

# Xcel Energy Integrated Resource Planning

*February 2020*



# Topics

- Integrated Resource Plan (IRP) Purpose, Process, Objectives
- Stakeholder Involvement and Regulatory Process
- Generation Options & Economics
- Upper Midwest 2020-2034 Preferred Plan

# What is the IRP?

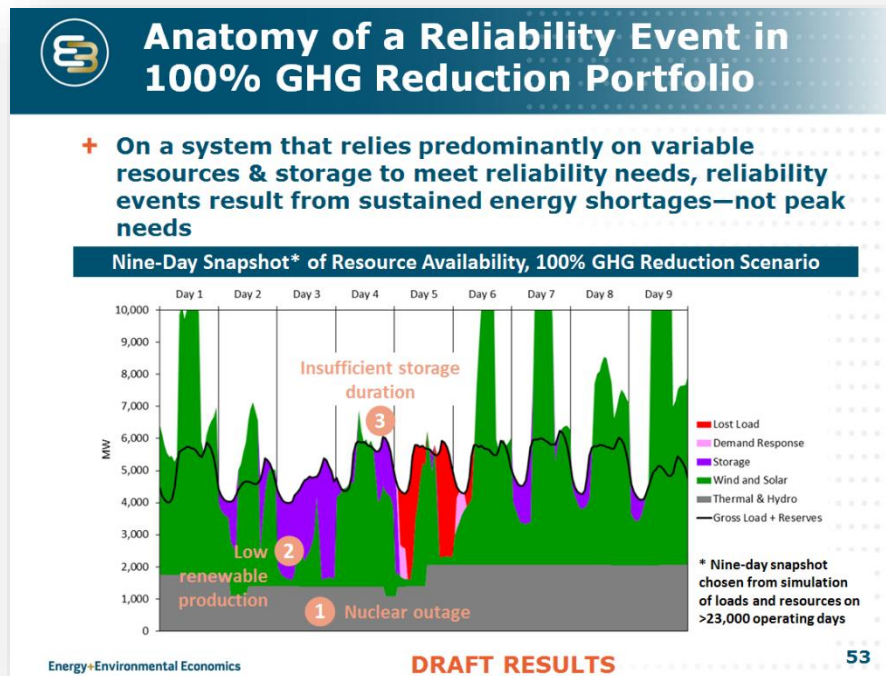
## Capacity Needs (Peak Hour)



- Traditionally, planning to meet capacity needs in least cost manner
- Identify new resource size, type, timing
- Transition to renewables is driving major changes

