# POWER PLANT WINTERIZATION SOLUTIONS

Severe winter weather brings many challenges to the power generation and transmission industry across North America, where extreme weather, like polar vortexes, can happen frequently.

Not only does cold weather keep plants from operating altogether, but if they are able to operate in low temperatures, their output is still impaired by the weather. With exposed infrastructure, it becomes critical for facilities to be built to withstand future challenges and remain operational after cold weather.

In some facilities, low temperatures will lead to freezing equipment and piping, fuel curtailments and resulting in inadequate fuel supply, and limited consumables and services needed to keep the plant operating.

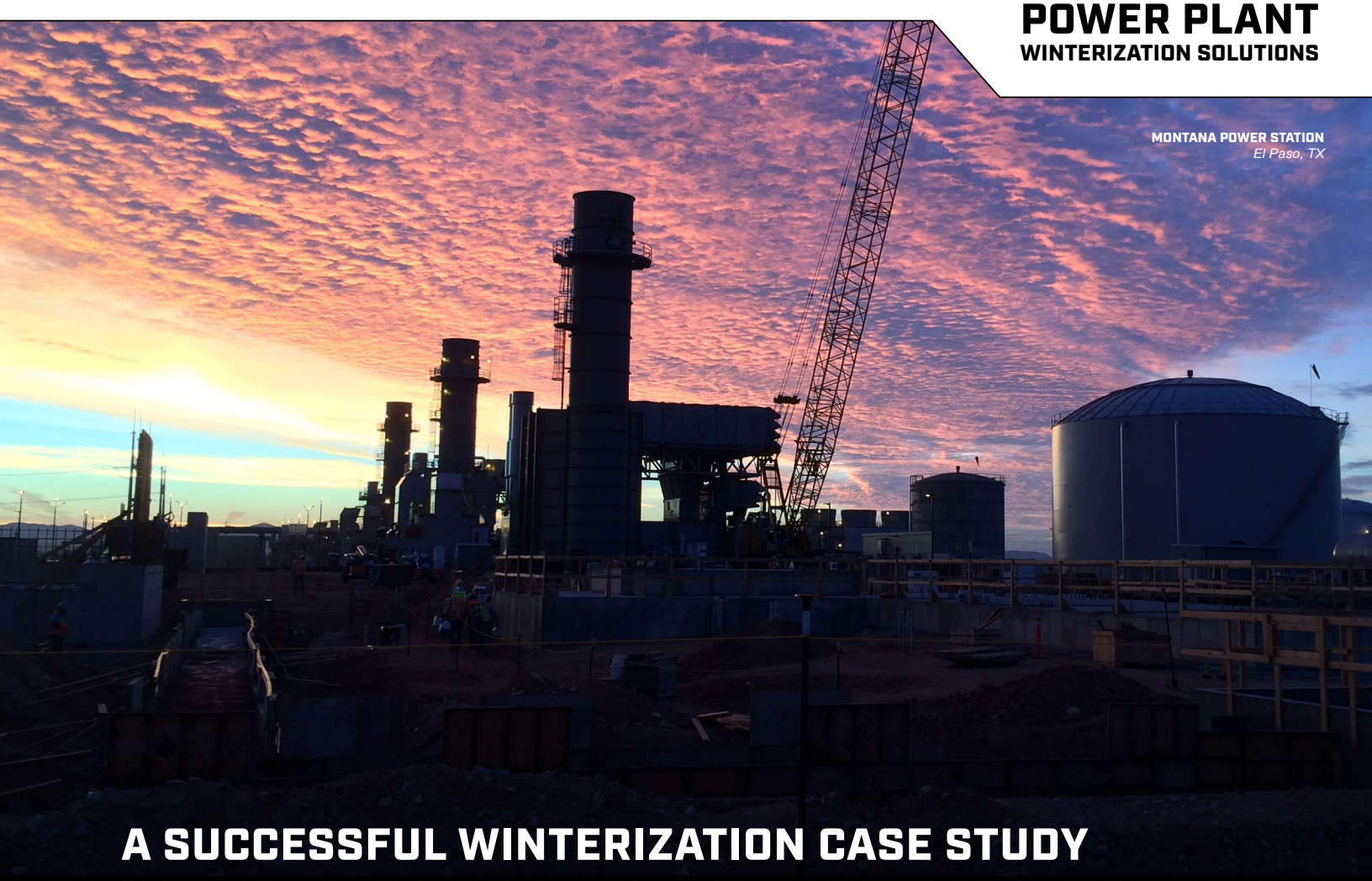
However, to keep up with extreme cold events, facilities can take steps to mitigate disruptions from winter freezes. Utilities that take a proactive stance on winterization stand to benefit in many ways, such as continued power supply in the face of inclement weather, less regulatory exposure and profitability.

