# Long Range Transmission Planning Update

System Planning Committee of the Board of Directors

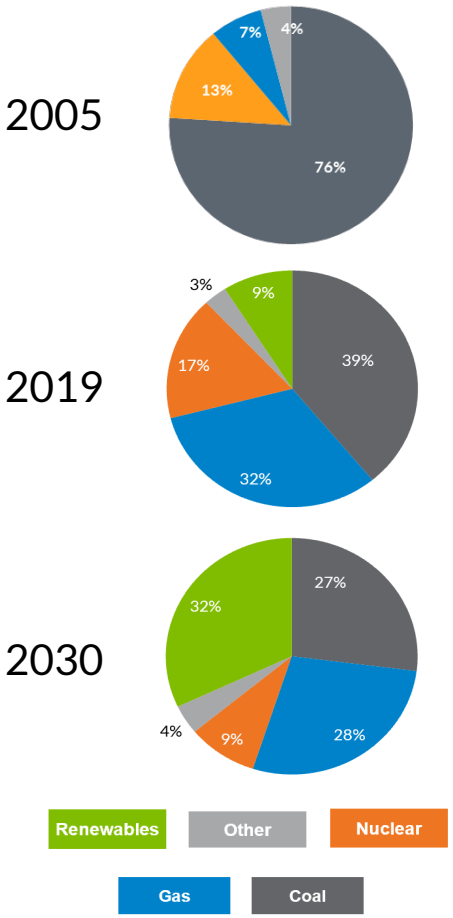
September 15, 2020

# Executive Summary

- Industry trends are driving MISO members to make significant changes to their portfolios including retirements of aging units and integration of increased levels of renewables
- MISO must focus now on solutions that anticipate and adapt to those rapid changes
- Long Range Transmission Planning is necessary to ensure a reliable and efficient regional and interregional transmission system that enables the changing portfolio across the near and long term

# MISO's Regional Reliability Imperative will help ensure ongoing, efficient reliability as members evolve their resource fleets

