

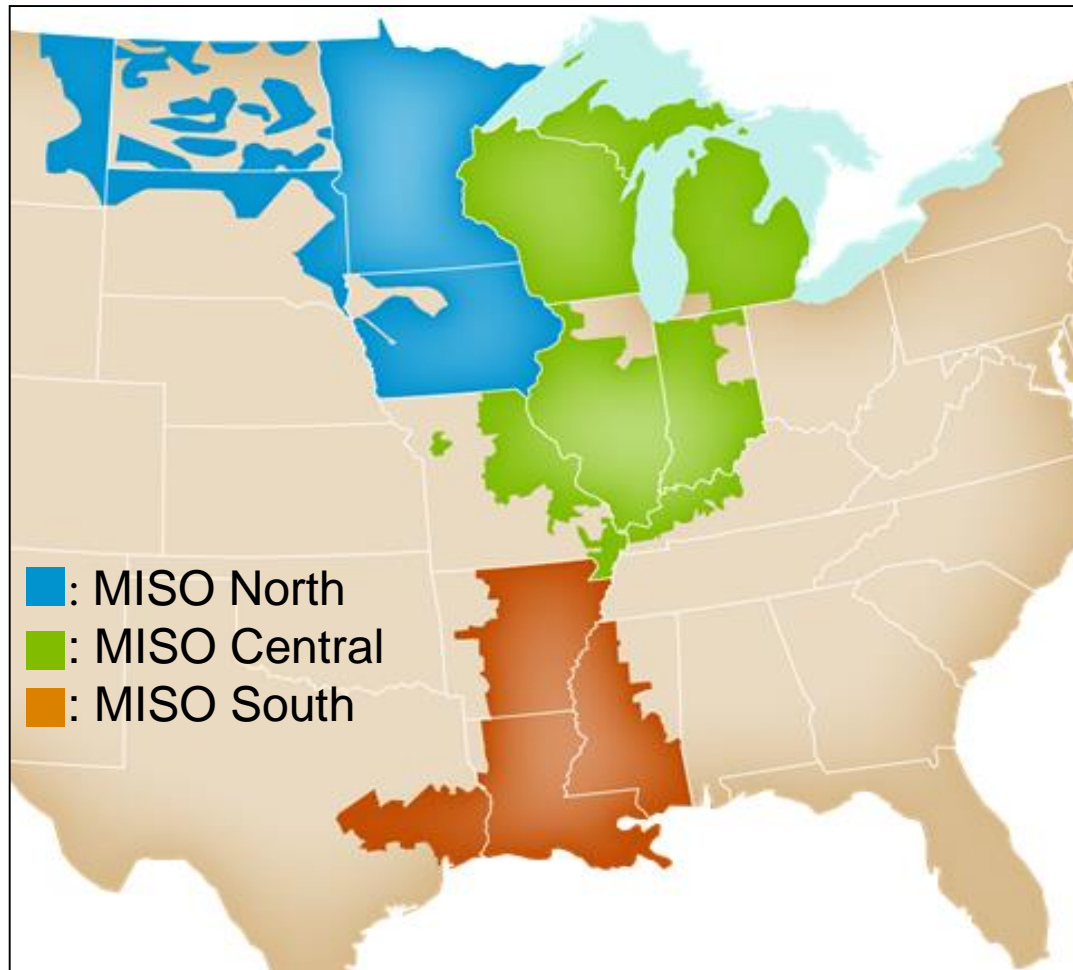


MISO Overview

Missouri Public Service Commission

November 21, 2017

MISO is an independent, non-profit organization in 15 U.S. States and one Canadian province



MISO by-the-numbers

High Voltage Transmission	65,853 miles
Installed Generation	177,388 MW
Installed Generation	1,594 Units
Peak System Demand	127,125 MW

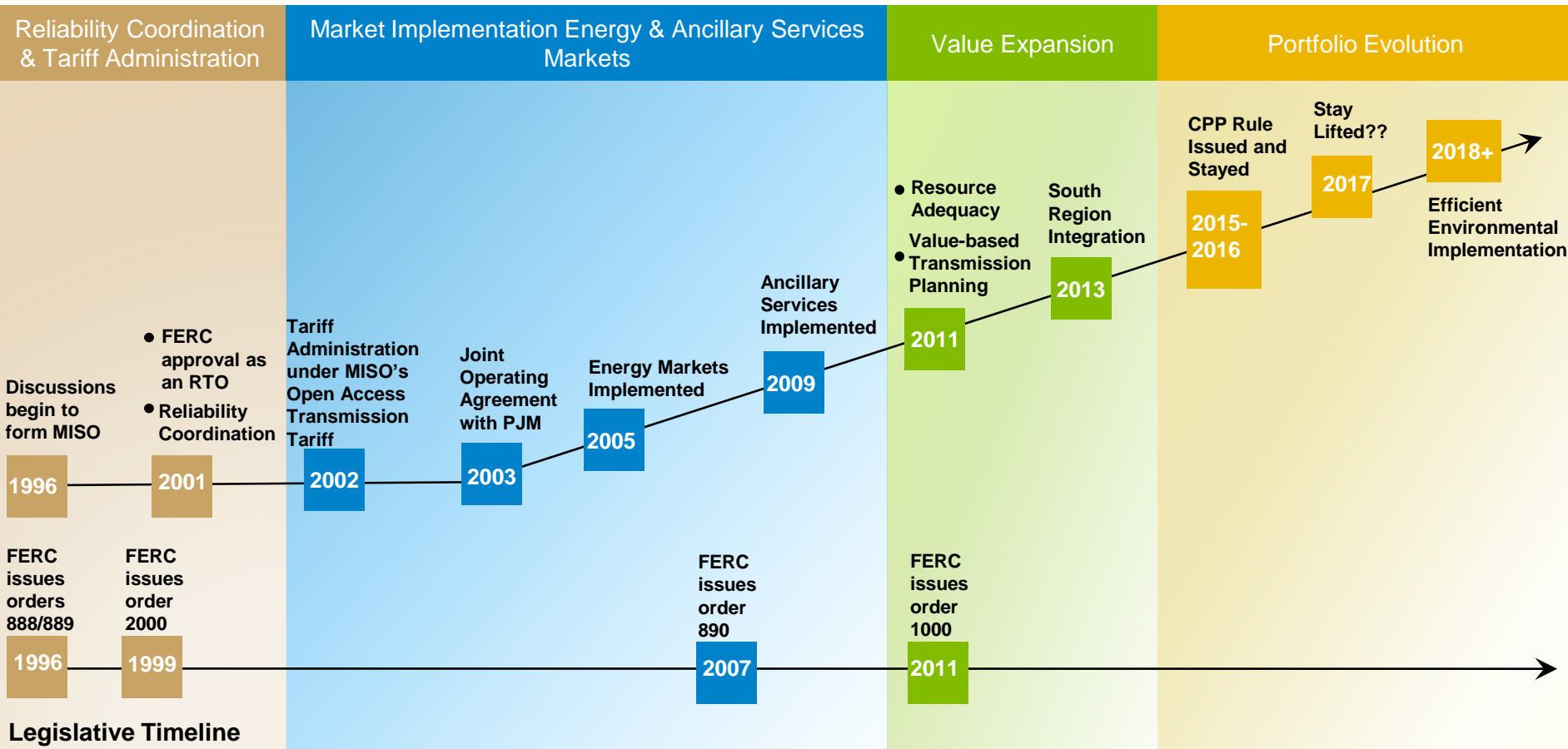
Mission

Work collaboratively and transparently with our stakeholders to enable reliable delivery of low-cost energy through efficient, innovative operations and planning.

