30% of total available economic activity

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Selected Literature

- Eastern Wind Integration and Transmission Study (EWITS). http://www.nrel.gov/wind/systemsintegration/ewits.html
- Ela, E.; Kirby, B.; Lannoye, E.; Milligan, M.; Flynn, D.; Zavadil, B.; O'Malley, M. (2011). Evolution of Operating Reserve Determination in Wind Power Integration Studies. 11 pp.; NREL Report No. CP-5500-49100.
- Ela, E.; Milligan, M.; O'Malley, M. (2011). Flexible Power System Operations Simulation Model for Assessing Wind Integration: Preprint. 11 pp.; NREL Report No. CP-5500-50641.
- Lantz, E.; Tegen, S. (2011). Jobs and Economic Development from New Transmission and Generation in Wyoming. 73 pp.; NREL Report No. TP-6A20-50577.
- Lantz, E.; Tegen, S. (2009). Economic Development Impacts of Community Wind Projects: A Review and Empirical Evaluation; Preprint. 29 pp.; NREL Report No. CP-500-45555.
- Lantz, E. (2009). Economic Development Benefits from Wind Energy in Nebraska: A Report for the Nebraska Energy Office (Revised). 33 pp.; NREL Report No. TP-500-44344.
- Reategui, S.; Tegen, S. (2008). Economic Development Impacts of Colorado's First 1000 Megawatts of Wind Energy. 25 pp.; NREL Report No. CP-500-43505.
- Reategui, S. Economic Development Impact of 1,000 MW of Wind Energy in Texas. ; NREL Report No. TP-6A20-50400.
- Western Wind and Solar Integration Study (WWSIS). http://www.nrel.gov/wind/systemsintegration/wwsis.html

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Thank You

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Transmission Jobs From The Ground Up

Randy Fordice
Project Communications Specialist
Great River Energy and CapX2020

www.CapX2020.com

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What is CapX2020?

- Collaborative of 11 load-serving utilities in Minnesota and the surrounding region to jointly study, plan, develop, and build the necessary transmission in our footprint
- Transmission planning in an open and transparent manner
- Actively engaging the public, regulators, local and state officials
- 700 miles of new transmission infrastructure
- $1.9 billion investment

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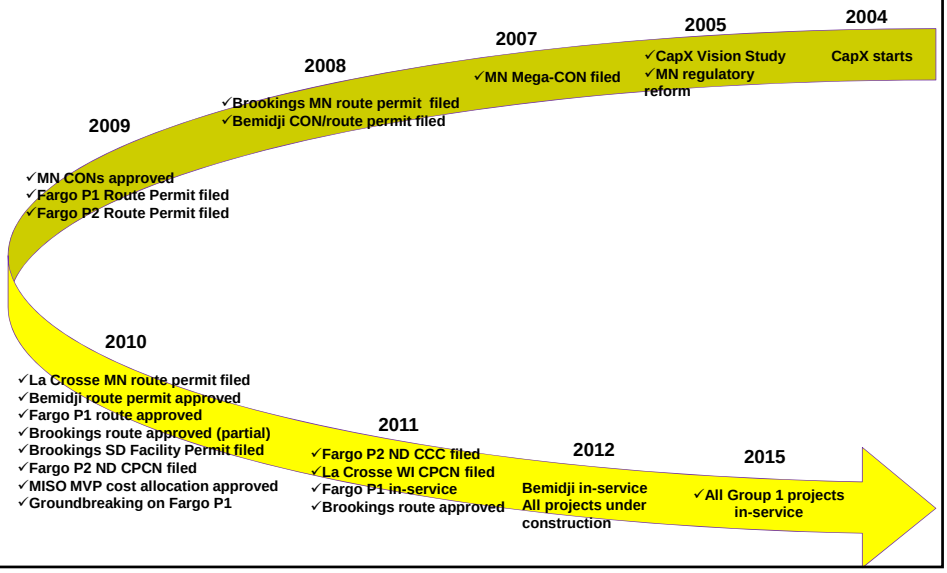
Who are the CapX2020 utilities?

