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MEDIA CONTACT: Amy Rutledge
Director, Corporate Communications
Minnesota Power, ALLETE
(218) 723-7400
arutledge@allete.com

Minnesota Power launches 'smart sphere' technology to boost grid reliability and customer benefits

DULUTH, Minn. – Minnesota Power is using the latest technology to modernize its electric grid with the rollout of new "smart spheres" on transmission lines across its service territory.

The innovative smart spheres, officially known as Neurons, are now being deployed at 52 locations, covering about 190 miles across six transmission lines that experience congestion. The new technology is designed to make the grid more reliable, flexible and cost-effective while supporting the region's transition to a cleaner energy future.

Smart spheres, designed and built by the Norwegian company Heimdall Power, are compact, self-contained sensors that can be installed directly onto energized transmission lines using drones. Once in place, these devices continuously monitor and report real-time physical and electrical conditions—such as conductor temperature, ambient temperature, humidity, voltage, current and more, acting as a kind of smart watch for power lines.

By providing a clearer picture of how much electricity can safely flow through the power lines at any given moment, the smart spheres will allow Minnesota Power to deliver more electricity through the lines without any other improvements. This technology allows for the implementation of what is known as dynamic line ratings (DLR) on the most critical and congested circuits on the company's transmission system. Other utilities that have installed the smart spheres report unlocking up to 40% more transmission capacity.

For instance, when lines sag in hot weather or because of ice or snow, they can carry less electricity. Grid operators tend toward a conservative approach in such conditions, and accurate data from the spheres will allow them to use the line's full capacity.

"Our investment in smart spheres is about more than technology—it's about delivering value to customers; supporting the state's clean-energy goals; and ensuring a resilient, reliable grid for years to come," said Dan Gunderson, Minnesota Power vice president of transmission system planning and operations. "This is one of the most practical, cost-effective ways to make our grid stronger and more flexible while supporting the transition of our transmission system to adapt to changing energy supply and customer needs. Our customers will benefit from avoiding costs related to system congestion and a grid that's ready to adapt to the changing conditions on our system."

Minnesota Power's investment in smart spheres comes at a critical time. The region's electric grid is facing increasing congestion as demand grows and new renewable energy projects come online. Economic studies

estimate millions of dollars in potential future congestion costs if DLR is not implemented on these critical energy highways.

Minnesota Power has collaborated with Heimdall Power, a technology provider specializing in advanced grid sensors, since early 2025. Together, they are working to ensure that the smart spheres deliver reliable, actionable data to support Minnesota Power's operations and planning.

"We are proud to be working with Minnesota Power as they take this important step toward a smarter, more reliable electric grid," said Jørgen Festervoll, CEO of Heimdall Power. "Like other utilities using our technology, Minnesota Power will gain clear, real-time information about the performance of their transmission system. These insights will help Minnesota Power make better use of its existing infrastructure and deliver real economic benefits for its customers and the grid overall."

Benefits for customers and the grid

Deploying smart spheres offers several important benefits:

- **Lower Costs:** By reducing congestion, Minnesota Power can deliver electricity more efficiently, helping to keep energy bills affordable.
- **Improved reliability:** Smart spheres provide real-time insights into grid conditions, allowing operators to respond quickly to changing circumstances. This helps prevent outages and ensures that power keeps flowing, even during periods of high demand or extreme weather.
- **Support for Minnesota's clean energy goals:** As Minnesota Power and its partners build new transmission lines to connect hydro, wind, solar, and other renewable resources, smart spheres will play a key role. They act as a low-cost bridging solution on existing assets, maximizing the transfer of electricity on existing lines during construction and maintenance of new projects. This ensures that renewable energy can reach customers without unnecessary delays.
- **Flexibility during upgrades:** When transmission lines need to be taken offline for upgrades or repairs, smart spheres help maximize the capacity of parallel lines. This minimizes disruptions and keeps the grid running smoothly while long-term improvements are underway.

About Minnesota Power
Minnesota Power provides electric service within a 26,000-square-mile area in northeastern Minnesota, supporting comfort, security and quality of life for 150,000 customers, 14 municipalities and some of the largest industrial customers in the United States. More information can be found at www.mnpower.com.

About ALLETE, Inc.
ALLETE, Inc. is an energy company headquartered in Duluth, Minnesota. In addition to its electric utilities, Minnesota Power and Superior Water, Light and Power of Wisconsin, ALLETE owns ALLETE Clean Energy, based in Duluth, Minnesota; BNI Energy in Bismarck, North Dakota; and New Energy Equity, headquartered in Annapolis, Maryland; and has an 8% equity interest in the American Transmission Co. More information about ALLETE is available at www.allete.com. *ALE-CORP*

ALLETE calculates and reports carbon emissions based on the GHG Protocol. Details in ALLETE's Corporate Sustainability Report.

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