



Thanks, Sam,
for your
many years as
Mr. Osprey!

Sam M.

Specialist Biologist
27 years of service



ENERGY CONNECTIONS

MT
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Solving a transmission outage mystery

The leading cause of power outages on NorthWestern Energy's largest transmission line probably isn't what you'd expect. It's not wind, or storms, or trees falling on the line. The leading cause of outages is birds, or more specifically, bird poop.

"It has been an issue to some degree ever since the lines were initially energized in 1983," said Jim Lueck, Electric Transmission 500kV Advisor for NorthWestern Energy.

These bird-caused outages occur in two distinct ways, and primarily by two different species of birds – eagles and ravens.

When eagles perch on transmission towers and relieve themselves, their waste comes out in one long streamer. Calling this poop, isn't entirely accurate. The technical term for bird waste is mute. In most birds, urine and feces are released at the same time. This substance is called mute.

Eagle mute can be so long that it can create a connection between the power line and the tower. Because electricity can be transmitted by mute, this can cause the line to fault. The line will arc causing the mute to disintegrate and the fault to clear. Typically these outages only last a few milliseconds, and the line will re-energize.

"It's similar to attaching a temporary wire directly from the energized conductors to the grounded tower," Jim explained.

However, raven mute is a different story. Ravens are becoming more and more prevalent around the 500kV facilities, and they leave a lot of droppings behind. Some 1,400 ravens were counted in one day at one isolated location along the 500kV right-of-way.

NorthWestern's 500kV lines are the utility's largest capacity transmission lines, running from Colstrip to Washington State. NorthWestern is responsible for maintaining these lines from Colstrip to Townsend, or approximately 256 linear miles for each of the two parallel circuits. 500kV means the lines operate at 500 kilovolts (500,000 volts) of electricity.

On the 500kV lines, the conductors, or power lines, are attached to each tower by strings of glass insulators. The insulators keep the electricity from flowing from the conductor into the metal support towers.

These towers are popular perching areas for ravens. When ravens sit on the towers, their mute falls onto the insulators. If enough mute builds up, the insulators become compromised and they cannot function

as designed. This means the electricity makes its way through the insulators and into the tower, causing a fault. However, unlike with eagle mute, the fault doesn't just go away. Instead, the line remains de-energized, potentially causing a prolonged outage. Crews then have to go find the problem insulators and clean them.

"Contaminated insulators can often result in an extended sustained outage owing to the remote location of those facilities, as well as the time required to properly remove the mute," Jim said.

So why not just clean the insulators more often?

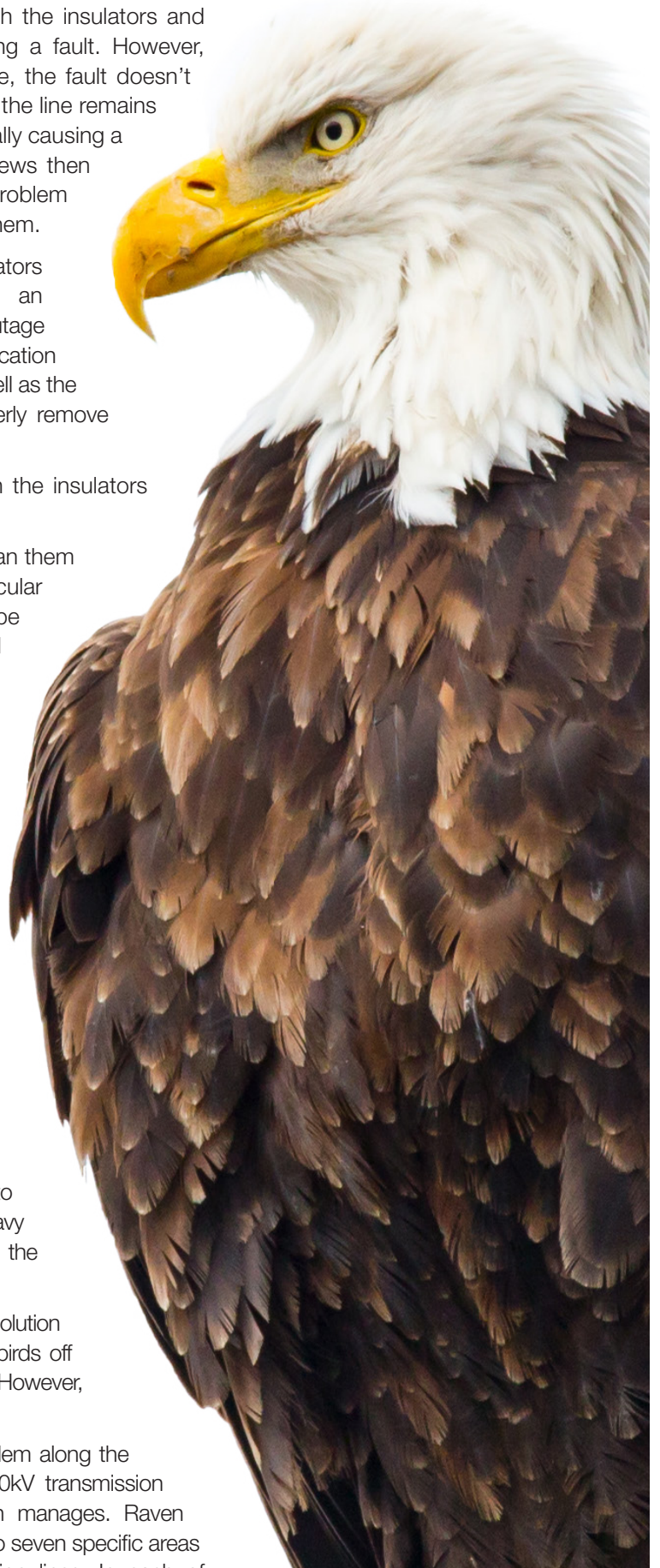
"We could virtually clean them spotless on any particular day, and they could be completely covered again within a week," Jim explained. "That's how much and often they go."

