MISO and Long Range Transmission Planning

Minnesota House of Representatives
Climate and Energy Finance and Policy Committee

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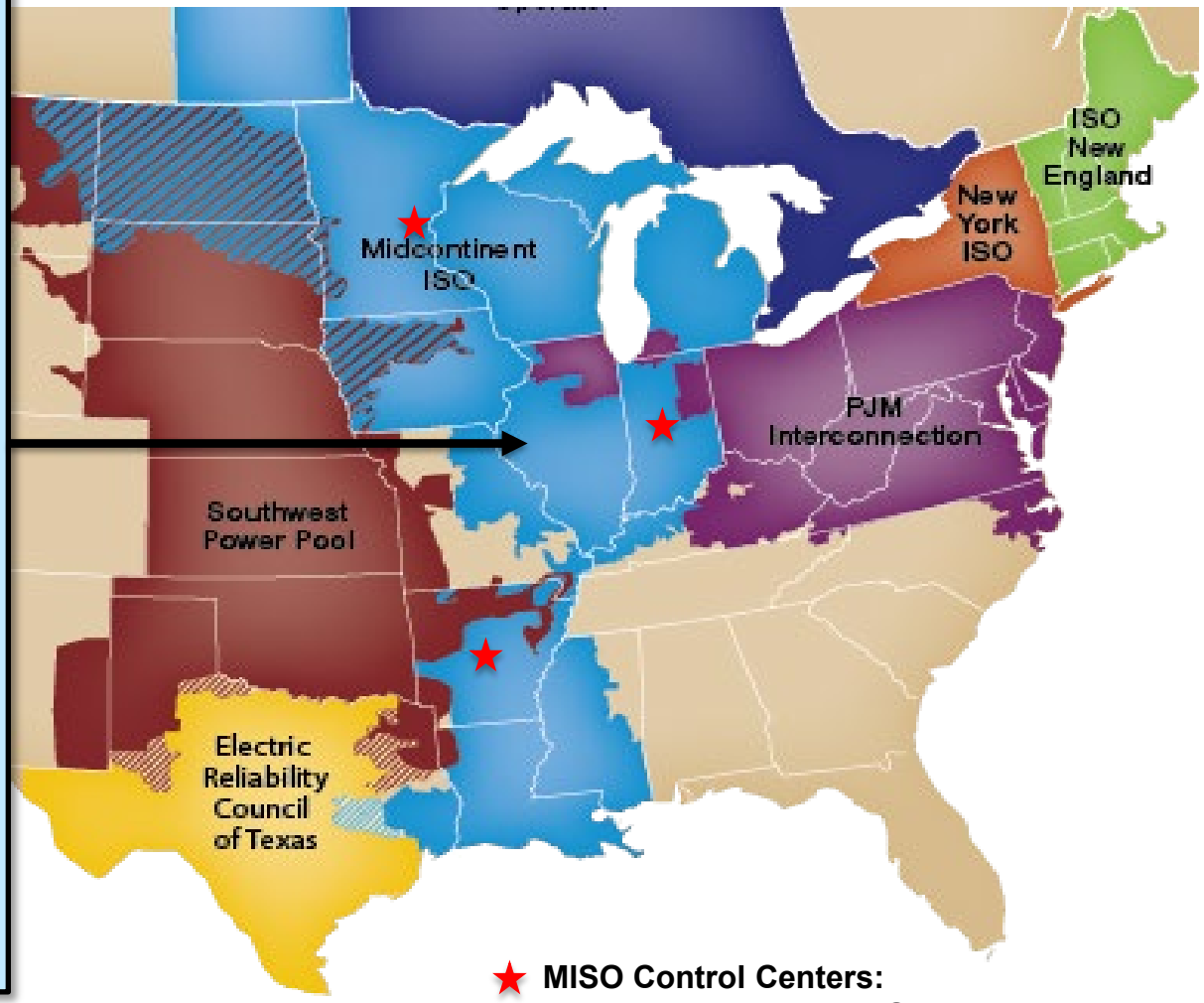
MISO & neighboring U.S. electric grid operators

MISO
(Midcontinent Independent System Operator)

- 15 states + Manitoba
- 42 million customers
- $25 - 30 billion annual market
- > 6,600 generation units with 175,000 MW of capacity
- 68,500 miles of high voltage transmission lines
- > 190 member utilities
- > 460 market participants



What does MISO do?

