

Renewable Energy and Carbon Goals: The Utility Connection

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Agenda

- Xcel Energy Overview
- Bold, New Vision
- Customer Options
- Electric Vehicles
- Community Partnership
- Utility Perspective

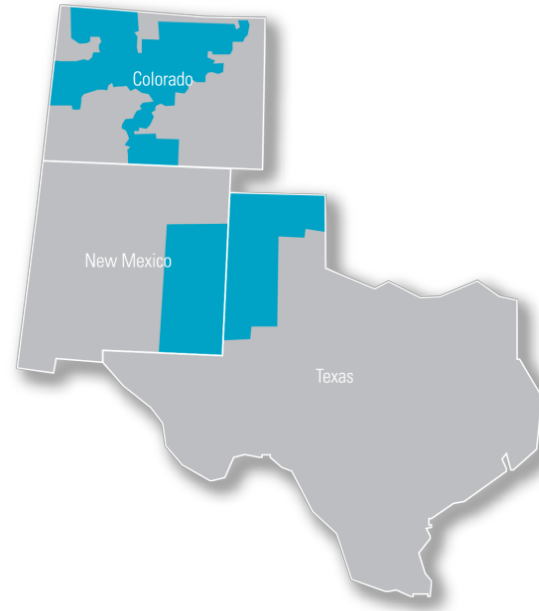
Xcel Energy

Serving eight states

- 3.6 million electricity customers
- 2 million natural gas customers

Nationally recognized leader:

- Wind energy
- Energy efficiency
- Carbon emissions reductions
- Innovative technology
- Storm restoration efforts
- Veteran hiring



Wisconsin Commitment

- Communities served: **213**
- Electric customers: **250,000**
- Natural gas customers: **109,000**
- Electric Reliability: **99.9%**
- Employees & contractors: **1,000+**
- Volunteer hours: **1,100+ annually**
- Community giving: **\$1 million annually**
- Annual spending in Wisconsin: **\$229 million with local suppliers**
- Renewable energy provider in state: **#1**