## GENERATION MIX (%MWH)




## MISO FORWARD



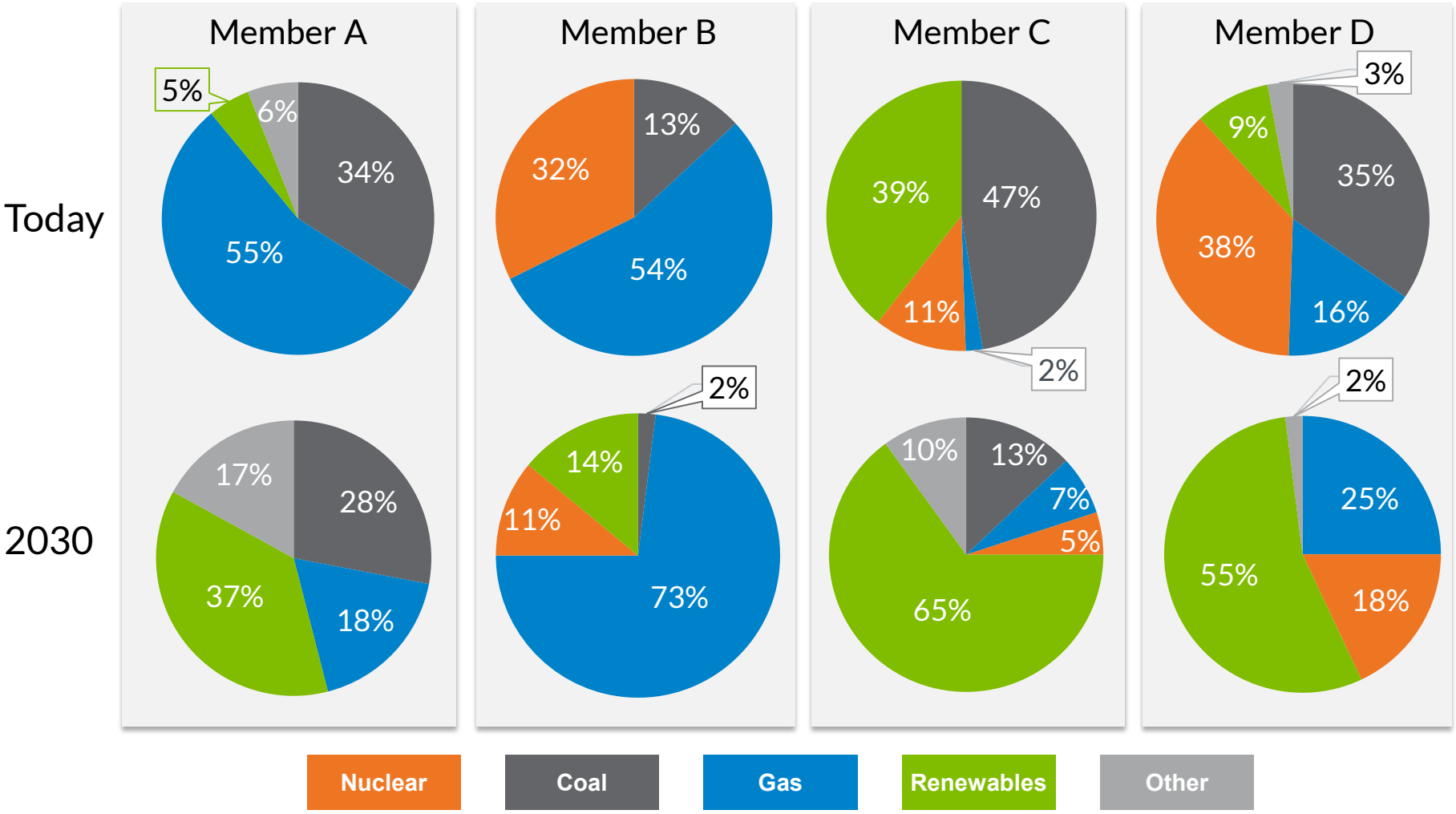
## RELIABILITY IMPERATIVE

| |
|---|
| Market Redefinition |
| Market System Enhancement |
| Long Range Transmission Planning |
| Transformation Processes & Tools |
| Grid Technology & Integration |

*List is not representative of all efforts*

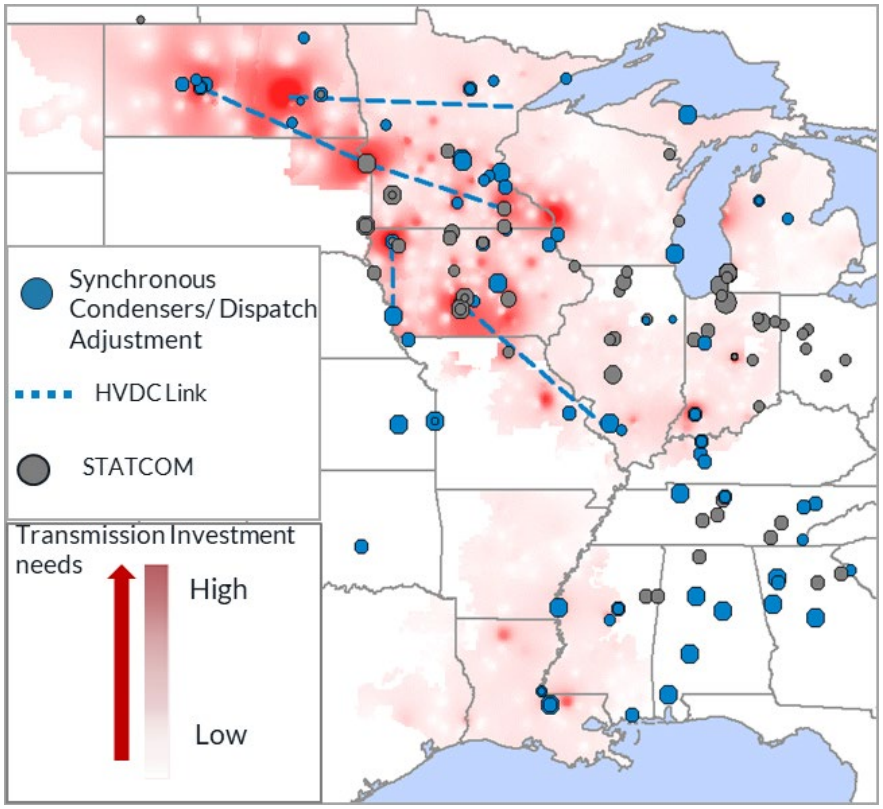
MISO is actively pursuing multiple workstreams to ensure on-going reliability and value creation

# Member plans project a significant portfolio shift; differences across individual portfolios present additional challenges and opportunities