1. Efficient Wholesale Market Management & Operations to Ensure Reliability

- Conduct day-ahead and real-time energy and operating reserves markets
- Manage least-cost, economic dispatch of generation units
- Monitor and schedule energy transfers on the high voltage transmission system

2. Comprehensive Regional Transmission Planning

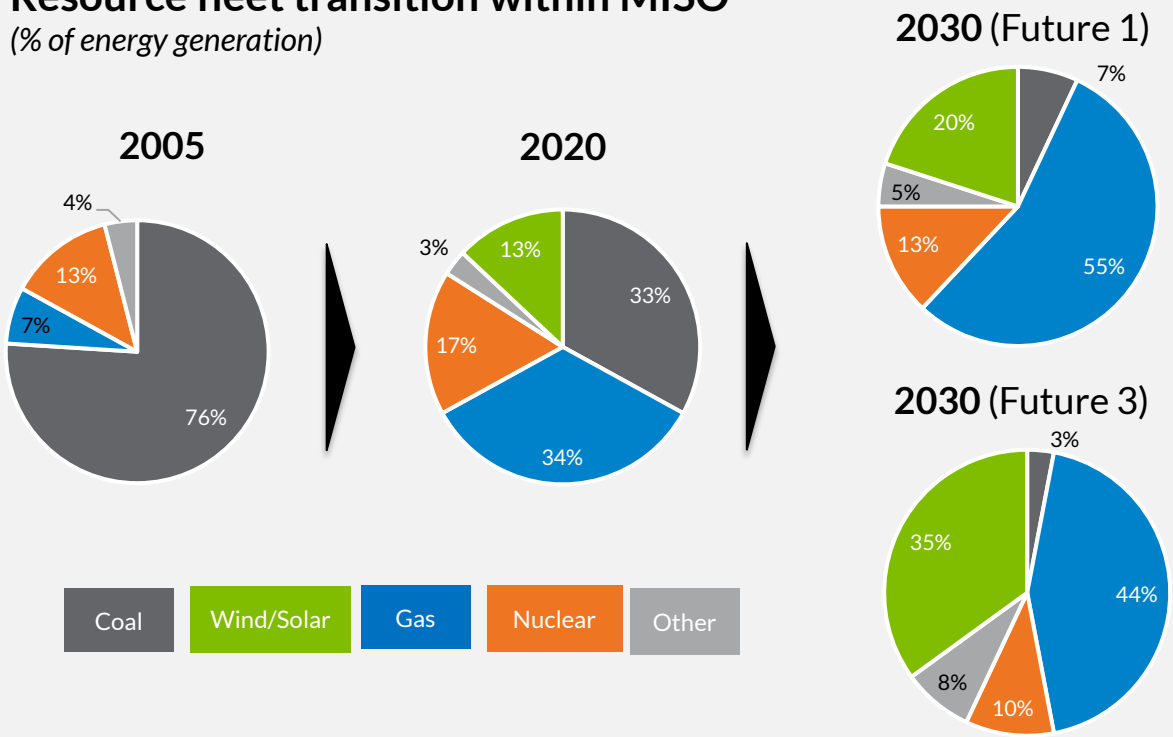
- Long-range transmission planning
- New generator interconnection and retirement
- Long-range studies, such as Renewable Integration Impact Assessment (RIIA)

MISO's Vision: Be the most reliable, value-creating RTO

MISO's actions as part of the Reliability Imperative address emerging needs on the system as member resource fleets evolve

Resource fleet transition within MISO

(% of energy generation)