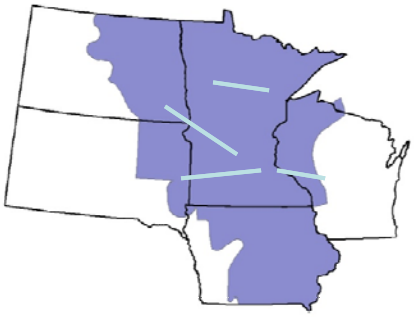
- Diverse group: cooperatives, municipals, investor-owned
- Serve nearly 5.5 million customers
- Serve Minnesota, Dakotas, Wisconsin
- 42,000+ miles of transmission lines
- Industry leaders in reliability

- Central Minnesota Municipal Power Agency
- Dairyland Power Cooperative
- Great River Energy
- Minnesota Power
- Minnkota Power Cooperative
- Missouri River Energy Services
- Otter Tail Power
- Rochester Public Utilities
- Southern Minnesota Municipal Power Agency
- WPPI Energy
- Xcel Energy

CapX2020 Timeline



CapX2020 Group 1 projects
Building a solid foundation



Nearly 700 miles and $1.7 billion Upsizing adds about $200 million	
Monticello-St. Cloud	28 miles 345 kV
Fargo-St. Cloud	210 miles 345 kV
Brookings County-Hampton	240 miles 345 kV
Hampton-Rochester-La Crosse	150 miles 345 kV
Bemidji-Grand Rapids	70 miles 230 kV

- Alleviates emerging community service reliability concerns around the state
- Critical foundation for future transmission and generation
- Provide needed transmission capacity to support new generation outlet
- In-service dates from 2011-2015

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CapX2020: Status of projects

Project	Miles	kV	Recent milestones	Upcoming	Final in-service
Monticello-St. Cloud	28	345	Under construction		Late 2011
Hampton-Rochester-La Crosse	150 30	345 161	MN Route Permit application filed	Filed WI CPCN in Dec. 2010	2015
Brookings County-Hampton	240	345	MN and SD Route Permits approved	Design/engineering, construction	2015
Fargo-St. Cloud	210	345	MN Route Permit approved	File ND route permit in 2011	2015
Bemidji-Grand Rapids	68	230	MN PUC granted Route Permit Oct. 2010	Construction started February 2011	2013

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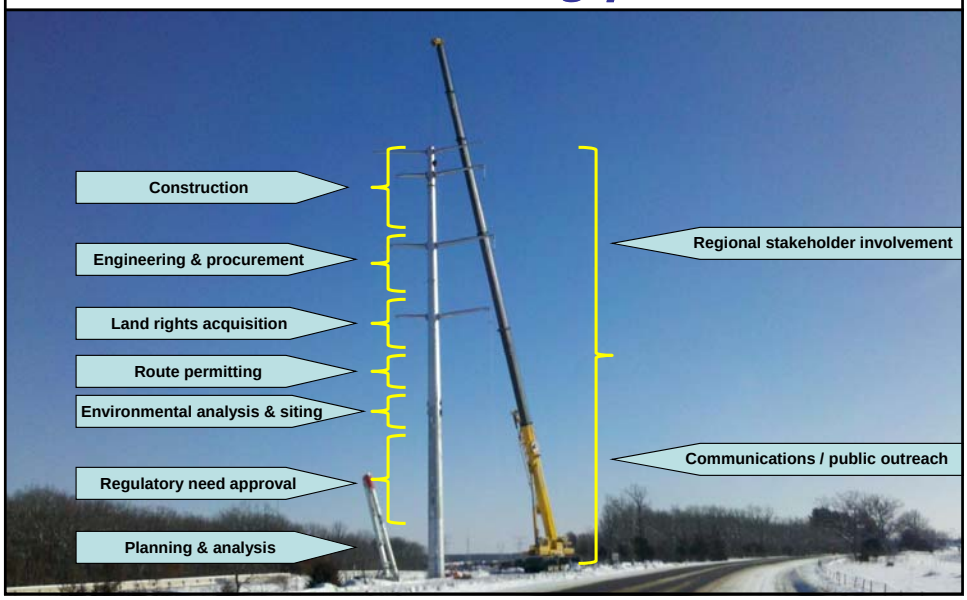
Transmission Development
A decade-long process