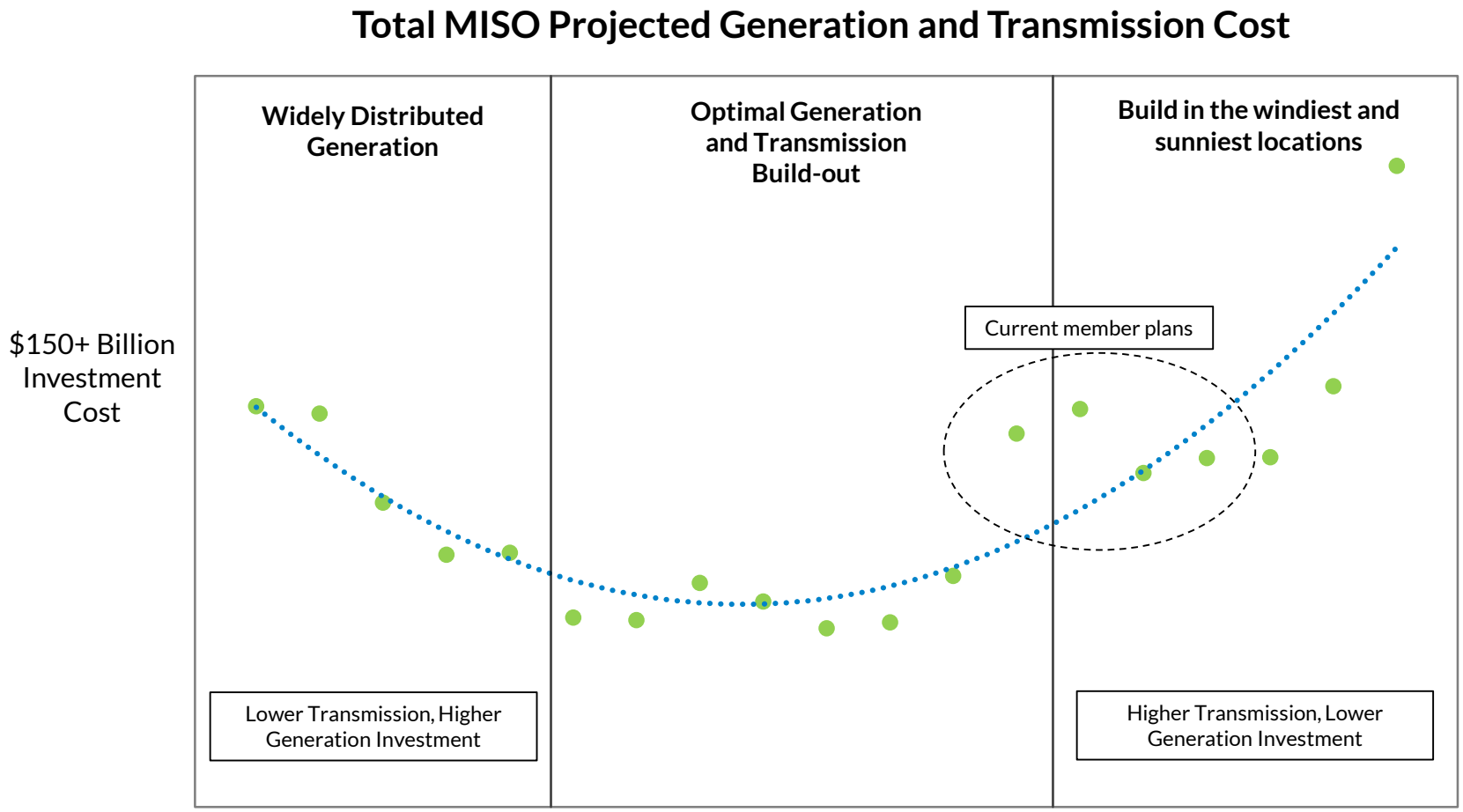

These figures show utilities' total energy generated by fuel type, in megawatt-hours. Current figures compiled by S&P Global Market Intelligence. 2030 projections compiled from IRPs, investor reports, and other sources.