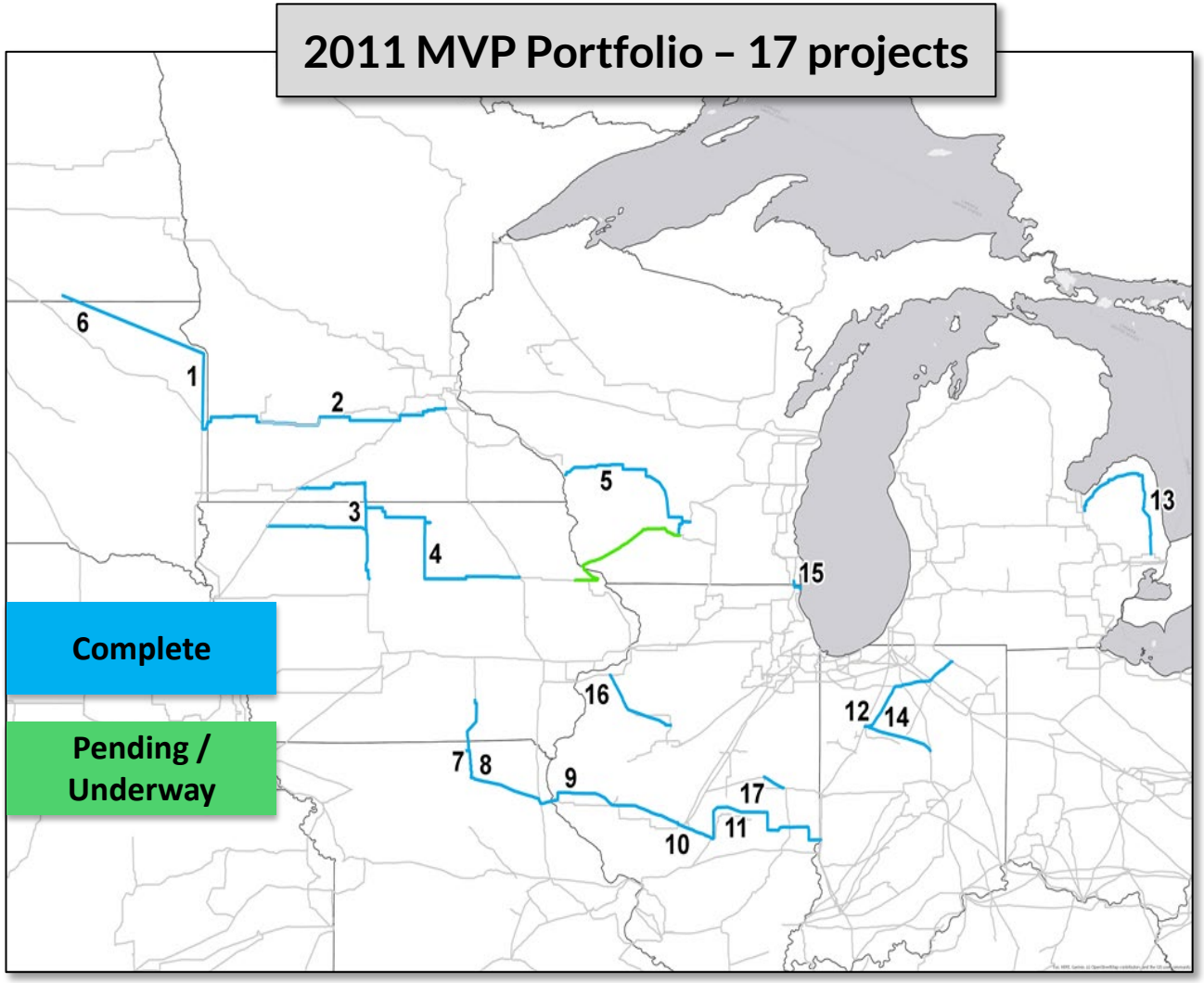


Trends:

- Accelerating retirement of traditional resources
- Increasing customer demand for renewables (~140 GW in interconnection queue, predominately solar)
- More decentralization (distributed resources) and electrification
- Increasing extreme events …

Long Range Transmission Planning (LRTP) is a key pillar of MISO's response to the region's Reliability Imperative

MISO's Multi-Value Project (MVP) portfolio illustrated regional cooperation; today's challenges are even greater…

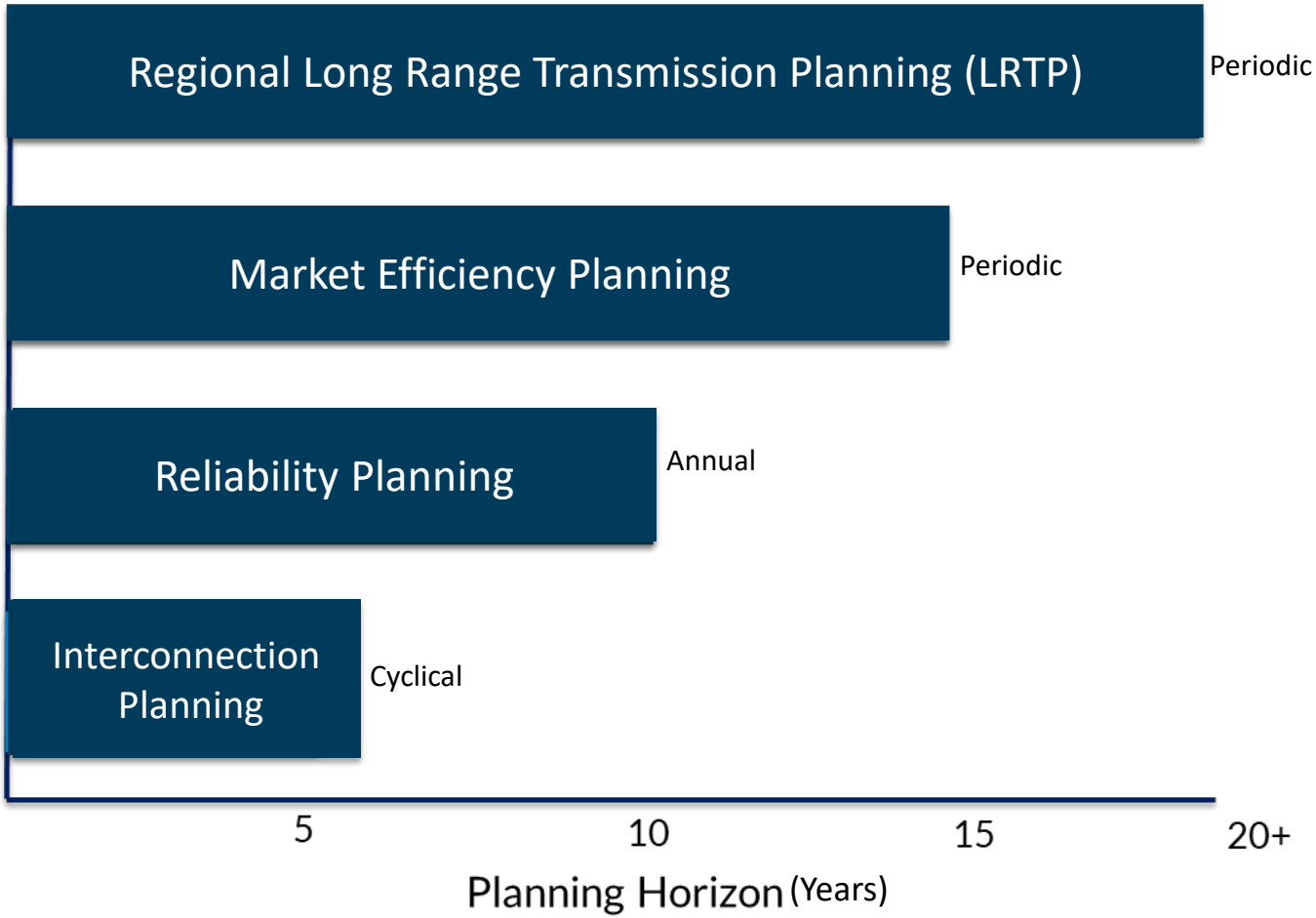


- **Began studies in 2008**
- **Approved by MISO Board in 2011; current estimated portfolio cost of $6.6 billion**
- **16 projects complete; 1 still in process**
- **Projected to enable:**
  - 50 million MWh of renewable energy per year to meet state goals and mandates