# How is Planning Evolving?

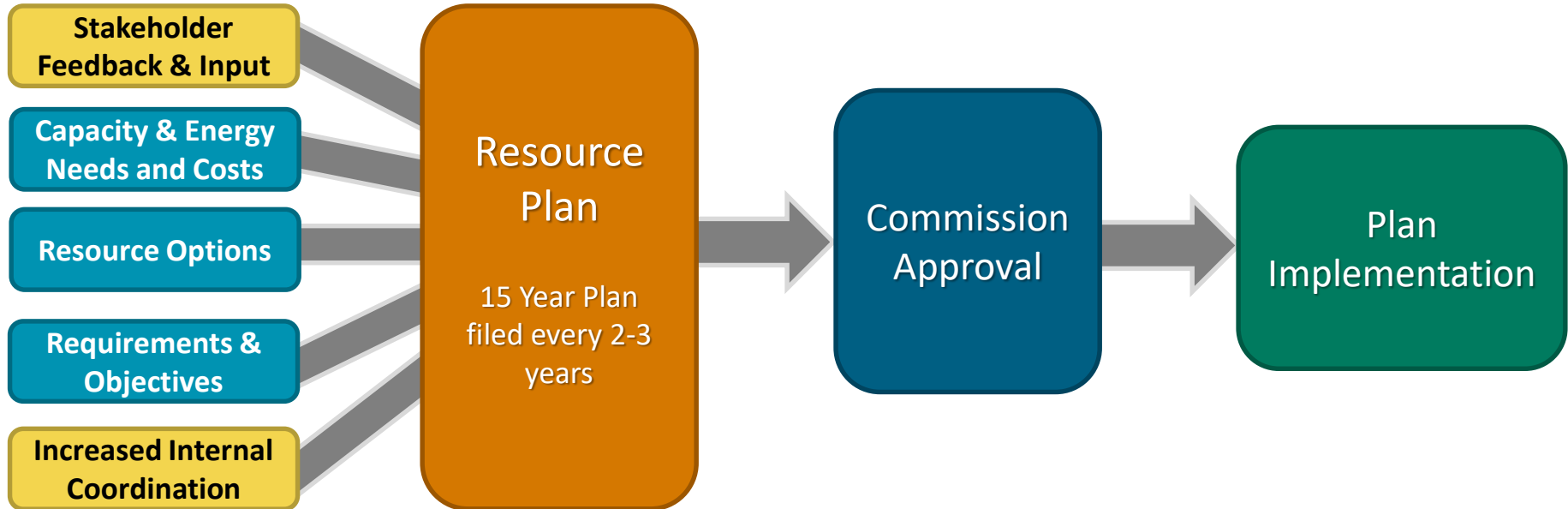
## Energy Needs (All Hours)



- Shift to renewables requires greater focus on all hourly energy needs (not just peak hour)
- Growing levels of intermittent renewables, decreasing levels of dispatchable generation presents load & resource balancing challenges

# How is the Process Evolving?

Increased focus on front end coordination with internal & external stakeholders



# IRP Objectives

Our goal is to strike a balance between key priorities



# Stakeholder Engagement



Workshops



Surveys



Host Communities

# Next Steps



Process to Date:  
13 Intervenors  
520+ Information Requests  
100s of Public Comments





# Modeling Inputs & Process

## Key Input Assumptions

Including

- Load Forecasts & MISO Reserve Requirements
  - Distributed Generation Forecasts
  - Electrification Impact Forecasts
- Market Energy & Fuel Price Forecasts
- Existing Generation Resource Costs/Characteristics
- New Generation Resource Price Forecasts
- Transmission Interconnection/Upgrade Costs
- Cost of Capital/Discount Rates
- Inflation Rates
- Carbon & externality Costs
- Demand Side Management Costs/Options
- Renewable Integration & Congestion Costs



## Utility Modeling

Modeling Objectives:

- Identify least cost generation portfolio plans
- Explore options for existing generation resources
- Identify optimal future resource additions to meet customer needs
- Evaluate risks with sensitivities/scenario analysis
- Cost, risk, emission, reliability metrics inform selection of a Preferred Plan