# Work to-date indicates expected portfolio changes will cause significant grid and stability issues requiring increased transmission investment




- Issues are driven by reduction in conventional generation and the increase in inverter based (i.e. wind/solar/battery) generation
- Regional energy transfer increases in magnitude and becomes more variable leading to a need for increased extra high-voltage line thermal capabilities
- Increase in renewable penetration causes different dispatch patterns of conventional generators, leading to several dynamic issues
- Power delivery from weaker areas may need transmission technologies equipped with dynamic-support capabilities

# Transmission needs, overall transmission costs and generation costs can change based on where renewables are sourced, but planned generation costs will far outweigh transmission costs in any case



# There are conditions precedent for longer-term transmission plans to be approved and successfully developed

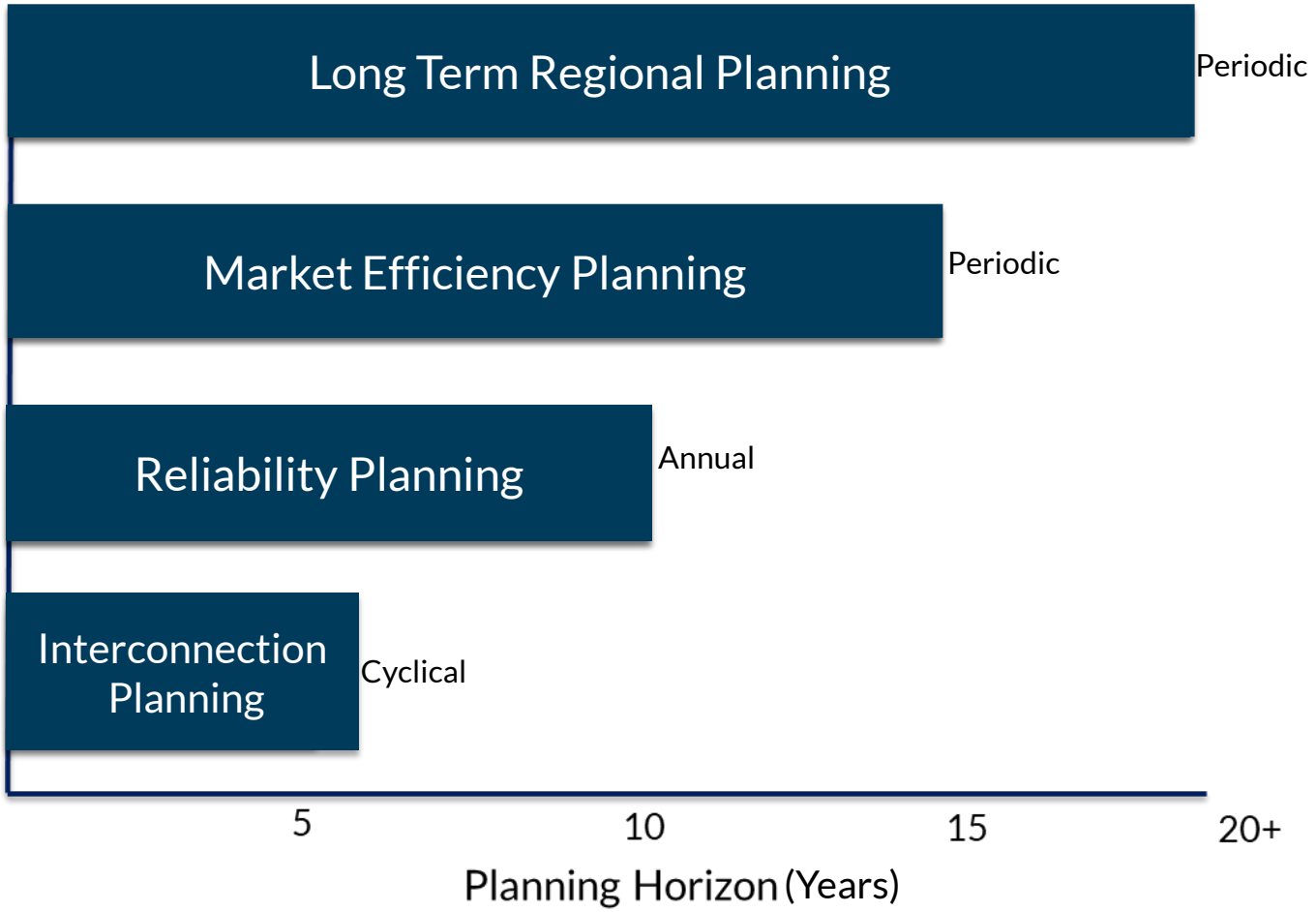

Consensus that transmission is required to address the subregional and collective needs of the footprint

