TEXAS IS NOT AS FAR AWAY AS YOU MAY THINK

Robert Cornell, Manager

The February events in Texas due to cold weather, high demand, and cascade system failures were all in the news. Much spin has been put on who/what is to blame for the outages and subsequent damages and it seems that every entity is pointing the finger at someone other than themselves. You can read an article regarding a number of the contributing factors on page 9 of this magazine.

Good thing we were here in Wisconsin where we are used to dealing with cold weather, right? Guess what? We were right in the middle of it just the same as Texas. The only difference is that grid operators here were able to manage supply and demand and keep the lights on. Don't think for a minute that it was not a delicate balancing act.

Yes, Washington Island was in the thick of the mess right along with Texas. And yes, we can expect to be in the mess again and again moving forward. I will get into the "why" shortly, but in the meantime, here is what the immediate result of the mess was for us.

If you have attended an annual meeting, you've heard me discuss "economic interruptions" and the way we purchase our wholesale power. During this cold snap your cooperative was under "economic interruption" for 164 hours. This means the wholesale power rate reached a trigger point that took us beyond the normal generation and fuel costs that make up our formula rate and we began purchasing power directly on the Midcontinent Independent System Operator (MISO) market. This market operates much like any commodity market and is wholly based on supply and demand. When we are interrupted, we have the choice to purchase power on the market or go on engines and generate our own electricity. The market operates in five-minute intervals and we purchase based on 15-minute increments. When we run our engines, based on fuel costs, it averages approximately $0.40 to $0.50 per kilowatt hour to generate. This means the market needs to be above that $0.50 per kilowatt hour and we need to be able to react to those 15-minute increments and a market that can wildly fluctuate.

Running engines based on the market is risky, because the actual market price might be below that $0.50 per kilowatt hour and even though we are losing money by buying through, we are not losing as much money as if we were running the engines. Not running engines is risky because the price might spike to $1 per kilowatt hour and then we lose even more…it is a true balancing act. In this event, the price in Texas reached $9 per kilowatt hour. Because our engines require startup and cool-down time, we really cannot react to a five-minute market (that we buy in 15-minute intervals) and most times will need to take our lumps with regards to wholesale price. Under most circumstances in the past, the market-based rate is offset by the vast majority of the rest of the year when we are not under economic interruption.

So, how did we fare during these 164 hours of interruption? The answer is "good and bad." The market fluctuated wildly during these hours and the average WHOLESALE cost of power ended up being $0.187 per kilowatt hour over that period. This is obviously better than the cost of running our engines, but considering that we are selling for an average of $0.135 per kilowatt hour we certainly lost money and when cranked into the total month, these hours added an additional $55,000 to our wholesale bill.

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None of this is a reason to panic. It is part of the cost of doing business and part of the balancing act that we as a cooperative must perform, much like the balancing act of the operators of the larger grid. The thing that we need to be concerned about is how close were we to being without power, like our closer-than-expected neighbor, Texas, and how often is this going to happen going forward. Thanks to that balancing act performed by grid operators and the fact that generation stayed online our "economic interruption" did not become an actual interruption required to maintain grid stability. Unfortunately, due to the transition from steady baseload generation fuels such as coal and nuclear to generation that depends on natural gas, a consume-as-delivered fuel, we can expect these economic interruptions to be more frequent and when coupled with inherently unstable renewables, you have a recipe for a load-to-generation ratio that can destabilize our grid and lead to cascade failures such as Texas saw.

We were told when the Kewaunee Nuclear Plant's baseload capacity was transferred to the Fox Energy Center peaking facility in Kaukauna that there would not be a net effect on our interruptions. This has not proven true. With a peaking capacity of 500 Megawatts reduced by Kewaunee's 300 megawatt baseload generation, this leaves only 200 megawatts of peaking capacity available during high demand situations. Add to

this the delivery constraints on natural gas and its dual use for generation and heat and the numbers indicate that this will continue. Renewables add to grid instability. When all is well, they can offset the need for other fuels and certainly reduce the emissions from other generation, but when the grid's load is in the upper part of generation capacity, any loss of generation (such as the wind not blowing or the sun going behind a cloud) can cause that delicate balancing act of the grid operators to become even more difficult and potentially lead to cascade failures. As we saw when the cable failed and we were only able to run one engine and that engine was at 70%+ capacity, even a bird causing an outage, caused the engine to trip out due to unbalanced load. When Washington Island is on engines, we are a true microcosm of the greater grid as a whole.

This commentary is not meant to be a doom and gloom prediction. Technologies and infrastructure will get there eventually. But they are not there now and until they are, we can expect to continue to be much closer to Texas than we realize.

FIBER UPDATE: GRANT ACCEPTED!

The Public Service Commission met on March 18, and among the other business that they regularly attend to, they announced the winners of the FY2021 broadband expansion grant applications. Our grant application was recommended for funding by the PSC staff. In fact, it was ranked #2 of 124 applications in order of merit. After discussion the commission approved our application. As we have discussed over the last several months, this application was made in partnership with NSight, Door County, and ourselves. Mick O'Malley of NSight wrote the grant.

Lead times on material (in particular fiber optic cable) are horrendous because of high demand and as has been mentioned before, in order to get ahead of this issue, the cooperative, in addition to the work planned for Lobdell Point Road, ordered 140,000 feet of fiber optic cable late last year. This cable is estimated to arrive in June, July, and August. It may have been a bit ahead of the game to do this, but it would have been awful to announce that we won the grant and then have to tell the members that material would not arrive until 2022.

This project gets the ball rolling and sets up for fiber for the entire Island.