North American Electric Grid Operators



MISO has gained experience with uncertainty while its focus has expanded from reliability and open access to value creation

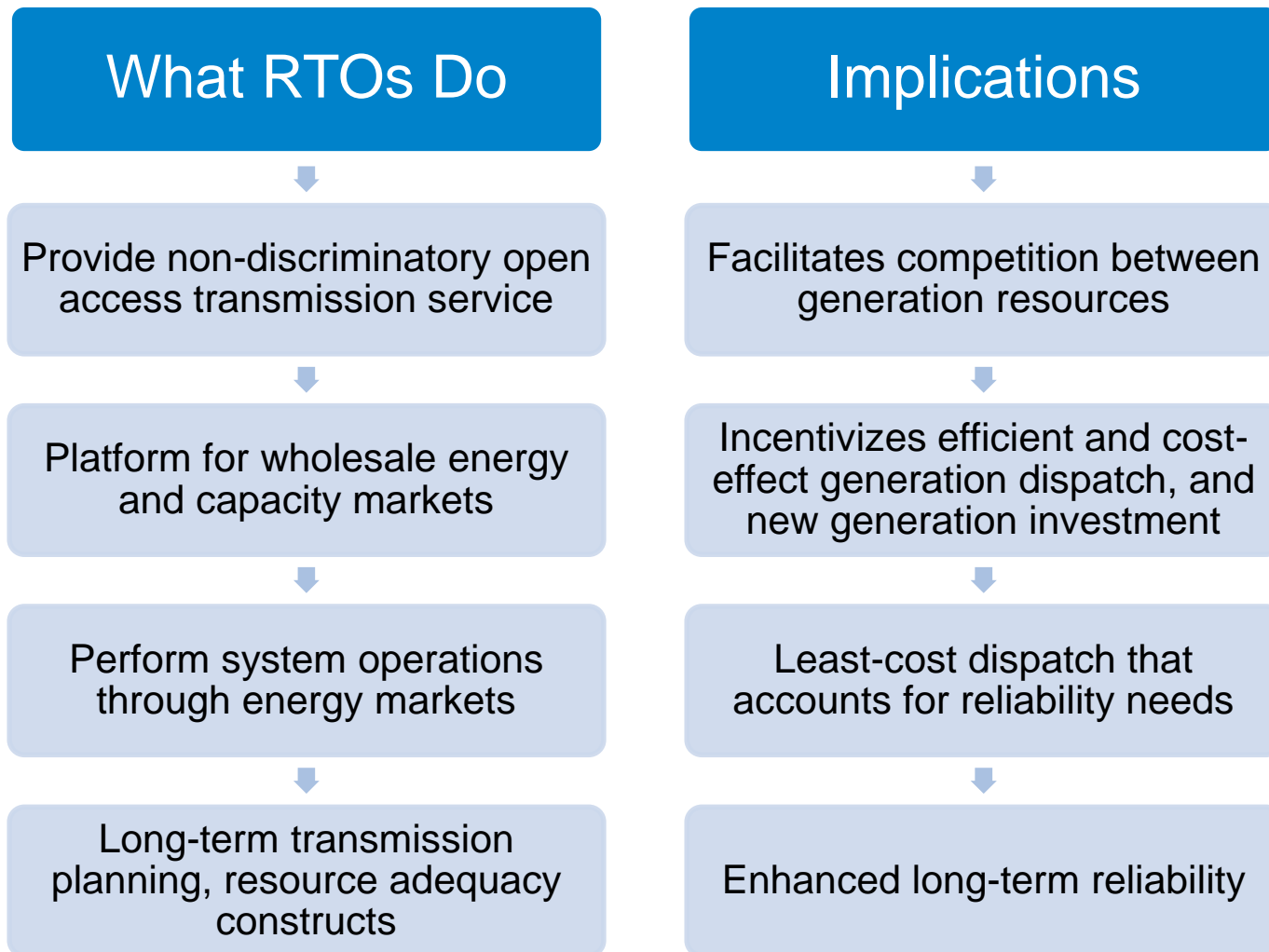


	2009	2010	2011	2012	2013	2014	2015	2016 ¹
Value Proposition (\$M)	\$789	\$761	\$2,429	\$2,169	\$2,043	\$2,680	\$2,585	\$2,600
Natural Gas (\$/MMBtu)	\$3.95	\$4.39	\$4.00	\$2.75	\$3.73	\$4.39	\$2.70	\$2.45
Wind Installed (MW)	5,467 MW	8,161 MW	10,219 MW	11,809 MW	12,539 MW	13,521 MW	14,552 MW	15,890 MW
Installed Multi Value Projects (\$)					\$512M	\$863M	\$1,331M	\$2,377M

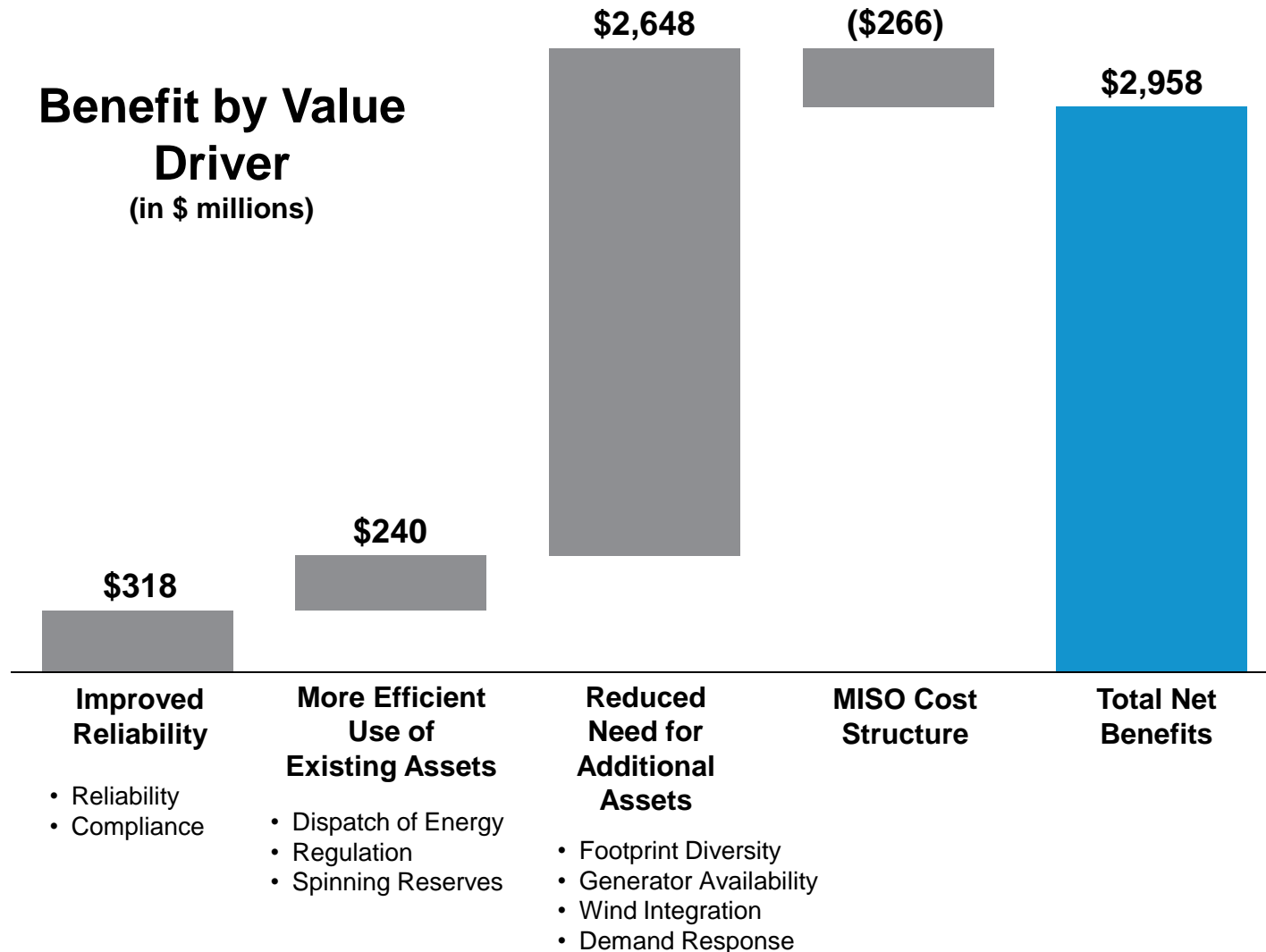
¹Indicative estimate of Value Proposition for 2016