Analysis of subregional issues and solutions compatible with regional reliability and market operations needs

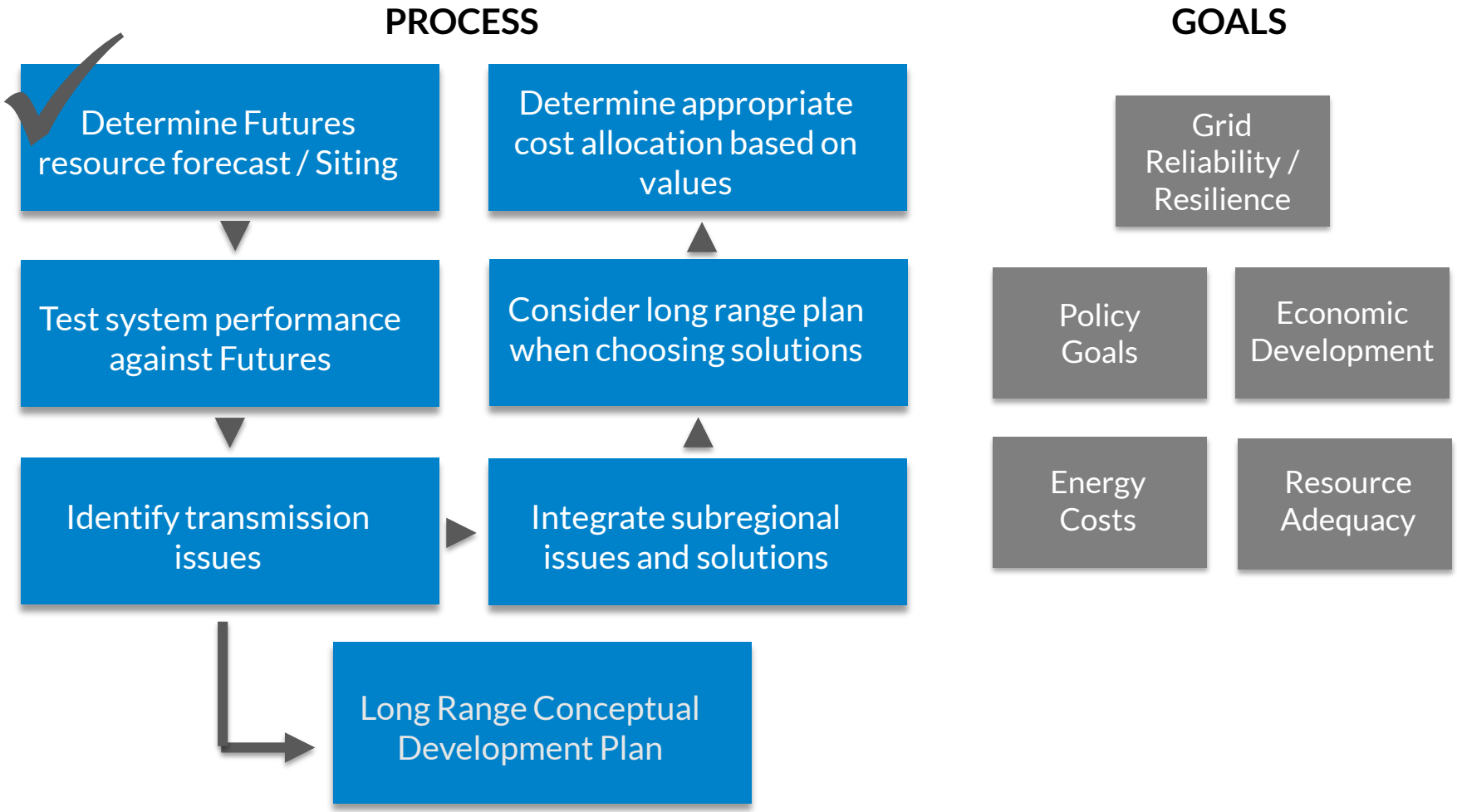
Costs assigned roughly commensurate with benefits to each area