McKinsey estimated that by 2050, the cost of damages and lost revenues to utility companies would rise by 23% to $300 million. Combined, their estimates give a baseline of $1.7 billion in economic damage for each utility. Winterization can support utility goals to deliver uninterrupted, quality service to their customers, even during cold weather.

According to an analysis by McKinsey a typical utility saw

**$1.4 BILLION IN STORM DAMAGE COSTS & LOST REVENUES**

due to outages caused by storms over a 20-year period.



**MONTANA POWER STATION**
*El Paso, TX*

# A SUCCESSFUL WINTERIZATION CASE STUDY

In 2011, low temperatures challenged the Texas power grid, causing blackouts and leaving millions of ratepayers without electricity as utility providers worked hard to get the lights turned back on across the state.

Then, a full decade later, it happened again in February of 2021 during Winter Storm Uri, with a nearly statewide blackout sparked by freezing temperatures and a strained power grid.

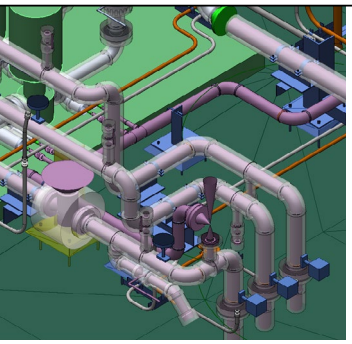
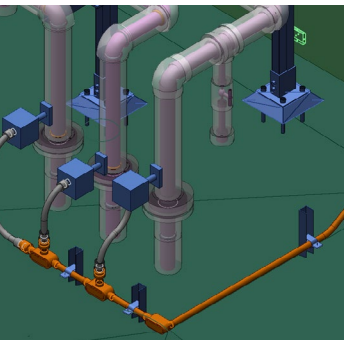
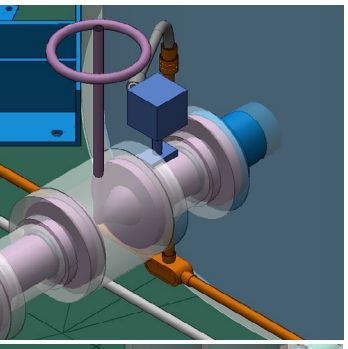
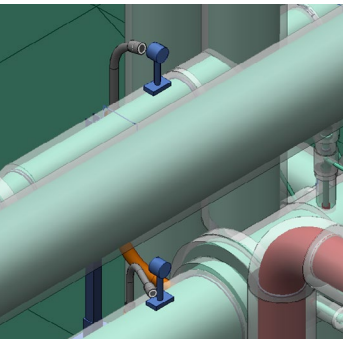
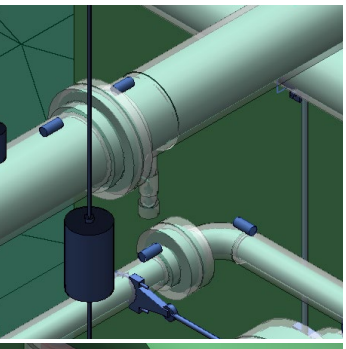
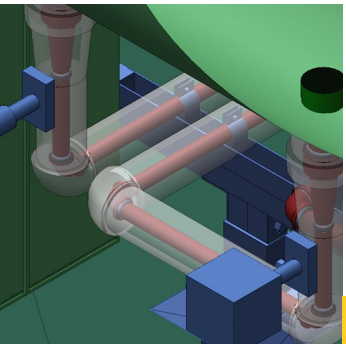
The power grid disruption had several causes. Some generation was offline for planned maintenance, plants went offline unexpectedly from the cold weather and others were unable to start back up because of severe cold weather conditions.

The resulting blackout left nearly 5 million homes and businesses without electricity for days, but the entire state didn't experience power outages. In El Paso, Texas, a city of nearly a million people, only 1,000 homes lost power.