Key MISO Functions and Benefits

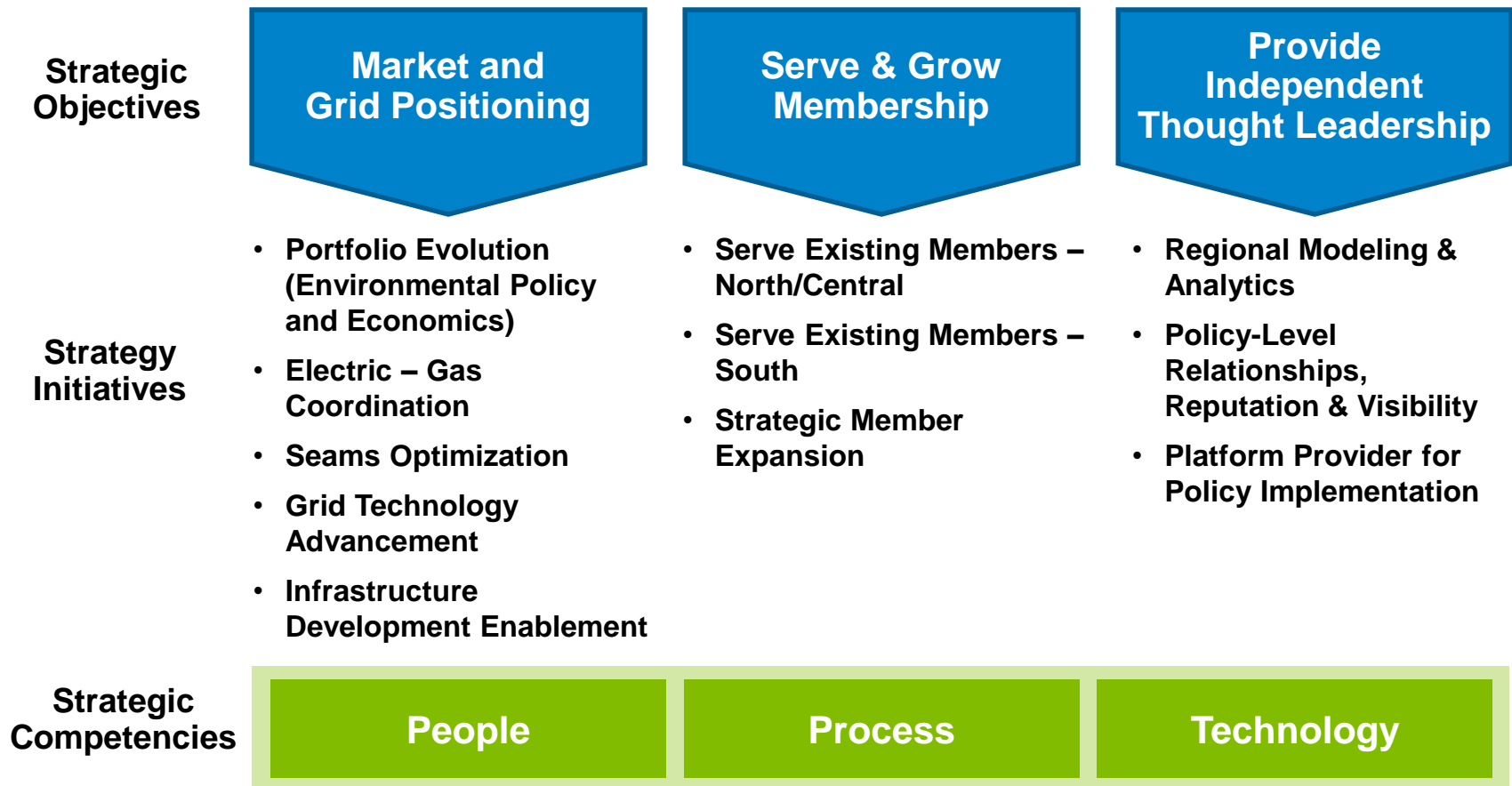


MISO's 2016 Value Proposition



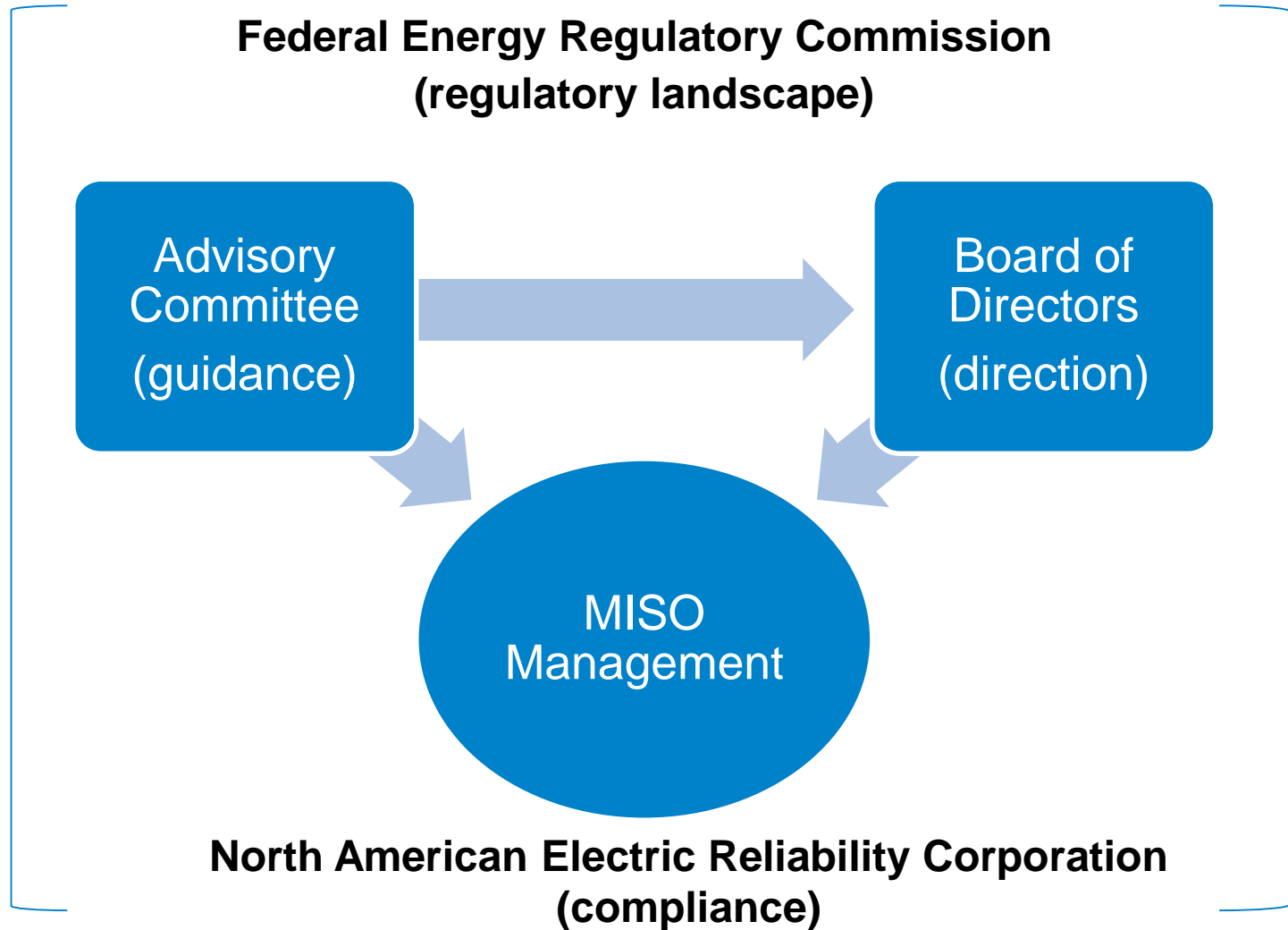
MISO's strategic objectives reflect our response to the nation's changing energy landscape