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

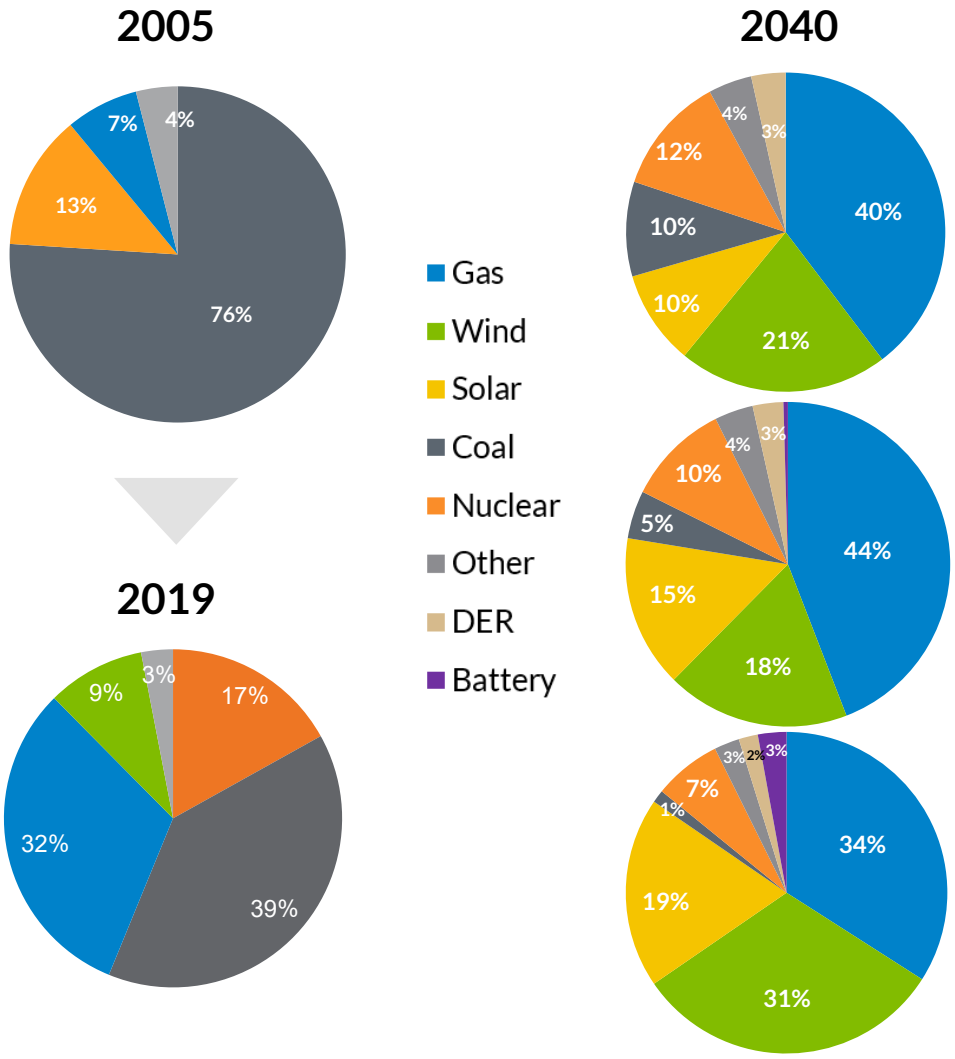
**Upgrade needs have different drivers and different planning horizons**



# Long Range Planning identifies grid needs based upon Futures, is multi-step, and considers subregional needs and solutions



# Energy projections for Futures are forecasted through 2040




## MISO Future Scenarios[1]

### Future 1

- Footprint develops in line with 100% of utility IRPs and 85% of utility/state announcements, etc.
- Emissions decline as an outcome of utility plans
- Load growth consistent with trends