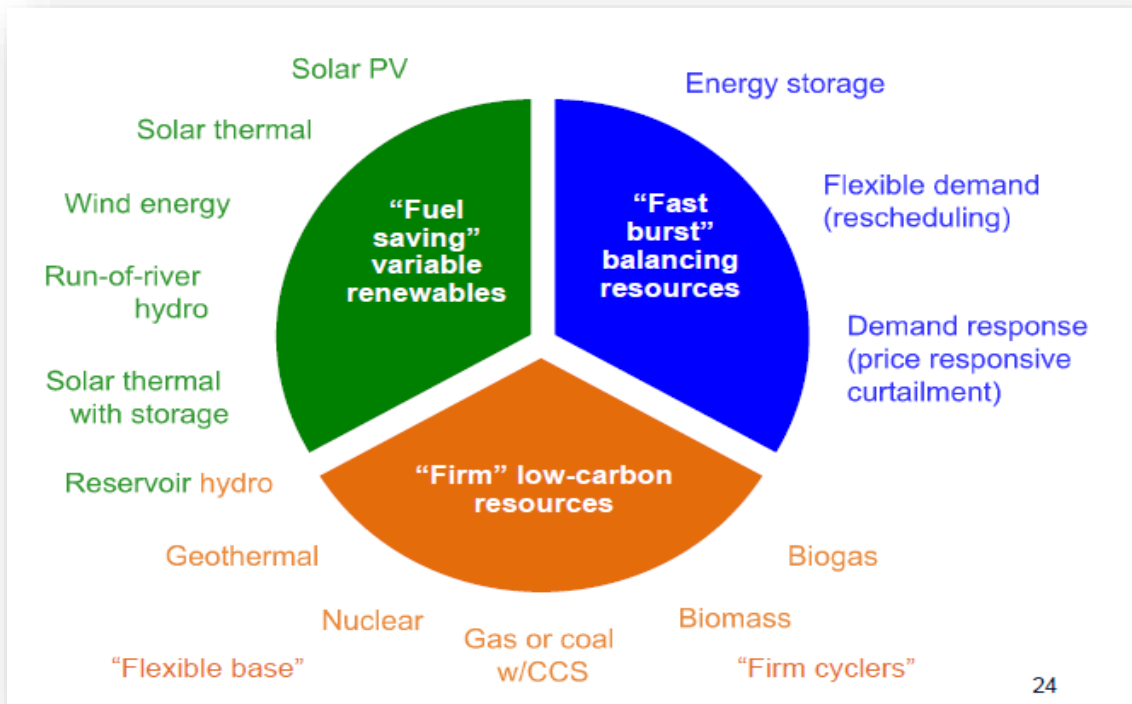


## Preferred Resource Plan

- 15 Year Preferred Plan for the 2020-2034 Planning Period

# Resource Options & Diversity

New generation resource options can generally be grouped into three categories



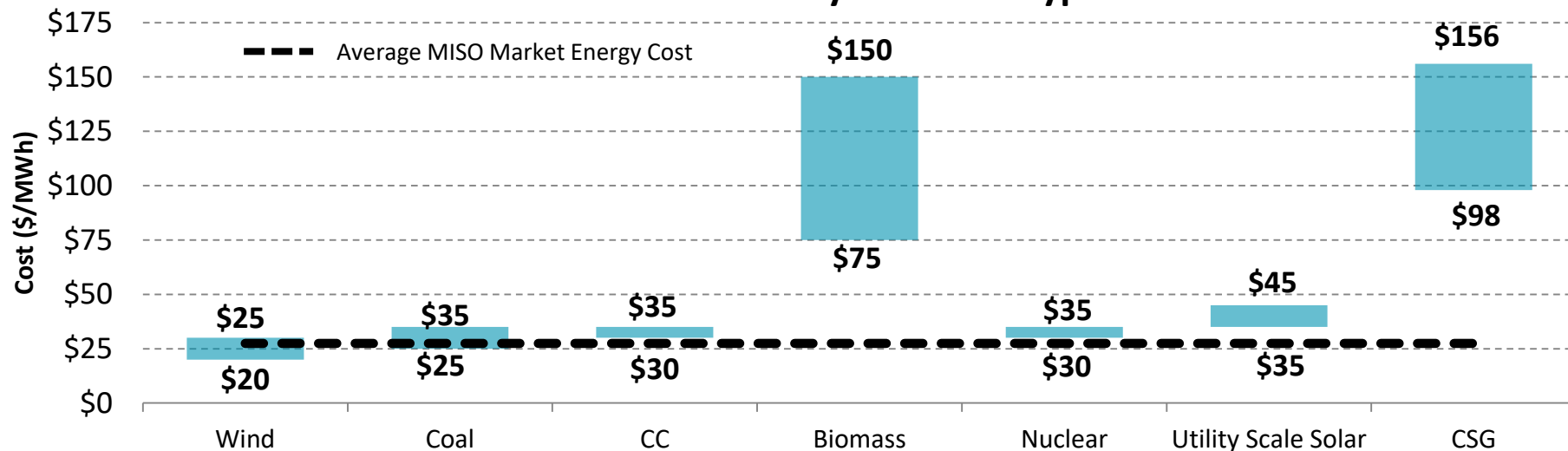
- Portfolio diversity is important
- "Firm" low-carbon resources including gas CTs and CCs are necessary components of the electric system