Vision: To be the most reliable, value creating RTO



Governance

MISO Governance



MISO's Board of Directors



**John R.
Bear
(MISO CEO)**



**H.B. "Trip"
Doggett**



**Barbara J.
Krumsiek**



**Todd M.
Raba**



**Phyllis E.
Currie**



**Baljit "Bal"
Dail**



**Mark S.
Johnson**



**Thomas M.
Rainwater**

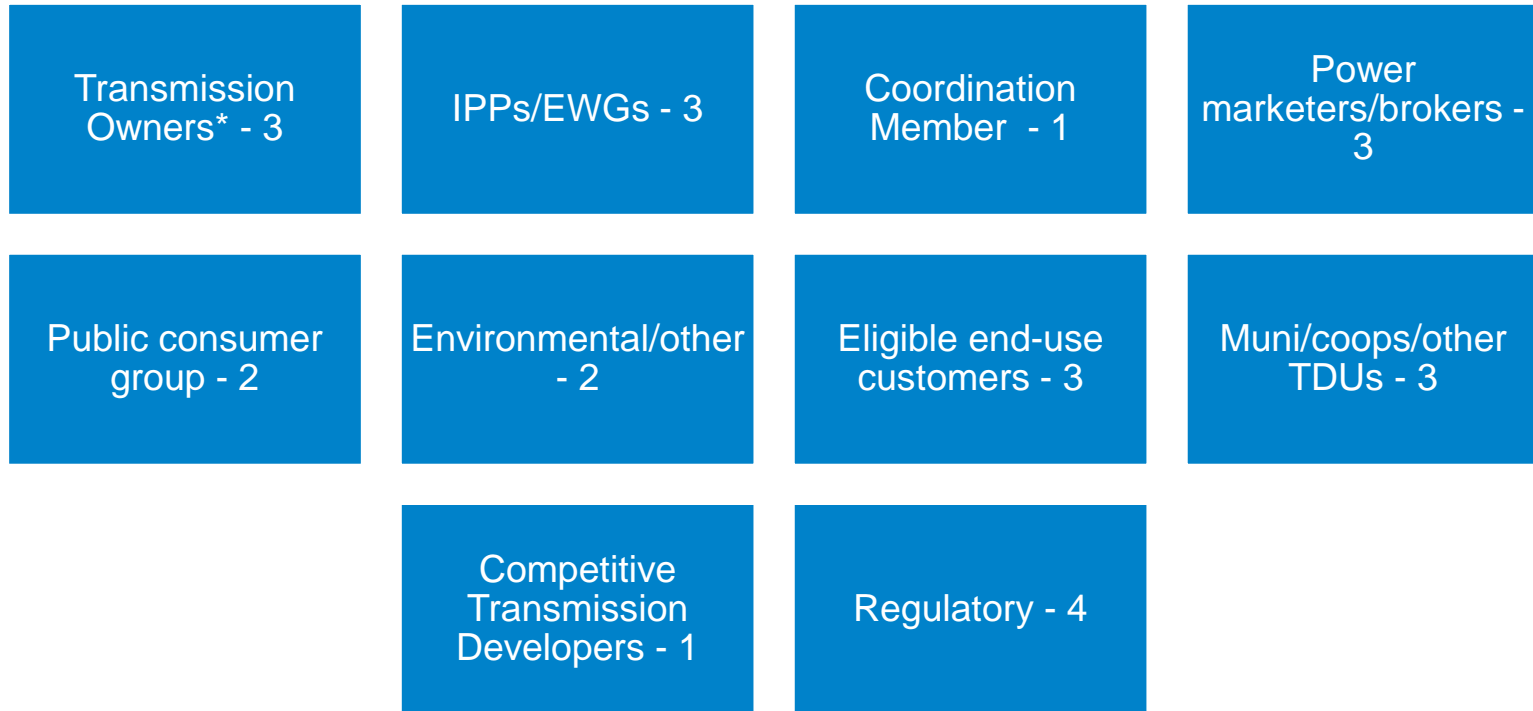


**Michael J.
Curran**



**Paul J.
Bonavia**

Advisory Committee – 25 Representatives



* Two members of Vertically Integrated Transmission Owners (VITOs), one member of MISO Stand-Alone Transmission Company (MSATs)

Business Areas

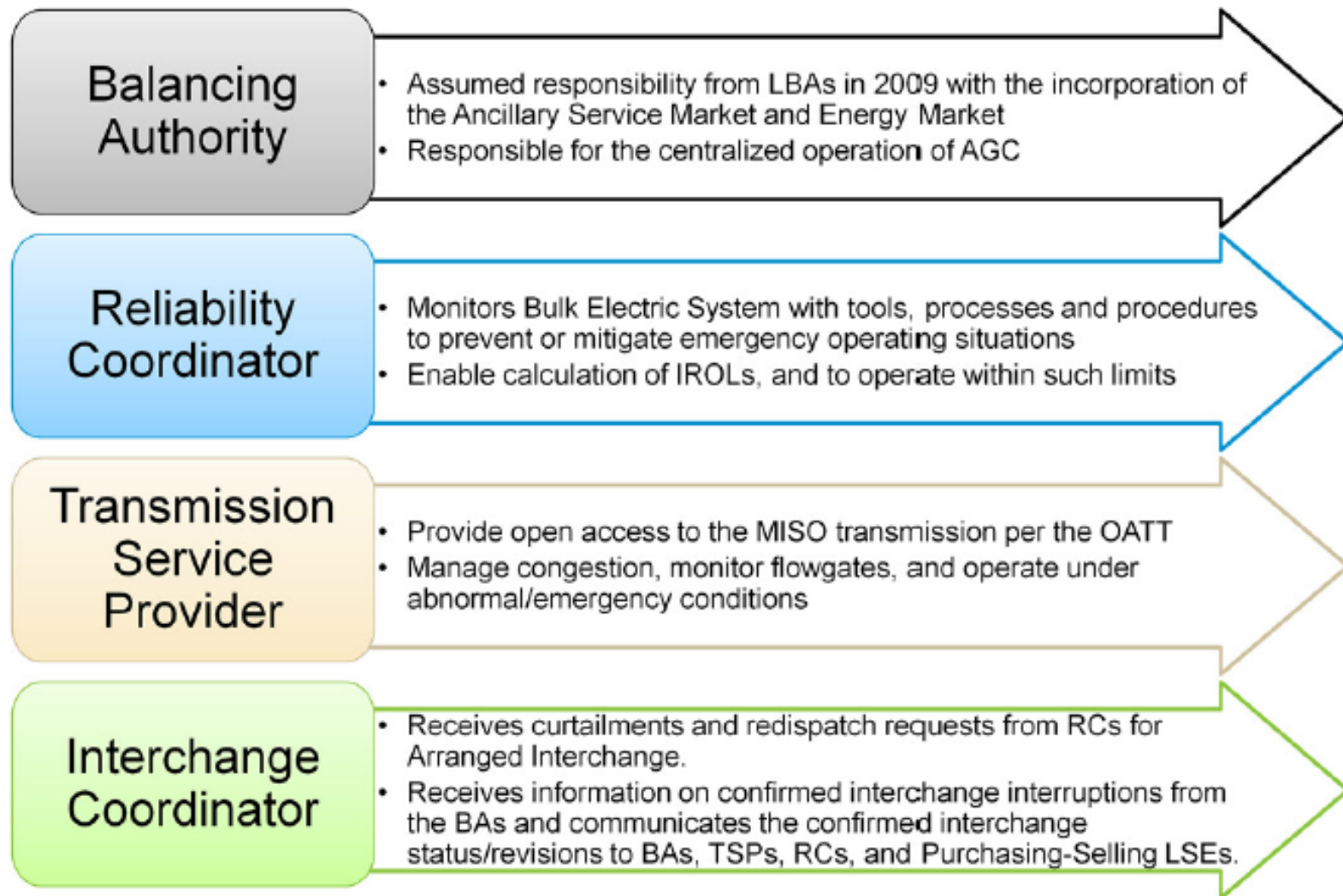
What We Do

MISO provides reliable system operations through:

- ***Real-time Operations (Keeping the Lights On)***
Safe & reliable operation of the electric grid
- ***Wholesale Market Administration***
Open energy markets, including centralized scheduling and economic dispatch of generation to support reliability and efficiencies across the system
- ***Transmission Planning***
For safe, reliable and economically efficient transmission expansion

Real-Time Operations

Real-Time Operations Functions



Emergency Operations

MISO's Emergency Operations messages define the area(s) involved, duration, and projections of system conditions. The table below is a summary, and does not replace or redefine MISO's Emergency Operations messages.

Message	Communication Intent	Potential Member/MISO Actions
Conservative Operations Declaration	Alert for Situational Awareness: Reliability issues possible for defined area.	<ul style="list-style-type: none"> • Potentially suspend transmission maintenance • Review outage plans for deferral, cancellation
Hot Weather, Cold Weather or Severe Weather Alert	Alert for Situational Awareness: MISO could be approaching tight supply conditions.	<ul style="list-style-type: none"> • Review outage plans for deferral, cancellation
Min Gen Alert	Alert for Situational Awareness: MISO is forecasting a potential supply surplus.	<ul style="list-style-type: none"> • Prepare for de-commitment (taking generation off-line), reduction in purchases or other actions
Max Gen Alert	Alert for Situational Awareness: MISO is forecasting a potential capacity shortage.	<ul style="list-style-type: none"> • Declare Conservative System Operations • Prepare for possible Max Gen Event
Max Gen Warning	Warning to Prepare for Possible Event	<ul style="list-style-type: none"> • Curtail non-firm exports • Schedule all available external resources into the MISO Market
Max Gen Event (Step 1)	Actions Taken to Preserve Operating Reserves: NERC Emergency Alert 1	<ul style="list-style-type: none"> • All available resources in use • Generators instructed to start off-line resources • Use of reserves not yet implemented
Max Gen Event (Steps 2, 3, 4)	Actions Taken to Preserve Firm Load: NERC Emergency Alert 2 (Step 2 declaration)	<ul style="list-style-type: none"> • Implement demand management programs • Utilize Contingency Reserves • Purchase Emergency Energy • Issue Public Appeals • Prepare for possible firm load shed
Max Gen Event (Step 5)	Event Occurring: NERC Energy Emergency Alert 3	<ul style="list-style-type: none"> • Shed firm load • Rolling brownouts or blackouts for defined area

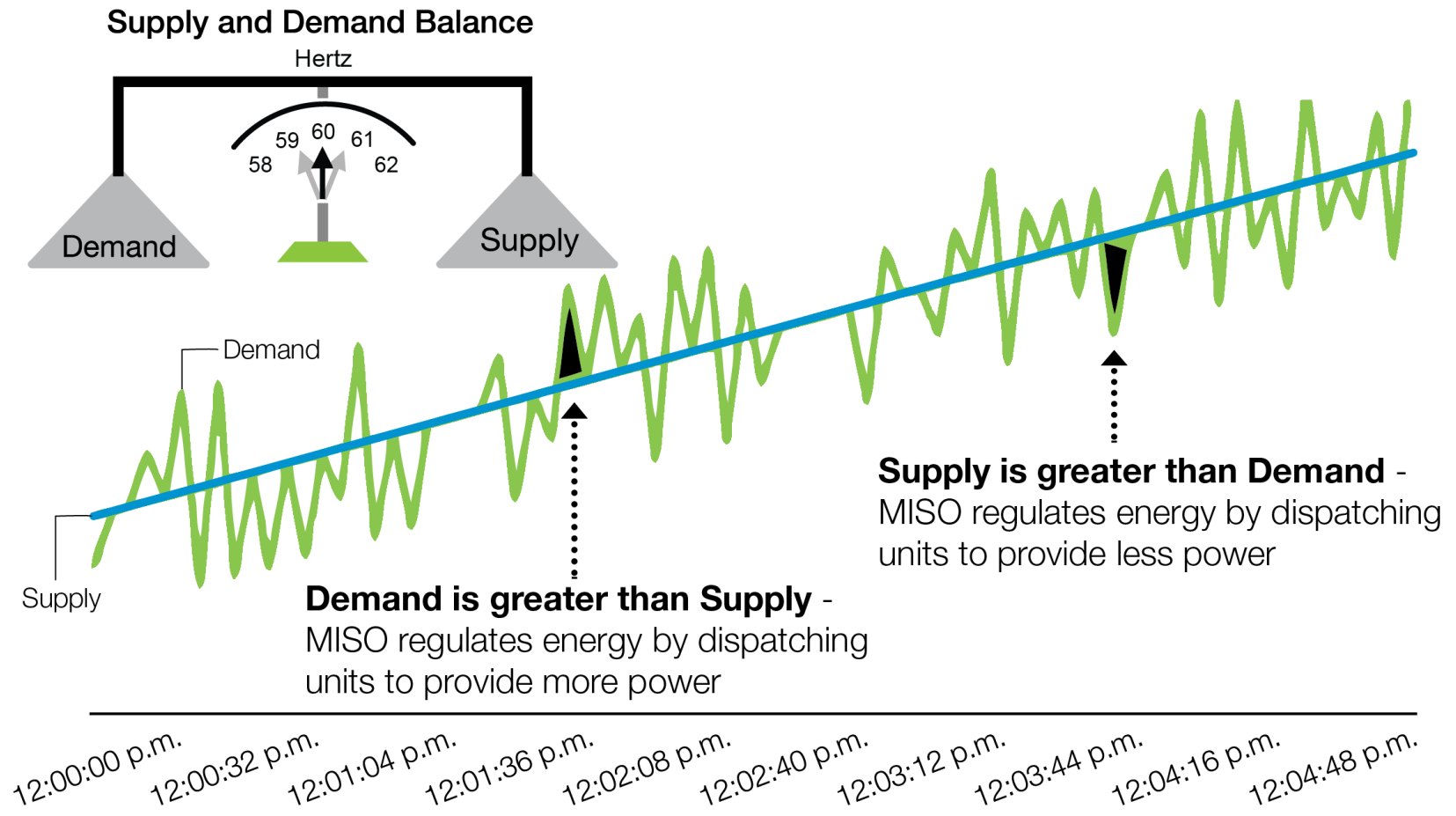
Wholesale Market Administration

The Balancing Act

- Day-to-day MISO reliably and efficiently balances the needs of customers with available supply through centralized, competitive energy markets
- Long-term reliability (resource adequacy) is assured through mandatory reserve margin requirements (planning reserve margin)
 - Load Serving Entities must meet their load forecast plus their planning reserve margin – this can be done through:
 - Owned resources
 - Controlled resources
 - Planning Resource Auction



Balancing Electricity Supply and Demand Moment to Moment



Offers to Supply from Generators Facilitate Least Cost Dispatch and System Operation