### Future 2

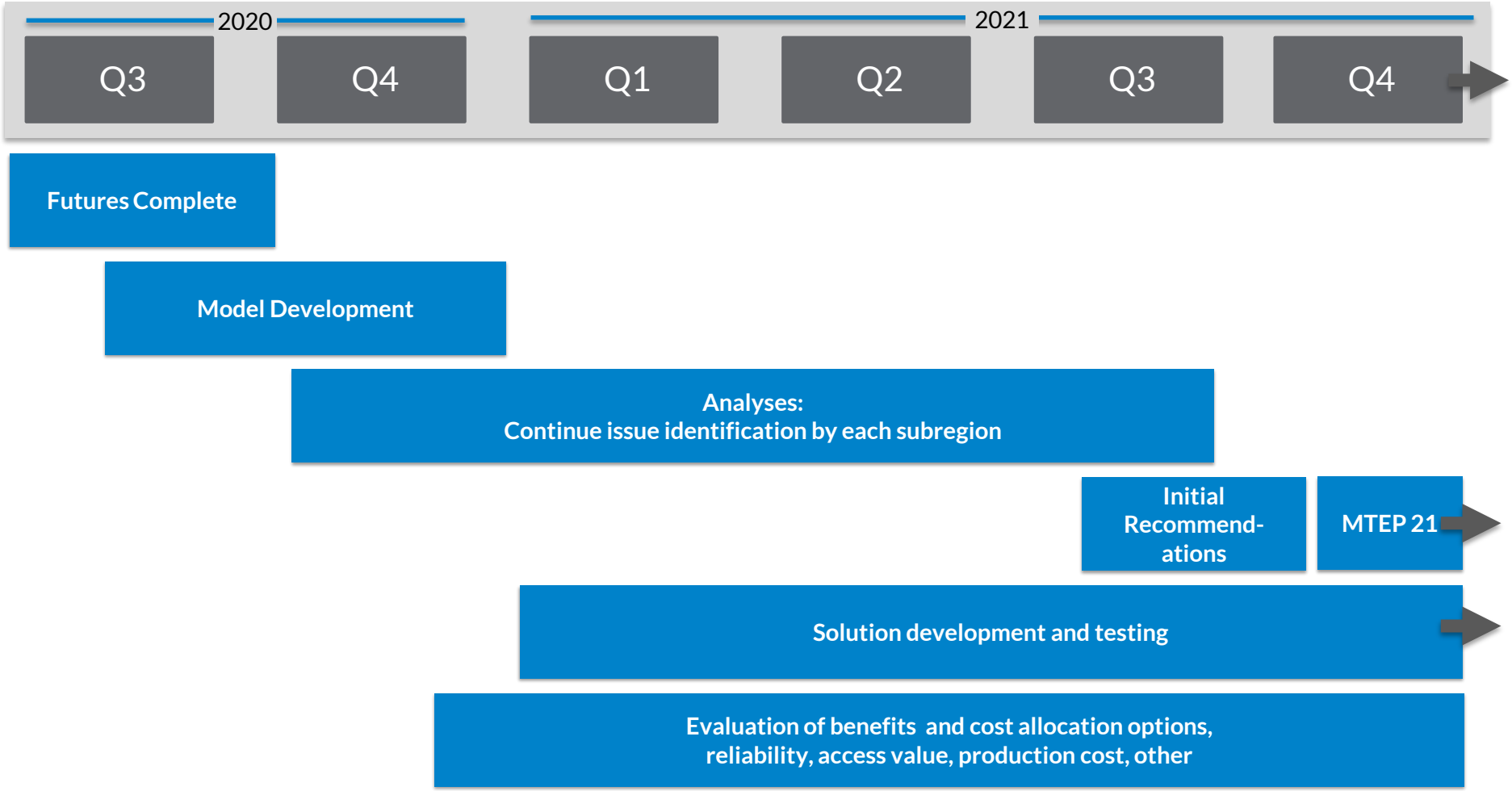
- Companies/states meet their goals, mandates, etc.
- Footprint-wide CER[2] of 60% by 2040
- Energy increases 30% footprint-wide by 2040, driven by electrification

### Future 3

- Changing federal and state policies support footprint-wide CER of 80% by 2040
- Increased electrification drives a footprint-wide 50% increase in energy by 2040

1. *Energy mix outputs from EGEAS do not consider transmission constraints*
2. *Carbon emissions reduction (CER) from 2005 baseline*

# The Long Range Transmission Planning Process will continue in an iterative fashion, with logical groupings of transmission projects coming forward over multiple MTEP cycles



# The 2021 Short Term Incentive metrics include a goal related to the Long Range Transmission Plan

## STRATEGIC ELEMENT

**Long Range Transmission Plan**

- Understanding future transmission needs is a critical part of maintaining reliability and efficiency
- A Long Range Transmission Plan is intended to provide a view of system needs that can be used to identify and inform transmission solutions on both a short term and long term basis to enable the resource portfolio shift contemplated by MISO stakeholders

## REQUIRED PERFORMANCE

- Develop a conceptual Long Range Transmission Plan to support the requirements of Future 1