CapX2020 Economic Impact Study

- Preliminary results demonstrate significant regional economic benefits from $1.9 billion construction project
  - Nearly 8,000 jobs created at construction peaks (2013)
  - $1.93 returned to economy for each dollar spent on construction activity
  - $3.4 B in sales generated from projects, according to economic multipliers
  - $150 M tax revenue (federal and state payroll)
- Job projections by year:
  - 2010: 571
  - 2011: 2257
  - 2012: 4580
  - 2013: 7802
  - 2014: 5907
  - 2015: 2425

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Transmission line in view

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Unique construction—environmental protection

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Workers and material

•700 miles of transmission infrastructure
•5 structures per mile
•40-60 feet deep
•Rebar cage
•Concrete fill
•150-foot tall single pole tower

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Significant media coverage

- "But CapX2020 is one of very few bright spots dotting Minnesota's construction landscape…So for now, CapX2020 is powering construction jobs"
- "Ripple effects from the project already touch cement mixers in Monticello, rebar fabricators in Minneapolis, river barge operators…and a host of truckers, excavators and tree choppers."


businessinsider

An Xcel Energy power-line project is one of the few bright spots for Minnesota's slumping construction industry.

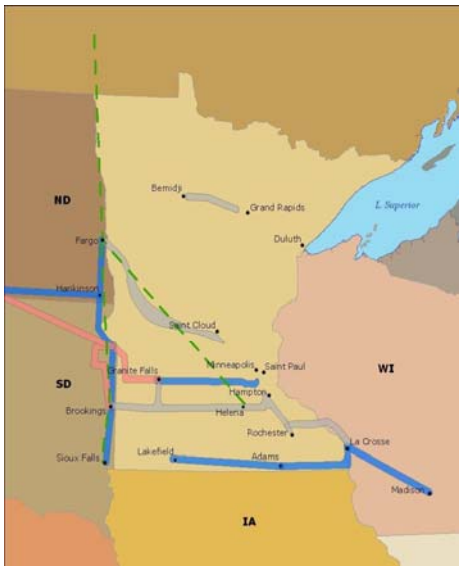
THE LONG ROAD BACK

Local businesses, local jobs

- AME Red-i-Mix (Monticello): I told the guys, 'Yahoo! We are going to keep going this winter!'"
- "A lot of our drivers have been laid off…but this job is putting a lot of guys to work"—Gary Dreier
- Ambassador Steel (Minneapolis) ironworker Mike McCone: "How blessed it is to have a job."

Upper Midwest future

Staged development targets wind-rich areas



- Transmission studies identify opportunities
  - MN RES
  - Manitoba Hydro Transmission Service Request
  - SMARTransmission
  - RGOS
  - UMTDI
  - SD Wind Energy Association
  - MISO Starter Projects
  - Western WI Reliability
- In-service time dependent upon RES targets and resource plans
- Actual expansion will reflect integrated system needs and regional/national energy policies

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Closing
Jim Hoecker

Themes To Think About

- The transmission system is:
  - A massive, highly integrated machine
  - A basic component of a vibrant economy
  - A contribution to employment directly (construction and manufacturing) and indirectly (generation development)
- Today's challenges to investment:
  - Planning
  - Cost recovery
  - Cost allocation
  - Siting

Questions? Contact us at www.wiresgroup.com

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Contact Our Faculty

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