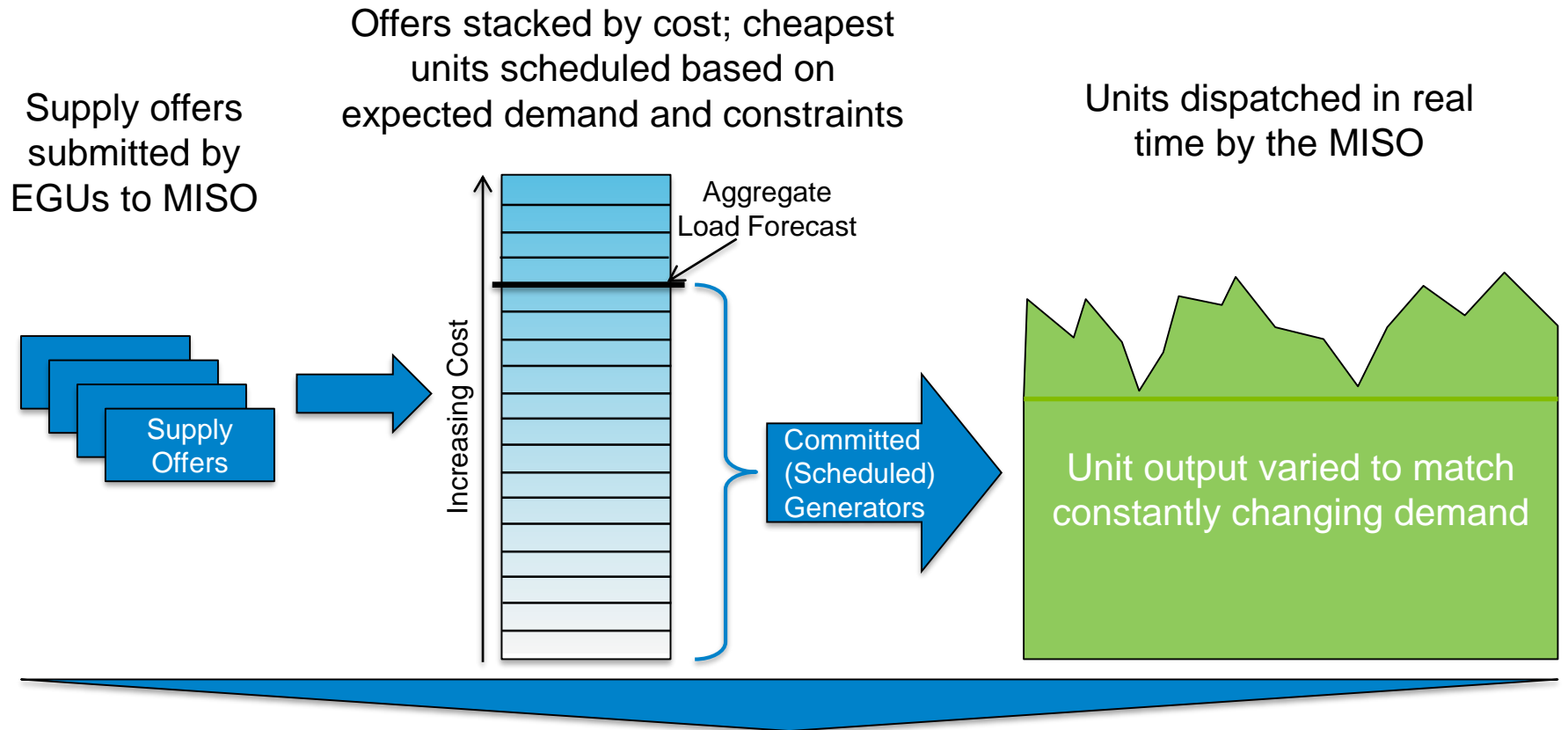


- Utilities seek to dispatch their systems at least cost
- Applies to vertically integrated utilities as well as organized markets

What goes into generators' bid?

- Fuel
- Variable O&M
- Emissions Costs

Overview of Generation Dispatch



- Electric Generating Unit (EGU) availability (limits, retirement) affects the amount of supply offered to meet demand
- Changing EGU costs (and thus offers) affect frequency and magnitude of utilization in RTO

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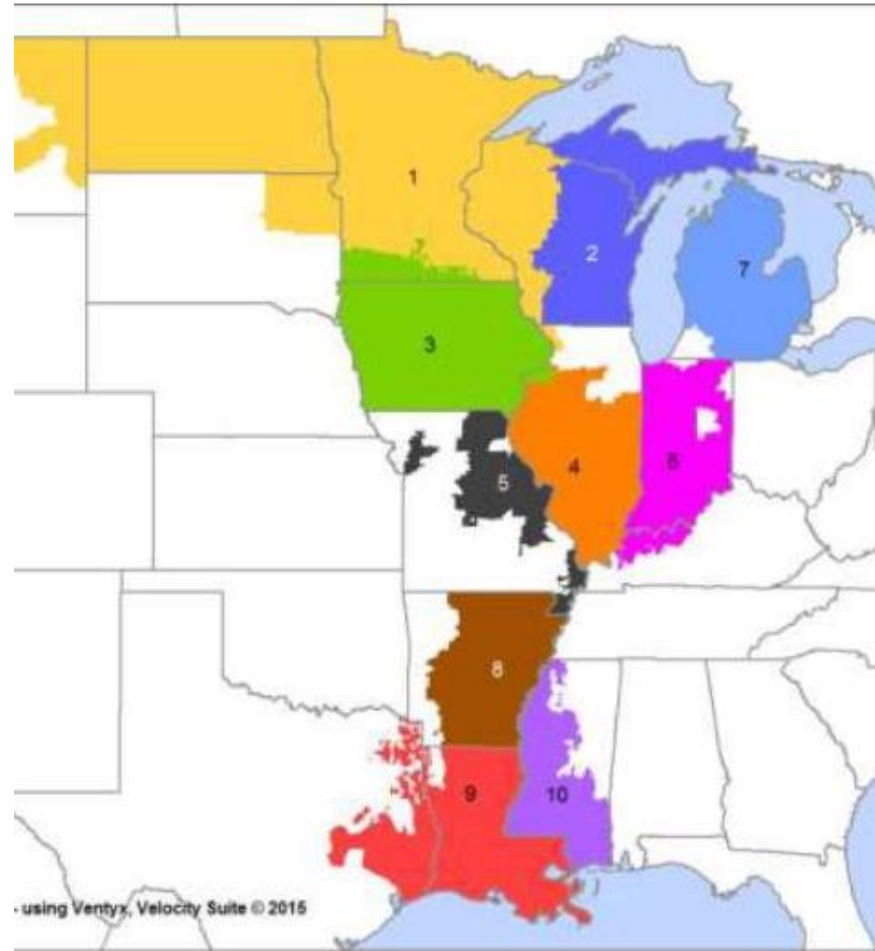
MISO's Resource Adequacy Construct