While most of the Texas electricity market is regulated by the Electric Reliability Council of Texas (ERCOT), El Paso falls outside of ERCOT's borders, and is instead regulated by the Western Electricity Coordinating Council. After the 2011 winter storm, El Paso Electric mandated that power plants under its jurisdiction weatherize against extreme cold.

El Paso Electric owns the Montana Power Station, an 352-megawatt simple cycle combustion turbine plant powered by natural gas. The facility also has added fuel flexibility, meaning it can run on natural gas or oil. The facility is designed to start quickly, in about three minutes, and can achieve full power production in about ten minutes. Unlike most of the other natural gas-fired plants statewide, the Montana Power Station had a liquid fuel system designed by Kiewit to prevent the plant from cold-weather-induced failure.

After the Montana Power Station weathered the winter storm, keeping the city of El Paso's lights on, plant operators credited the liquid fuel system for keeping the plant online.

# HEAT TRACE

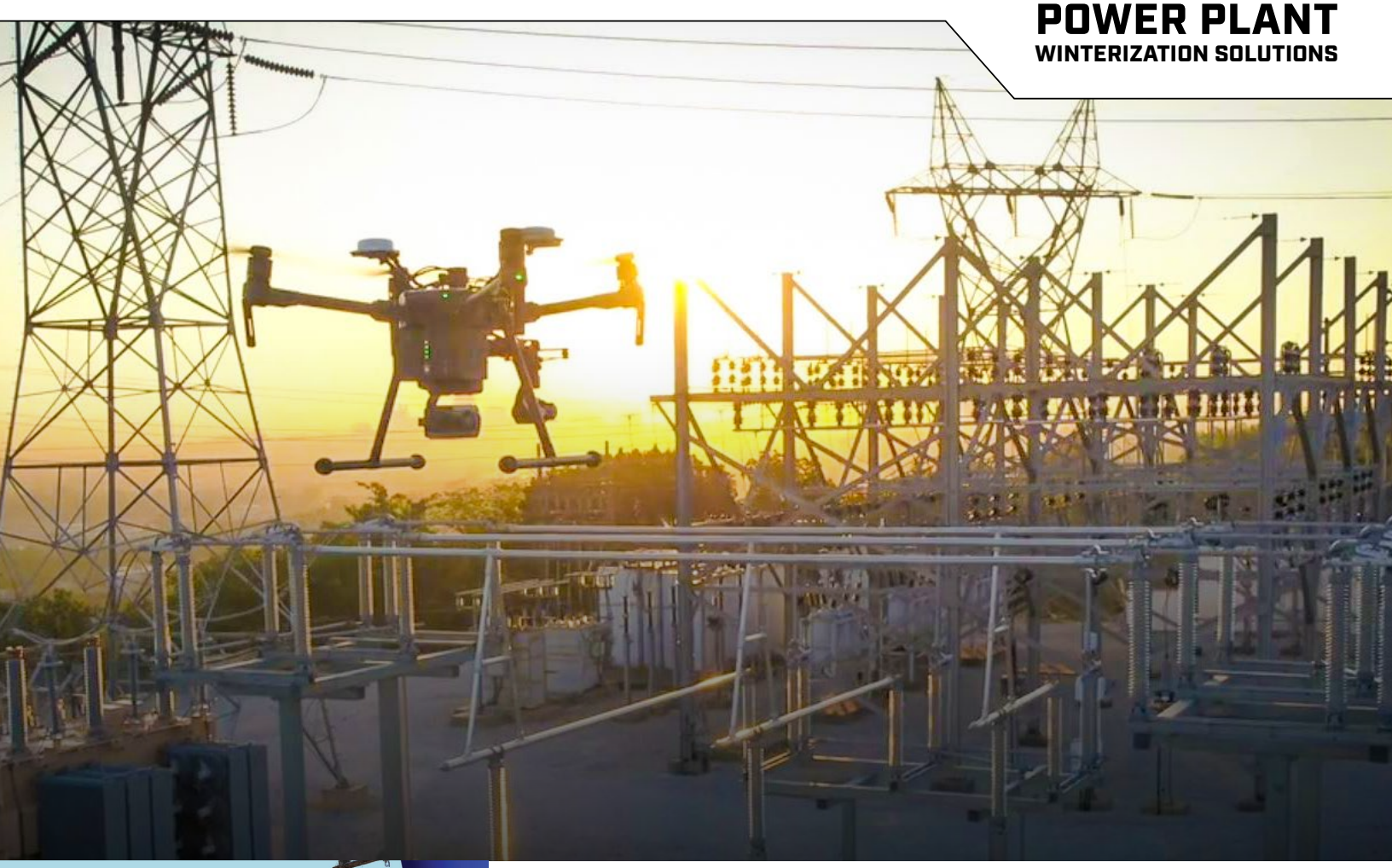
Weatherizing solutions often involve heat tracing work, in which an electric cable runs alongside delivery pipes and equipment to protect them against extreme cold temperatures. Heat trace is designed to prevent freezing from occurring inside water or steam lines, which could rupture or prevent adequate flow and disrupt plant operations. It can also be used to maintain required process temperatures in lines. Although some pipes can reach extremely high temperatures during normal operations, they can be subject to freezing during scheduled or unforeseen plant outages or shutdowns.