# Current Generation Resource Economics



Utility scale renewables have become least cost options

## Production Costs by Resource Type

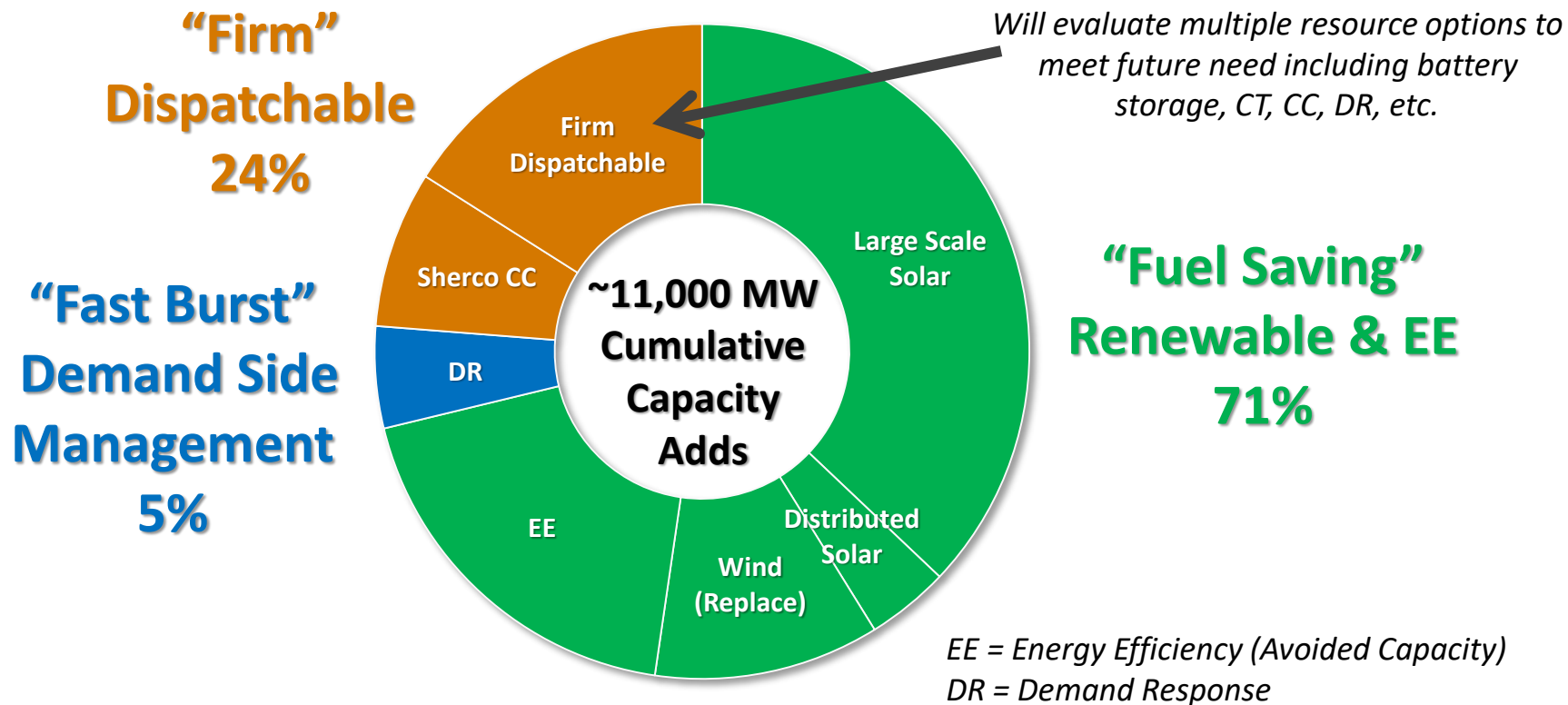


Production Cost = Fuel plus Operating & Maintenance Costs, CSG = Community Solar Gardens, CC = Natural Gas Combined Cycle  
Wind & Solar Costs represent current estimated range for power purchase agreements (non-owned resources)  
Sources: SNL Financial Power Plant Benchmarking Report 2018 values, Internal Xcel Energy Information