  - $7 – $39 billion in net benefits
- **New capacity is already fully subscribed**

Links: MISO MVP Business Cases; MVP History/Lessons Learned

Transmission planning provides a comprehensive approach that covers short and long term needs to address generation additions, ongoing reliability, market efficiency and policy trends

Upgrade needs have different drivers and different planning horizons



Transmission Planning: three conditions must be satisfied to develop and approve a transmission plan

Aligned Interests

Identify transmission solutions to address the needs of the collective footprint

Robust Business Case

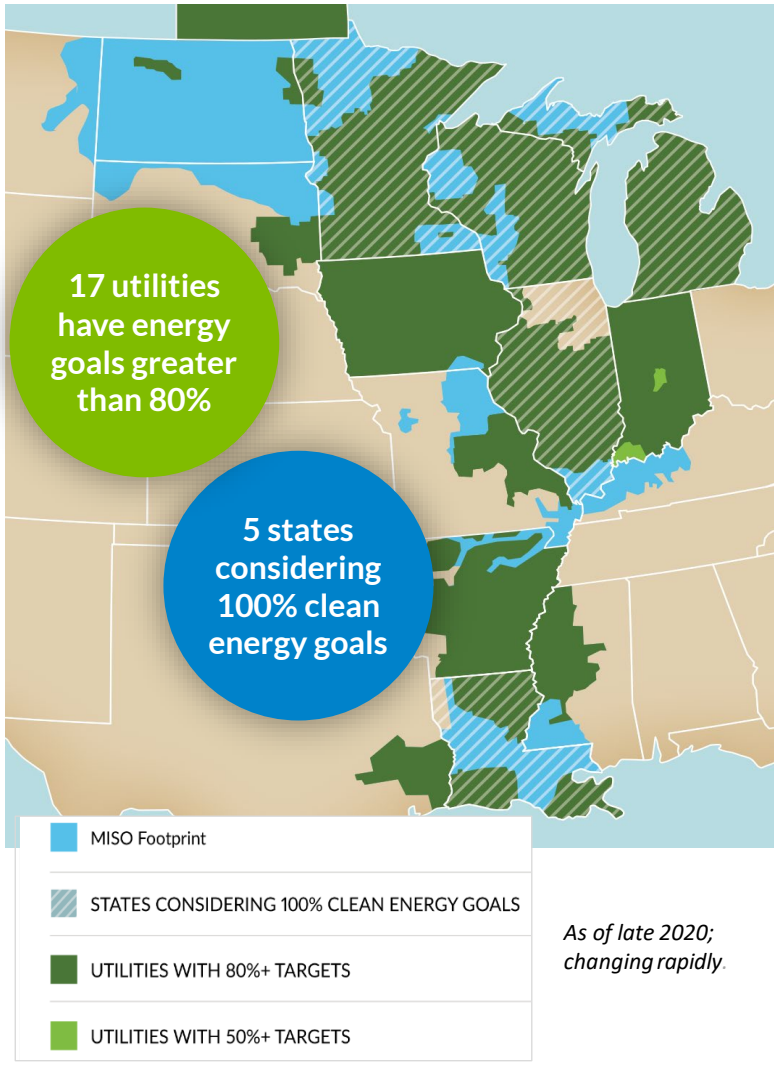
Include an analysis of benefits and costs for each project