Xcel Energy Priorities



Lead the Clean
Energy Transition



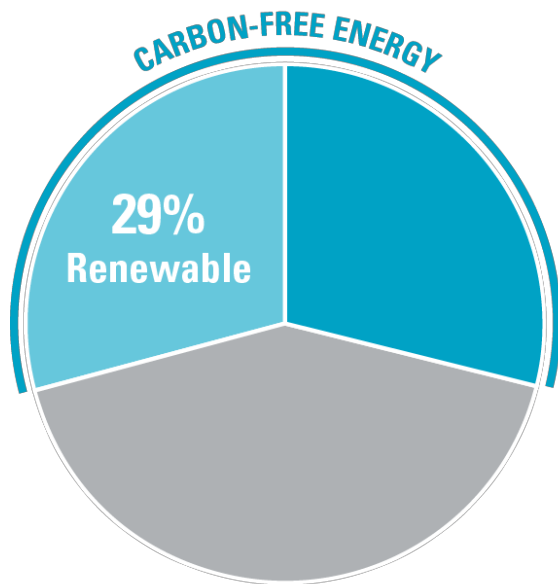
Enhance the
Customer Experience



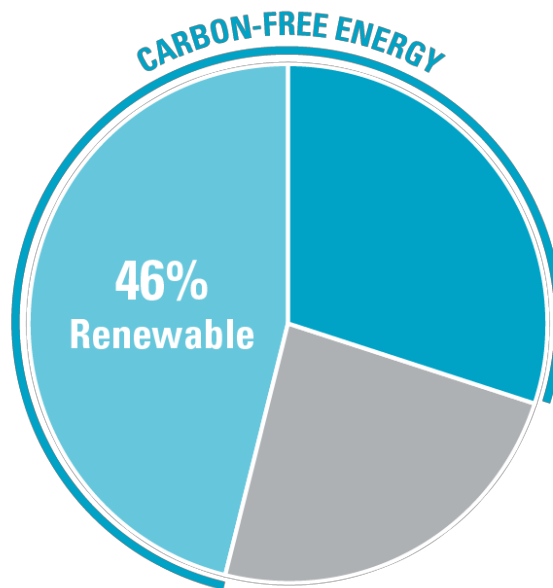
Keep Bills Low

Xcel Energy's Clean Energy Plans

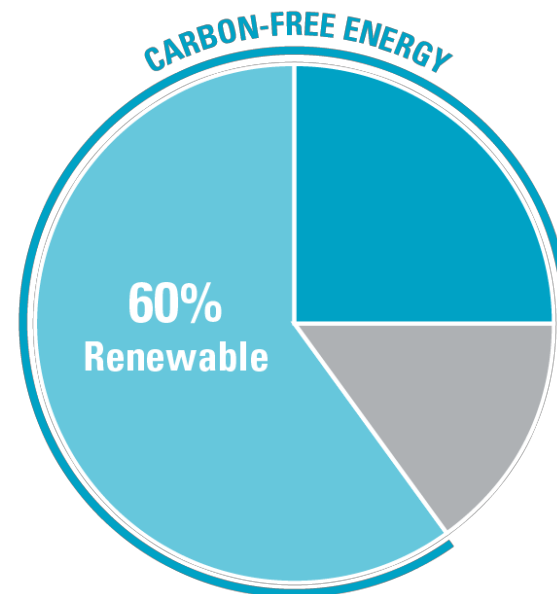
Today



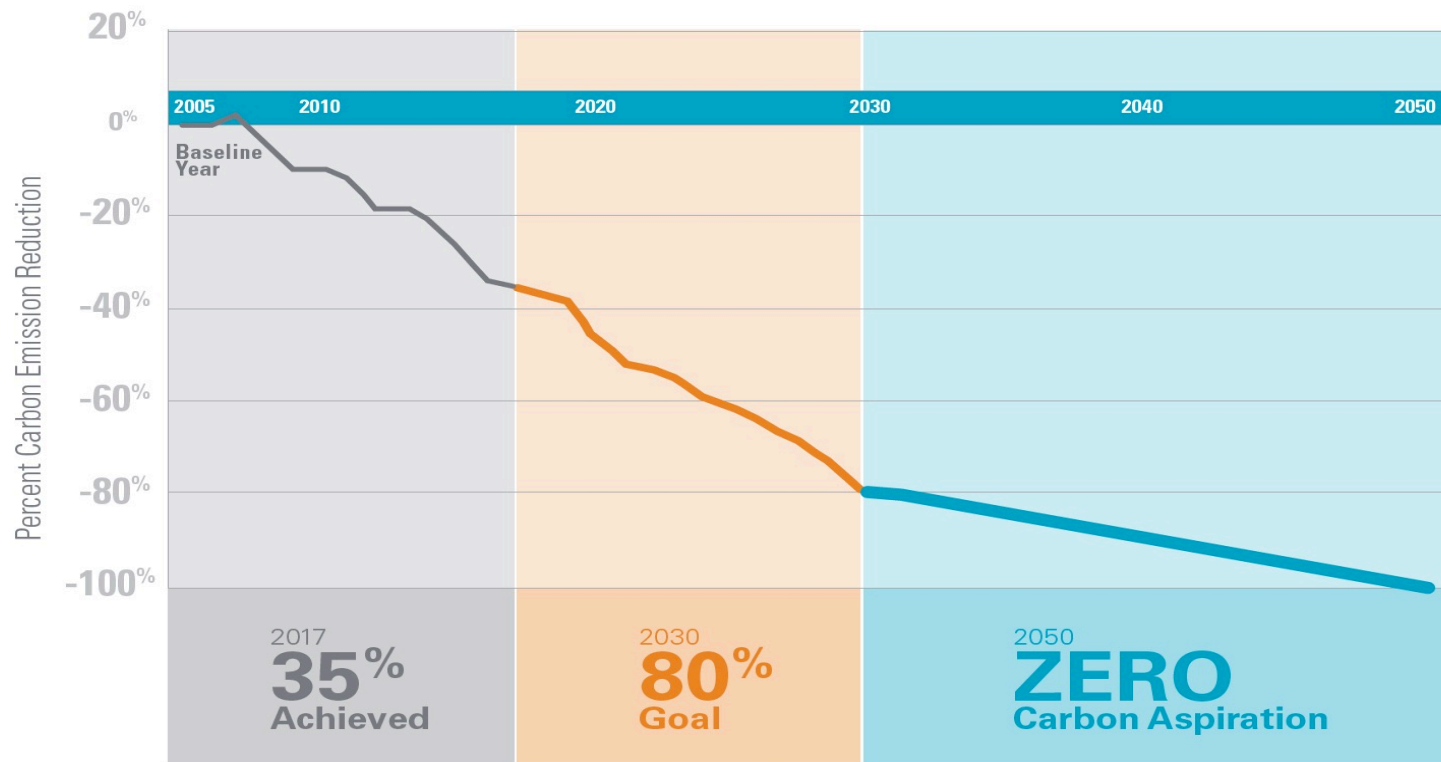
By 2022



By 2030



Bold, New Vision for 2030 and 2050



Solar*Connect Community



- Three 1,000-kW (1-MW) gardens
 - Eau Claire: Energized 2017
 - Cashton: Expected Jan 2019
 - Ashland: Expected June 2019
- Initial Cost: \$1,600 per kilowatt
- Bill credits for 25 years
- Almost 100% subscribed!