Annual Obligation for LSE's

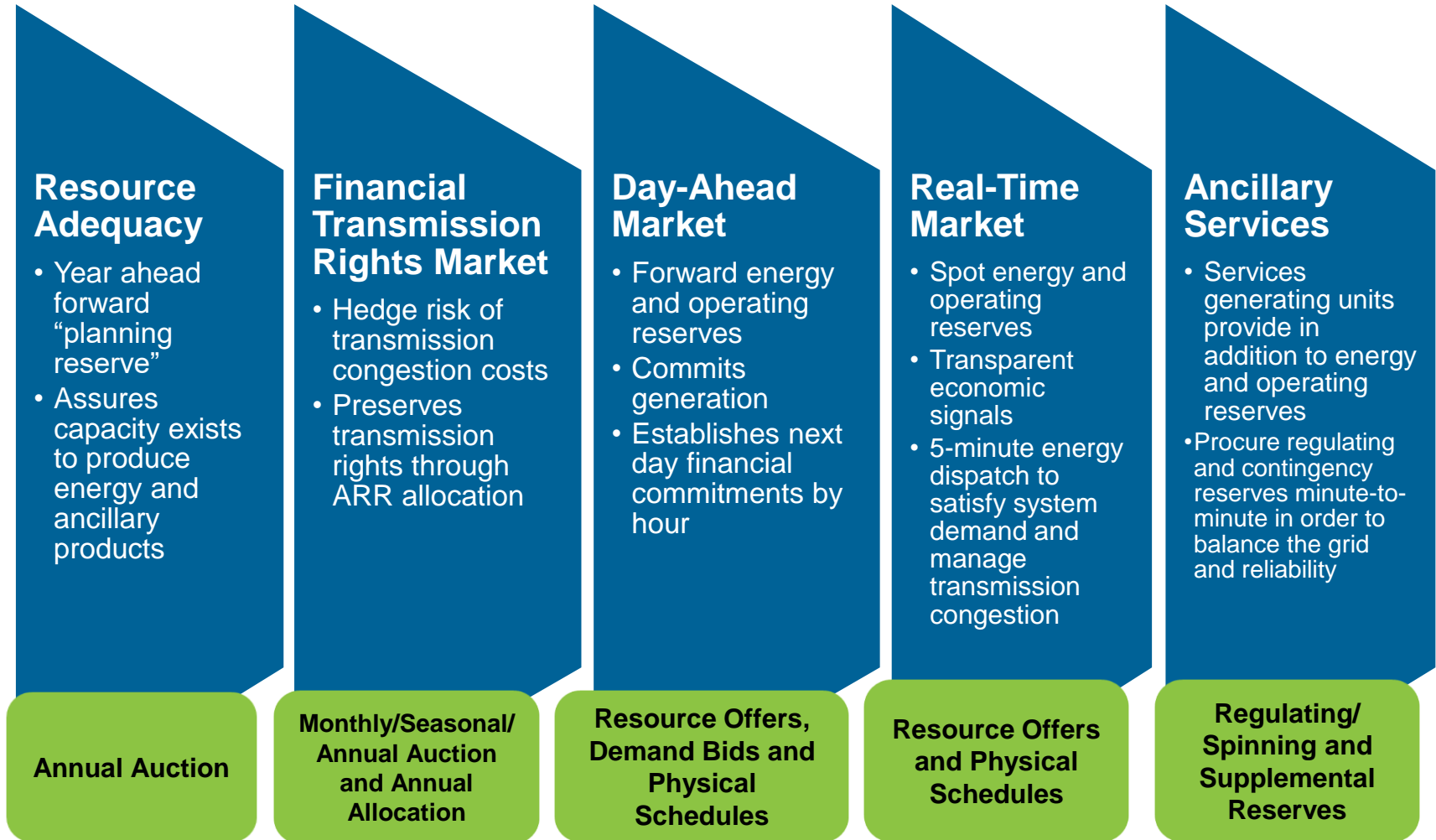
- Planning Year period is from June 1st to May 31st
- Multiple methods of achieving and demonstrating resource adequacy, including self-supply, bilateral contracting and market-based acquisition via the Planning Resource Auction.

Overview of Planning Resource Auction

- Occurs two months ahead of Planning Year
- Residual Auction - allows buyers and sellers to balance resource portfolio prior to Planning Year
- Includes a locational requirement indicating the amount of capacity that must be secured from resources within each zone to meet reliability standards