Cost Allocation

Assign cost roughly commensurate with benefits

MISO's Long Range Transmission Planning (LRTP) uses three "Futures" to incorporate & bookend uncertainty

Future 1	Future 2	Future 3
• The footprint develops in line with 100% of utility IRPs and 85% of utility announcements, state mandates, goals, or preferences. • Emissions decline as an outcome of utility plans. • Load growth consistent with current trends.	• Companies/states meet their goals, mandates and announcements. • Changing federal and state policies support footprint-wide carbon emissions reduction of 60% by 2040. • Energy increases 30% footprint-wide by 2040 driven by electrification	• Changing federal and state policies support footprint-wide carbon emissions reduction of 80% by 2040. • Increased electrification drives a footprint-wide 50% increase in energy by 2040.

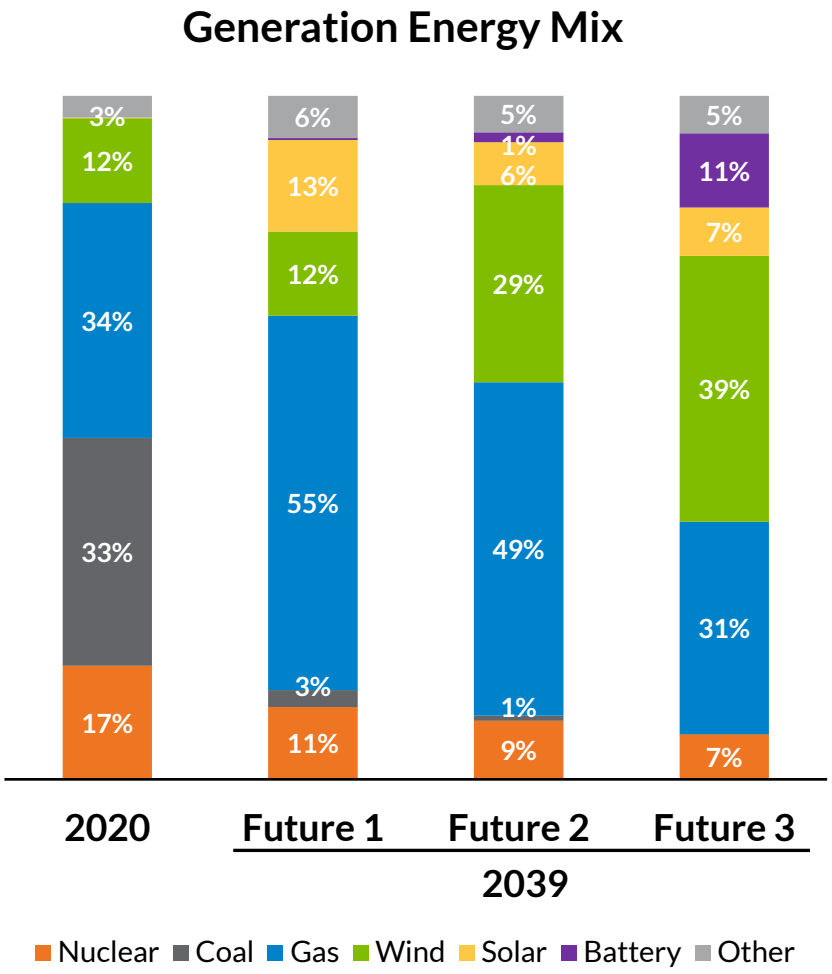


As of late 2020; changing rapidly.

IRP = Integrated Resource Plan

See: MISO Futures Report for details.