Eau Claire Solar*Connect Community

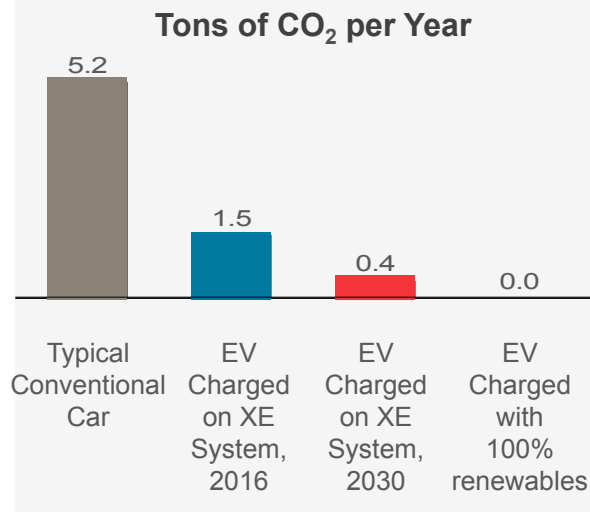
Renewable*Connect

- New program option in Wisconsin
 - PSCW approval December 2018
 - Available early 2019
- Dedicated wind and solar resources
- Customer control
 - Convenient way to meet sustainability goals
 - Choose amount of energy and subscription length
- Plan to build a new solar facility in Wisconsin to serve this program in future



Transportation Electrification

Significant emission reductions



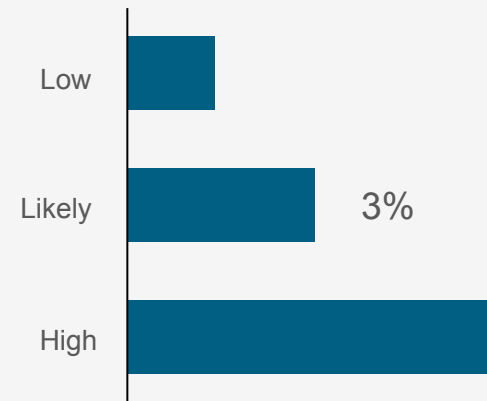
Source: Xcel Energy Analysis

Creating awareness of electrification

- Trusted information and advisors
- Cost of charging infrastructure
- Providing access to charging
- Analytics on fleet alternatives
- Evaluating rate options to charge when energy costs are lowest

Lower rates through increased sales

Share of Load by 2030 by EV Adoption Scenario



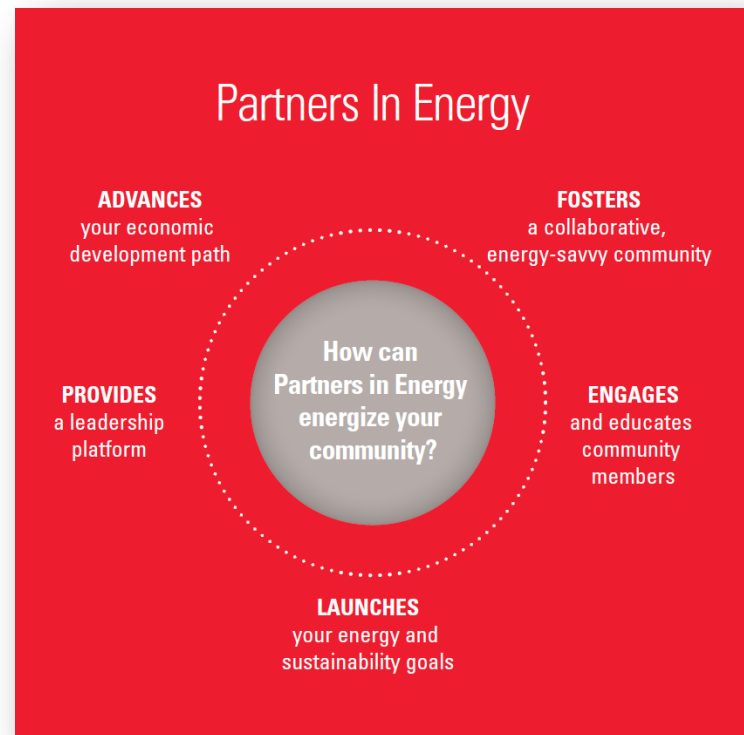
Electric Vehicle Support

- Fleet Advisory Services
 - Xcel Energy grant to communities
 - Make informed choices about electrifying fleets
 - Several communities participating
- Ride & Drive Events
- Rate Options
 - Education on time-of-day rate for EV charging
 - Evaluating future rate & infrastructure options



Eau Claire: 2019 Partners in Energy

- Collaborate with communities to develop and implement their energy plan goals
 - Planning phase
 - Implementation phase
 - Assistance with energy data
 - Incorporate with existing programs for even greater savings
- Award winning in Minnesota and Colorado
- City of Eau Claire first in Wisconsin
 - Grant from state Office of Energy Innovation