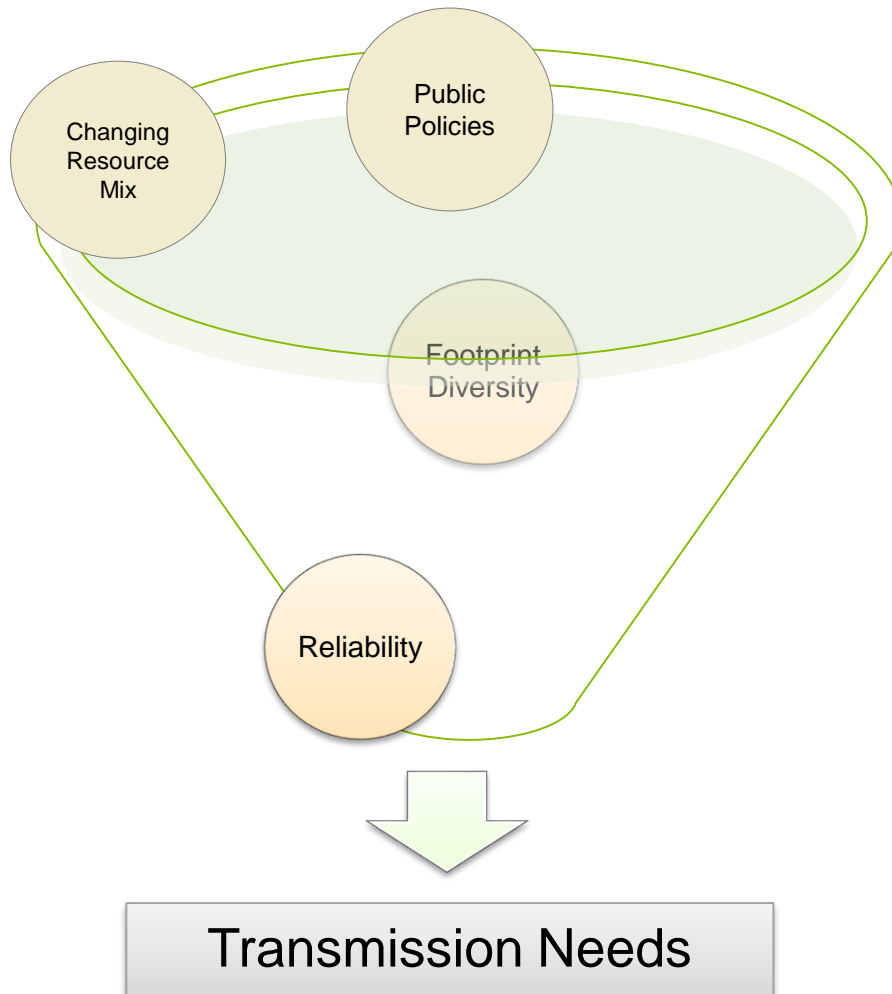


Overview of MISO Markets



Transmission Planning

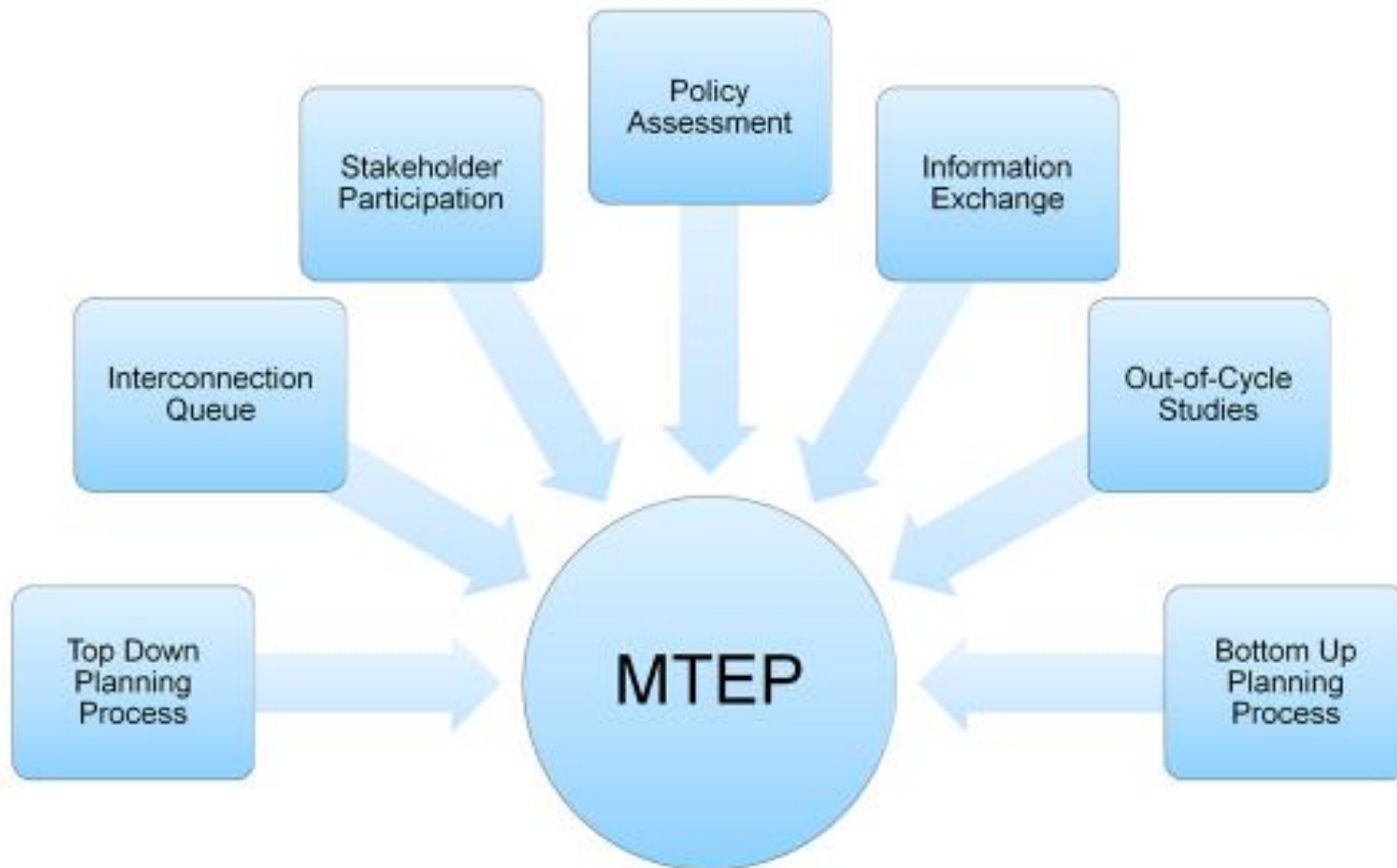
A key conduit of value creation is our transmission planning process, which we have advanced over time to account for a growing set of project drivers and future uncertainty



Objective is to take a holistic look at multiple drivers to maximize the value of regional transmission

- Changes in resource mix
- North/Central and South footprint diversity
- Reliability to address generation retirements
- Low cost energy delivery across footprint
- Federal and state energy policy compliance planning

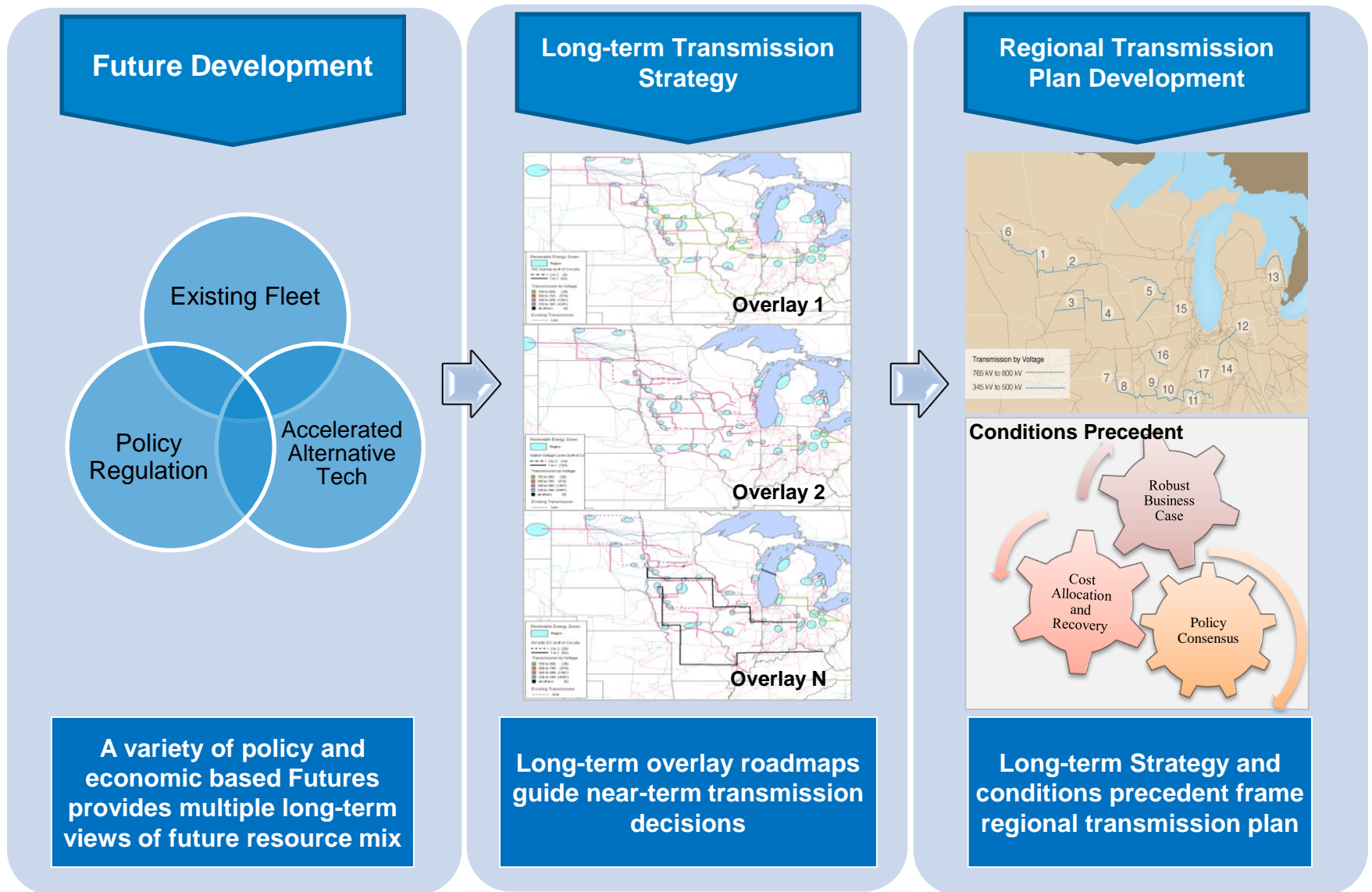
MISO Transmission Expansion Plan



Types of Projects & Cost Allocation

Allocation Category	Driver(s)	Allocation to Beneficiaries
Participant Funded (“Other”)	Transmission Owner identified project that does not qualify for other cost allocation mechanisms.	Paid by requestor (local zone)
Transmission Delivery Service Project	Transmission Service Request	Generally paid for by Transmission Customer; Transmission Owner can elect to roll-in into local zone rates
Generation Interconnection Project	Interconnection Request	Primarily paid for by requestor; 345 kV and above 10% postage stamp to load
Baseline Reliability Project	NERC Reliability Criteria	100% allocated to local Pricing Zone
Market Efficiency Project	Reduce market congestion when benefits are 1.25 times in excess of cost	Distributed to Local Resource Zones commensurate with expected benefits; 345 kV and above 20% postage stamp to load
Multi Value Project	Address energy policy laws and/or provide widespread benefits across footprint	100% postage stamp to load

Regional Transmission Overlay Study develops the most robust plan under a variety of policy and economic future scenarios



For Additional Questions:

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