Future scenarios incorporate and build upon member plans to inform the resource transition and changing demand patterns

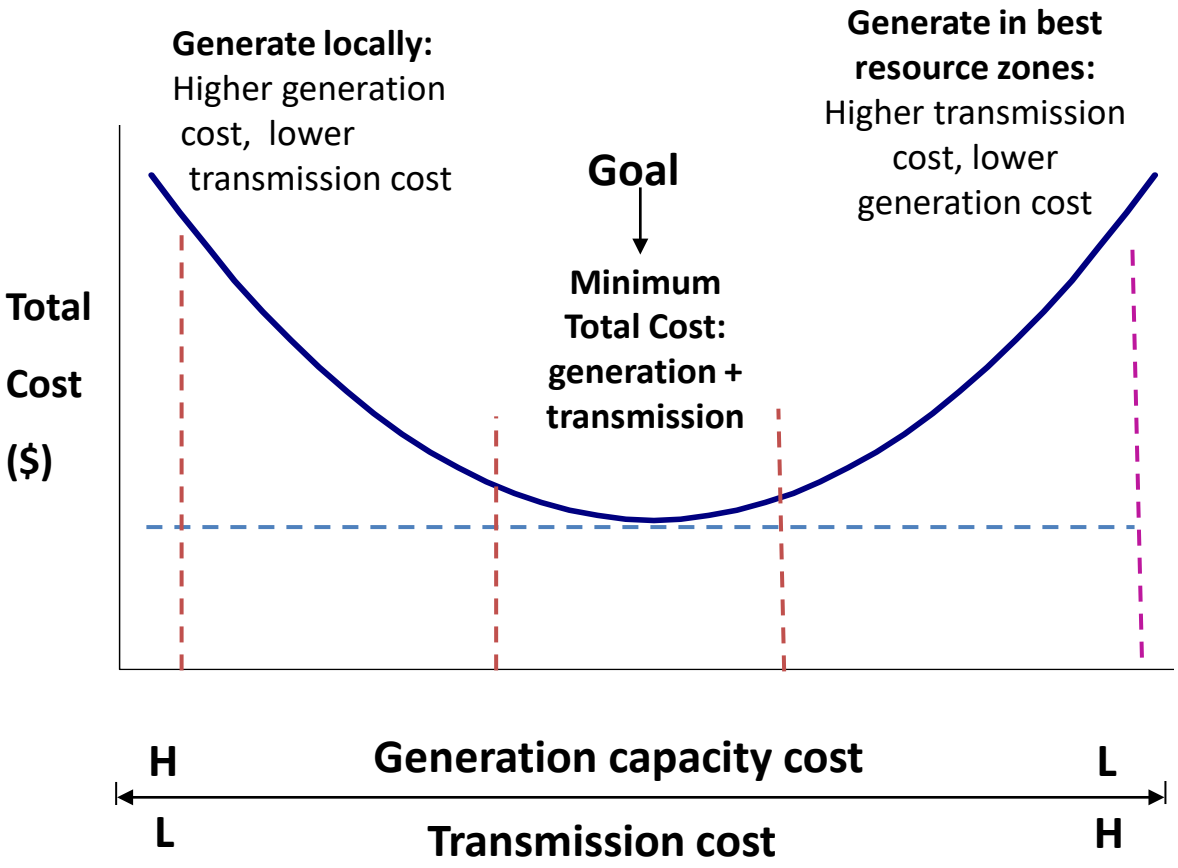


By 2039…	Future 1	Future 2	Future 3
Additions	121 GW	170 GW	306 GW
Retirements	77 GW	80 GW	112 GW
Peak Load	136 GW	148 GW	164 GW
Emissions*	↓ 63%	↓ 65%	↓ 81%

* Resulting emission reductions based upon 2005 levels

See: MISO Futures Report for details.

MISO plans transmission, not generation, but minimizing total costs requires balancing both generation and transmission investment



MISO's long range transmission planning process is focused on minimizing the total cost of delivered power to consumers – of energy, capacity and transmission – to meet a given objective

Reliability work refining projects that will feed into economic and business justification analysis over the next several weeks

DRAFT transmission solutions from MISO LRTP analysis
(as of Jan 2022)

On-going work:

- **Reliability analysis (narrowing in on 'Tranche 1' projects)**
- **Economic analysis**
- **Business case development**