# Preferred Plan Key Components

Resource	Plan Detail
Nuclear	Extend Monti from 2030 to 2040, Prairie Island Units (PI) to current end of life (2033, 2034) Question of PI extension addressed in next IRP
Coal	Early King retirement (2028), Early Sherco 3 retirement (2030)
Gas CC	Mankato CC acquisition included, Sherco CC included
Firm Peaking	~1,700 MW of cumulative firm peaking (CT, pumped hydro, battery storage, DR, etc) additions by 2034 (first in 2031)
Wind	1,202 MW of cumulative wind replacement by 2034
Solar	4,000 MW of cumulative utility scale (first in 2025), ~450 MW distributed solar additions by 2034
DSM (EE & DR)	2 out of 3 EE bundles (~2,000 MW avoided peak demand by 2034) 1 out of 3 incremental DR bundles (~550 MW of incremental DR resources by 2034)

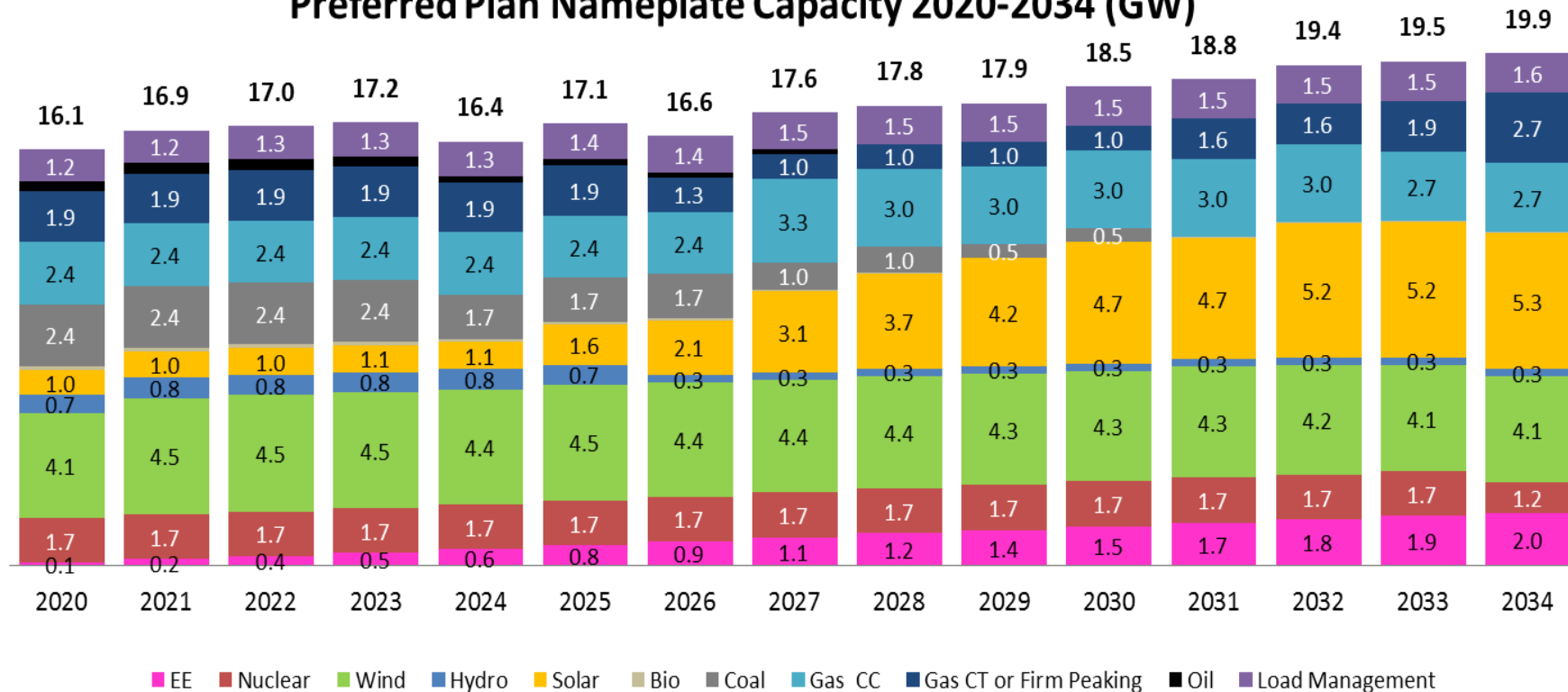
# Cumulative 2020-34 Resource Adds



# Final Preferred Plan Capacity Overview



Preferred Plan Nameplate Capacity 2020-2034 (GW)



# 100% Renewable Challenges



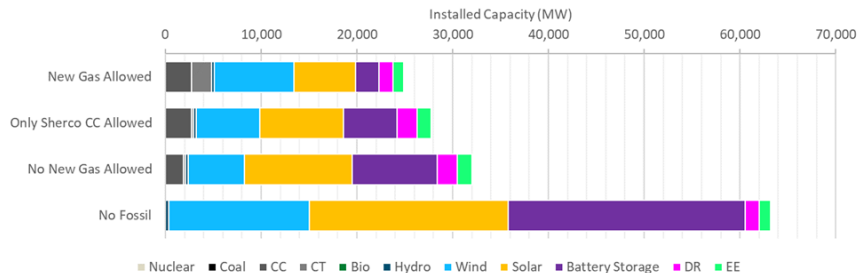
## Meeting Reliability Needs without Gas Resources

- + In the absence of dispatchable gas and coal resources, significant new investment in renewables and storage are needed for reliability

- 36 GW of wind and solar
- 24 GW of 5-hr storage
- +\$4.4 billion/yr in incremental fixed costs

- + Results in sharply exponential cost increase to achieve final 5% GHG reductions

Portfolio Snapshot: 2045 Total Installed Capacity



Energy+Environmental Economics

52