Plus, most of the time mute-covered insulators don't cause a problem. The mute dries, and the insulators can do their job. It takes fog or light rain to create the perfect recipe for an outage. Fog or mist moistens the mute, allowing the substance to conduct electricity. Heavy rain actually removes the mute very well.

It may seem that the solution would be to keep the birds off the towers all together. However, it's not quite that simple.

Ravens are not a problem along the entire 256-miles of 500kV transmission line that NorthWestern manages. Raven problems are isolated to seven specific areas along those transmission lines. In each of those seven areas, large numbers of ravens can be found on just a handful of towers.

Those seven areas are popular with ravens because they are near a food source, such as a feed lot or prairie dog town for instance. Ravens are scavengers and prefer



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Solving a transmission outage mystery (cont.)

to perch close to an area where they can consistently find food without expending energy. If we tried to completely remove the ravens from the towers they currently occupy, they would simply move to the next adjacent tower and then the next, and so on.

“As there are approximately 2,250 towers within our service area responsibility, we do not want keep them off the towers entirely, because that will create an unending struggle for us,” Jim said.

Instead, Jim has been working to devise a way to keep the birds off specific portions of the tower, but leave enough space for birds to perch on other parts of the tower.

NorthWestern Energy crews eventually began installing bird deterrent spikes on the towers directly above the line. That way bird mute does not accumulate on the insulators closest to the power line conductors. Mute can build up on the insulators farthest from the power line without causing any problems.

There has been some trial and error to determine exactly where the spikes need to be placed to keep the mute off the critical insulators. Already it's clear the spikes are deterring the birds from certain areas of the tower while still giving them a place to perch. This spring, crews added more spikes to many of the towers to further protect certain insulators from mute.

“We have all the hope in the world this is going to work,” Jim said. “We won't know for sure until next winter when the ravens come back in earnest.”

Most raven mute-caused outages occur in January and February. Birds flock to the towers to take advantage of the near-by food sources. Once spring begins to melt



the snow, they disperse as food becomes much easier to find.

This year, with the long, hard winter, outages continued into March and April. The snow lingered and the birds stayed put longer than usual. Insulator cleaning and other mitigation processes were scheduled in those areas, but the excess snow did not allow access to the lines until much later than normal.

NorthWestern experienced the same issue two winters ago and has been working ever since to find an ultimate solution. That meant spending a lot of time figuring out how and why birds were perching on power structures.

“We discovered a lot of this over the last couple years by putting up game cameras on the towers,” Jim said. “It's taken us essentially two years to really put all of the pieces of the puzzle together.”

Raven mute is a problem for utility companies across the country and around the world. However, no one has come up with a perfect solution.

“If we're successful, it will have an enormous impact to the line integrity,” Jim said.

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We are required to translate important customer information for populations in our service area that meet a certain threshold. We have two languages that currently meet that threshold: Spanish and Karenic.

Nos preocupamos por su seguridad. Este anexo a su factura incluye mensajes importantes sobre seguridad que usted necesita saber con respecto al servicio público que le proporciona NorthWestern Energy. Comuníquese con nosotros si desea recibir la información de seguridad en español, llamando al teléfono 888-467-2669 (en Montana) 800-245-6977 (en South Dakota o Nebraska) y pregunte por las opciones de idiomas para los anexos de sus facturas.

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Downed trees and power lines



Recently, NorthWestern Energy responded to a few outage reports where recently cut trees had inadvertently fallen into energized power lines. In a few cases, people were putting themselves in serious danger by trying to remove the tree themselves. Always contact your utility company and never touch a power line or any object, including trees, that are in contact with a line.

Some simple reminders:

- Always maintain adequate clearance from power lines. Keep people, equipment and objects at least 10 feet away.
- Never attempt to remove a fallen tree or branch from a power line. You could be seriously injured or killed.
- If a tree or branch does come in contact with a power line, keep yourself and others away from the tree and contact your utility company.

Visit northwesternenergy.com for additional electrical safety tips.