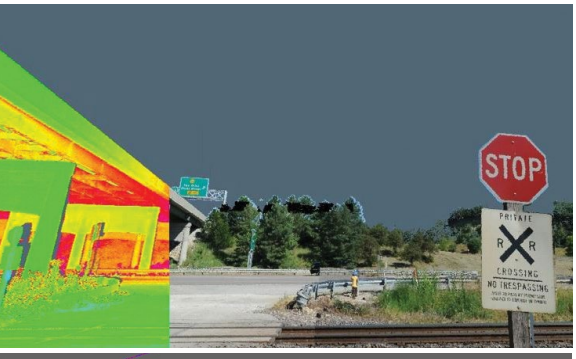
Kiewit's heat trace engineering team is multi-disciplined with a wide array of expertise ranging from oil, gas and chemicals to infrastructure, power and industrial markets. Kiewit has executed the complete design of over 250,000-feet of heat trace circuits and systems.

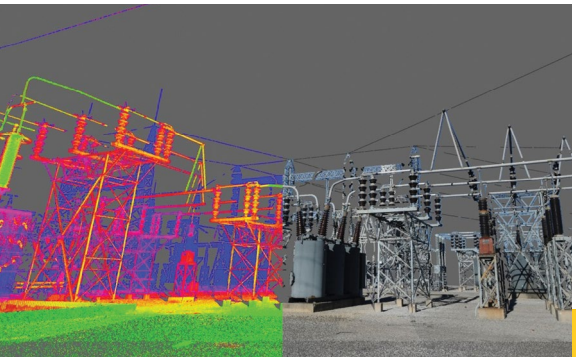
For example, Kiewit engineered, procured and constructed the Jackson Generation Plant in Elwood, Illinois, a 1,200-megawatt natural gas-fired, single-shaft facility. The project was originally planned to have a minimum design temperature of negative 5 degrees, but Kiewit conducted a study based on historical low temperatures and found the area can reach sustained temperatures as low as negative 32 degrees. Due to the Kiewit study findings, the project changed its design temperature to withstand negative 32 ambient degrees. With the installation of heat trace and other winterization solutions, the project is designed to maintain operations even during sustained Midwest winter freezes.

Kiewit conducts ambient temperature studies on all heat trace projects to ensure the project is designed to withstand the lowest historical ambient temperature in the project location. Our unique team of construction-focused experts know how to design projects for operational efficiencies in the face of cold weather.

> Kiewit has executed complete design of over
> **250,000 FEET OF HEAT TRACE CIRCUITS AND SYSTEMS.**



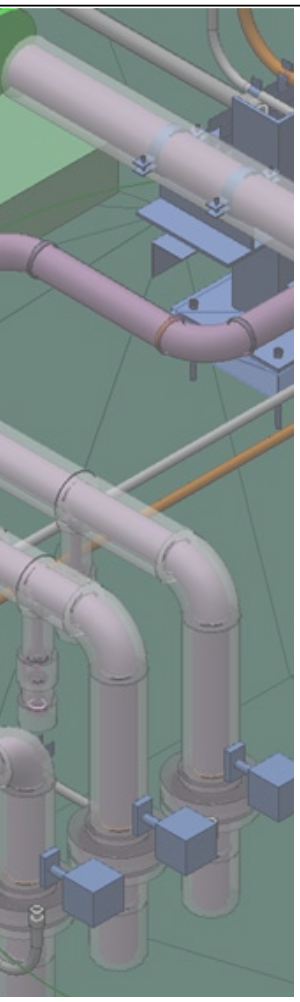


## GEOSPATIAL IMAGING

New and emerging technologies, such as drones and geospatial imaging, can also play key roles in winterization. Thermal imaging technologies such as advanced, high-resolution visual and infrared cameras offer detailed imaging of current infrastructure and can be used to detect hot spots, thermal heat loss, structural and equipment inefficiencies.

