

MISO's Renewable Integration Impact Assessment (RIIA)

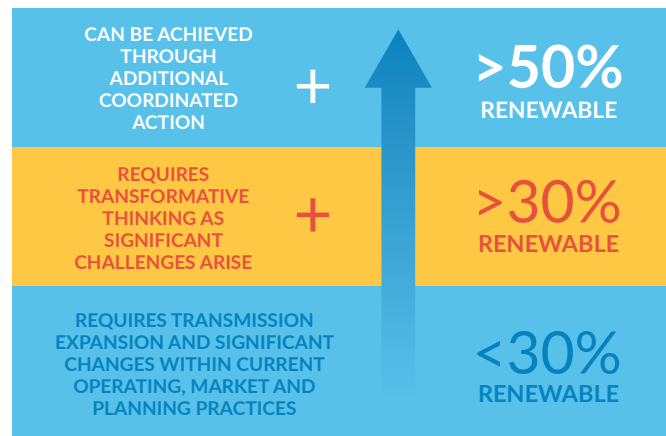
RIIA demonstrates that as renewable energy penetration increases, so does the variety and magnitude of the bulk electric system needs and risks. Managing the system under such conditions, particularly beyond the 30% system-wide renewable level is not insurmountable and will require transformational change in planning, markets, and operations. RIIA concludes that renewable penetration of at least 50% can be achieved through additional coordinated action.

While grid operators have managed uncertainty for decades, MISO is preparing for an unprecedented pace of change, driven by member utilities, state regulators and customers. MISO, members, regulators, and other entities responsible for system reliability all have an obligation to work together to address these challenges. MISO calls this shared responsibility the Reliability Imperative, which is broken into four categories: Market Redefinition, Long Range Transmission Planning (LRTP), Operations of the Future, and Market System Enhancements. RIIA is a key part of understanding the risks ahead.

RIIA is a technically rigorous systematic analysis that evaluates increasing amounts of wind and solar resources on the Eastern Interconnection bulk electric system, with a focus on the MISO footprint. RIIA examines renewable penetration levels in 10% increments up to 50% to better

understand the complexities of integration at each level. This assessment provides examples of integration issues and examines potential solutions. RIIA is the result of over 3.5 years of various stakeholder meetings and workshops.

RIIA is policy and pace agnostic: generation changes in the analysis are assumed to occur regardless of external drivers and timelines. As a technical impact assessment, RIIA does not directly recommend any changes to the existing electrical power system or construction of any new resources.



Adaptation within the existing planning, market, and operations constructs will suffice - but only to a point. New and changing risks require new practices to mitigate.

FIVE RISKS EMERGE IN THE RIIA ANALYSIS:

- **STABILITY RISK** - The grid's ability to maintain stable operation is adversely impacted, primarily when renewable resources are clustered in one region of the transmission system. Multiple transmission technologies, operating and market tools to incentivize availability of grid services are needed.
- **SHIFTING PERIODS OF GRID STRESS** - Periods of highest stress on the transmission system shift from peak power demand to times when renewables supply most of the energy and long-distance power transfers increase. Flexibility and innovation in transmission planning processes is needed.
- **SHIFTING PERIODS OF ENERGY SHORTAGE RISK** - The risk of not having enough generation to meet demand shifts from the historic times of peak power demand to other periods, specifically hot summer evenings and cold winter

mornings, when low availability of wind and solar resources is coincident with high power demand. New unit commitment tools, revised resource adequacy mechanisms are needed.

- **SHIFTING FLEXIBILITY RISK** - The ability of resources to provide system flexibility will be challenged. Market products to incentivize flexible resources are needed.
- **INSUFFICIENT TRANSMISSION** - The current transmission infrastructure becomes unable to deliver energy to load. Proactive regional transmission planning is needed.

[Click here to learn more about MISO's RIIA analysis](#)