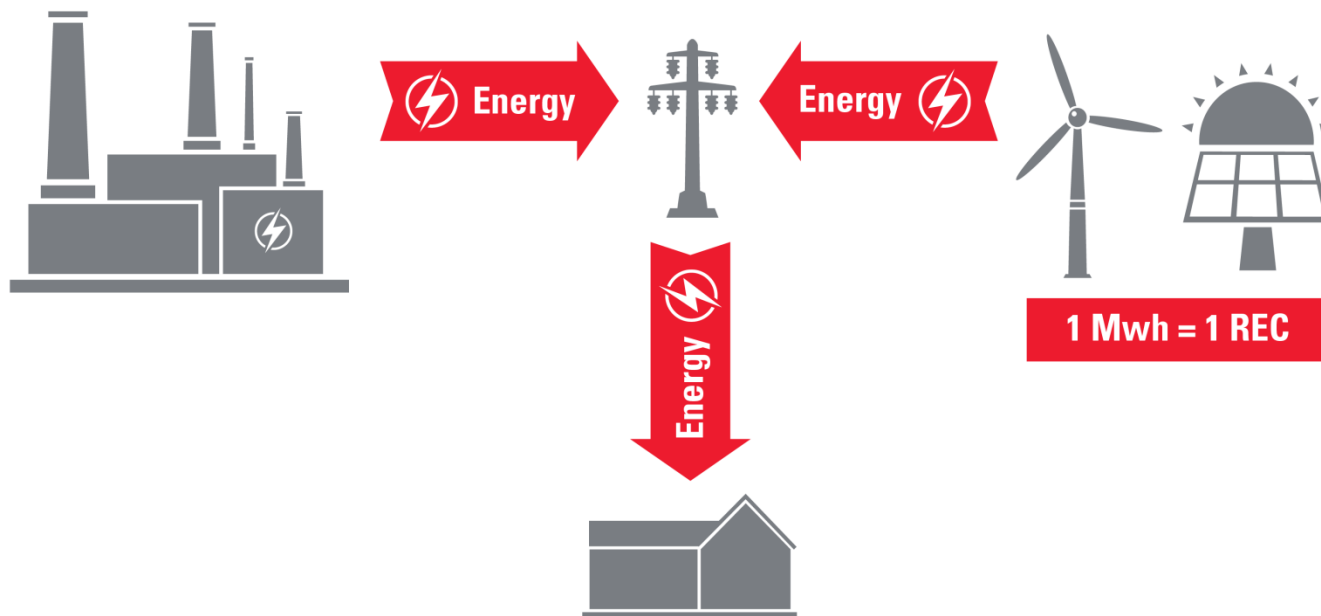


Renewable Energy Goal Considerations

- CO₂ accounting: as utility systems get cleaner, customers can automatically take credit
- REC accounting: more complex
 - Used for RPS compliance and voluntary green pricing programs
 - Customers using solar want to take credit but sometimes don't hold RECs
 - Xcel Energy plans to allow grid RE as starting point through new initiative

Region	2016		2017	
	CO ₂ Intensity (mt/MWh)	CO ₂ Intensity lbs/MWh	CO ₂ Intensity (mt/MWh)	CO ₂ Intensity lbs/MWh
Upper Midwest (Michigan, Minnesota, North Dakota, South Dakota, Wisconsin)	0.371	817	0.372	820
Colorado	0.609	1,343	0.593	1,308
Southwest (Texas, New Mexico)	0.584	1,287	0.586	1,293

Renewable Energy Certificates (REC's)



A REC serves as “proof” that 1 Mwh of renewable energy was generated and can be purchased separate from electrical service.

Deep Decarbonization Pathways

- 100% Renewable Energy vs. 100% Carbon Neutral Goals
 - Large customers – cities – states – the “big grid”
- Differences & challenges
- How to address other major emitting sectors
 - Transportation, buildings, industry, agriculture, etc.
 - Electrify everything?
 - Cost effectiveness is key

100% Renewable: At what scale?

- Your house → Solar*Connect Community, Renewable*Connect, etc.
- A large corporate customer → Renewable*Connect, on-site solar, solar garden
- A city → still feasible, especially if means City Government operations
- A state?
- The whole grid?

→ The public cares about cost, seems to accept a gradual approach

100% renewable electric system challenges

- Renewable “overbuild” – installed capacity 3-5x peak demand
- Declining capacity and fuel-saving value
- Need some dispatchable generation to address peaks, ramps, seasonal imbalances
- Days to weeks, not hours, of storage
- Curtailment and/or massive storage investment
- Transmission investment
- Very low utilization
- Land impacts



Duke Energy's Monroe Solar project – 60 MW; 2017 Climate Report to Shareholders

Bold, New Vision for 2030 and 2050