Winter storm damage can compromise and endanger communities. Kiewit's experienced geospatial professionals support early assessment efforts to help utilities identify problem areas to restore power faster. In post-disaster planning and storm response, rather than sending workers across the entire grid to analyze and assess damage, these technologies can allow a utility to focus efforts on the places where early action can restore power to the most people in the shortest timeframes. These solutions also keep workers from having to expose themselves to dangerous conditions, whether that is icy roads or bitter winds.



# ADDITIONAL SOLUTIONS

*Critical-spares Inventory*

Developing and maintaining a critical-spares inventory is also an essential solution. Critical-spares inventory offers increased uptime, lower shipping costs and increased efficiency of resources. When a critical component for plant operations fails, the replacement component is on site and readily replaced by facility staff. This allows for increased operational time because plants are not waiting for shipments of critical components; they are readily available on site. Only critical components are stored at the facility, keeping non-critical components from taking up valuable storage areas. If a failure occurs, plant operators will be able to quickly remedy any challenges.

*Functional Redundancies*

Similar to critical spares, functional redundancies can increase reliability by ensuring a system will continue to function despite failure in other components of the system. Redundancies offer alternative operational options, such as the fuel oil kept on site at the Montana Power Station by El Paso Electric. Redundancy solutions can also include multiple power lines that connect power facilities to the power grid. When one power line is down, other connected power lines can still distribute power to the grid. When designing a power generation plant, it is important to have engineering and construction experts to incorporate functional redundancies to maximize plant reliability.

*Auxiliary Heating*

Other options for weatherization include auxiliary heating using propane, electric or diesel. When outside temperatures are extremely cold, heat pumps may never reach operating temperatures, making plant operations less efficient. To heat the pump up to operating temperatures, the auxiliary heat will assist the pump in warming up and increase efficiency when starting up. The auxiliary source doesn't take over for the pump but instead reduces the pump warm-up time. Pre-heated pumps start easier and have reduced wear and tear, resulting in less maintenance and facility down-time.

*Safety Hazard Inspection*

Safety for operators and maintenance staff cannot be forgotten. Walkway and platform safety hazard inspection and plans are also essential. When surfaces are covered in ice or snow, they create slipping and tripping hazards. Designing and building walkways and platforms that are protected from snow and ice, having winter plans to address snow and ice, or covering walkways with non-slip materials are key to winterizing facilities and keeping people safe.

*Decentralizing Generation*

Additional solutions include decentralizing generation where power is generated closer to the end-user so that the energy produced does not have to travel long distances. Typically, power generated in a decentralized model does not produce more than 10 MW, but they improve power supply.

Along with a decentralized generation model, using battery storage and developing microgrids can operate independently and create grid resilience.

Our extensive regional network allows us to

**EASILY SCALE TO ANY JOB AND PROVIDE SOLUTIONS**

to meet all plant winterization needs.

## SOLUTIONS PROVIDER

A key opportunity for utilities comes with engaging early with a consulting partner who has the expertise and experience to build for the future while mitigating risks.

Kiewit uses approaches like design-build and EPC to help power utilities design their facilities with a construction-focused engineering approach that supports sustainable operations. We have been in the business of designing solutions to withstand external challenges and position facilities for future success in the case of severe weather events.

## UNMATCHED EXPERTISE

Our construction-focused engineering approach means we analyze the design from a constructability standpoint, identifying and suggesting alternatives that result in increased efficiencies, quantity reductions, safety improvements and improved project schedule. Our engineers have field experience on our projects, and they know how to handle construction in tight outage schedules. Additionally, our commissioning personnel participate in the preliminary and detailed design processes to further verify project completion strategy is fully considered and optimized.

## PROVEN EXPERIENCE

Through our collaborative and transparent approach, Kiewit has successfully completed projects of varying sizes and complexities. We have the flexibility to provide services through traditional contract models, as well as alternative models.