- Natural gas resources are necessary to maintain reliability & keep costs down
- Eliminating all fossil resources would drive a quadrupling of our portfolio size
  - 2019: ~14 GW gen capacity
  - 2045: >60 GW gen capacity

**\$4.4 billion per year  
Incremental Fixed Costs**

# E3 Key Conclusions



## Key Conclusions

### 1. Early retirement of coal generation resources provides the lowest cost pathway to meet 2030 emissions reduction goals

- Coal generation produces approximately 85% of Xcel's GHG emissions in the 2020 Reference case
- Capacity and energy from existing coal plants can be replaced at relatively low cost with a portfolio of efficiency, renewables, storage, and natural gas

### 2. A diverse portfolio of resources—including nuclear—offers the least-cost pathway to deep carbon reductions

- Relicensing both nuclear plants will help Xcel meet its 2050 GHG goals while also ensuring a reliable system
- Meeting all reliability needs with a combination of wind, solar, and storage will require prohibitively large investments

### 3. Natural gas plants will be useful to ensure a reliable system, and will operate at low capacity factors

- Wind, solar, storage and demand response are limited in their ability to provide effective capacity
- Disallowing new gas investment drives up the cost of the system while generating the same amount of GHG emissions
- Between 2,000 and 4,000 MW of new gas resources are selected by 2045 when allowed as part of a least-cost portfolio to meet greenhouse gas goals