ELECTRIC VEHICLE CHARGERS AND WASHINGTON ISLAND'S SYSTEM

In last month's issue we told you about the cooperative becoming a part of Charge EV and how we intend to be a source for chargers installed in homes and publicly here on the Island. These chargers will be controllable by the cooperative and we explained how and why that is so important from an infrastructure standpoint and from a load management standpoint.

We wanted to touch a little bit more on how EV chargers could have an extremely detrimental effect on us running our engines during an outage (or during an economic interruption as discussed on page 15) unless we are able to control them.

Currently, when we lose power from the mainland, we start our engines and generate for ourselves until power is restored. In order for our engines to run, we must have a balanced load across all three phases. An unbalanced load leads to return current on the neutral. Without going into the specifics, a high return current on the neutral is detrimental to the windings of the generators themselves, and our switch gear, which controls the operation, will trip out the generators if this return current exceeds a preset level for more than three minutes.

This can occur under normal circumstances, especially if it is cold out or if a higher percentage of water heaters is attempting to cycle on out on the system. In some cases, we can restart the engines and just the additional three minutes of run time will be enough for the load to settle and balance so that the engines will stay running. In some cases, we are forced to open breakers so that the south and north parts of the Island are separated and allow one side or the other (generally the south first) to settle out before we add in the load of the north. In other cases, we have had to go out to a couple key locations and move a tap for a branch line from one phase to the other to manually move the load and balance it.

Imagine now that we have 20 EV chargers on a single phase and all are trying to charge a vehicle at the same time when we lose power from the mainland. This could potentially add 47 amps at 7,200V of load on that phase alone and would easily cause the load to be VERY unbalanced. We need to ensure that after an outage, the chargers DO NOT operate for a period of time and IF they are allowed to operate that they operate at the lowest possible charge rate. The chargers the cooperative will have available to our members will have such controls and the company we are dealing with is in the process of writing firmware that will handle our specific installation.

We know, no matter how well intended, our members are unlikely to disconnect their EV from the charger in order to reduce load and alleviate the above described situation, especially if an outage occurs in the middle of the night (when they are most likely to be charging their EV).

We also know that no one with an EV wants to be responsible for creating an unbalanced load that might affect someone who depends on an oxygen generator or other electrical device that will not operate if we are unable to run engines.

This may sound a bit dramatic, but it is in fact the reality of the situation. We need to know if you have a charger installed and while we may be able to retrofit the installation with a relay that prevents operation after an outage, it would be more practical and beneficial to the cooperative and its members (you!) if you worked with us. This is a big part of the reason why we are promoting chargers that we can control.

OH, *#?@%!

You can fill in the blanks above with the expletive of your choice and you will get the idea of how we felt when ferry captain and cooperative board member Joel Gunnlaugsson stopped in to let us know that ice had drug the Plum Island #1 buoy and its 4,000 lb. sinker at least ¼ mile off station towards the new submarine cable and fiber optic cable laid alongside it. From all angles it was apparent that the buoy, no longer in ice, was in the vicinity of the new cable. Without knowing the length of the anchor chain connecting it to its sinker, we had no idea where the 4,000 lb. weight was.

Above: View from Koyen Fisheries Sea Diver on approach to the wayward Plum Island #1 Buoy, tied to the Sea Diver at left.

Numerous calls to the U.S. Coast Guard (Cleveland, Sault Ste. Marie, Sturgeon Bay, Milwaukee, etc) were initially unanswered (or we were told to call another department) and Hoyt Purinton, Rich Ellefson, and I took the Arni J. Richter out to the location in order to get a GPS fix on the buoy itself. This fix was also confirmed by the crew on the Madonna. With the help of Roen Salvage engineer Pete Huber, the points were plotted on the cable map created during the installation operation. It showed that the buoy was approximately 100 feet beyond the mapped cable location.

After some discussion, Hoyt and I determined that the next course of action should be to use the ROV co-owned by the Ferry Line and Snapshot Science LLC/Steve Schmidt to determine exactly where the sinker was in relation to the power and fiber optic cables. Because we felt using the ferry to tie up to the buoy might actually drag it further and potentially make matters worse, Kenny Koyen was contacted and he volunteered to take us out with his fish tug, the Sea Diver, and tie up to the buoy while Hoyt investigated with the ROV. In the meantime, the Coast Guard finally got back to us and told us that the sinker was attached with 90 feet of chain. If our plotting and mapping were correct, because the buoy was in approximately 45 feet of water and the chain appeared to be straight up and down, this meant the sinker was likely 45 feet closer to the cable than the buoy, meaning that it had definitely crossed over it. At this point we had no idea if there was damage or if the ice was strong enough to move the cable if it were to be entangled in the sinker/chain of the buoy. The heavy steel armoring around the cable should protect it; however, a 4,000 lb. concrete sinker being drug across it is most definitely an unknown!

Investigation with the ROV confirmed that the sinker had been drug between 40 and 50 feet beyond the cable (which, on the good side, showed our mapping was extremely accurate). It also appeared that the sinker had been plowing up sand and silt on the bottom and pushing it in front of itself as the ice drug the buoy along. This actually created something of a ramp that allowed it to cross the submarine power cable with no apparent damage and at best, minimal movement of the armored cable. It did, however, catch the fiber cable that was laid alongside it, separate it from the aircraft cable we had lashed it to, and moved it probably a good 5 to 6 ft.

Kenny Koyen looks on as Hoyt Purinton operates the ROV.

Using the ROV, Hoyt was able to inspect the length of the cable that had been disturbed and, other than the movement, it did not have any visible signs of kinking or even scuffing of the jacket. This armored fiber cable is the same cable that is run many miles for communication between oil platforms on the North Sea, and the manufacturer had told us when we specified it that it had become entangled in nets and anchors and had survived the experience. The aircraft cable lashed to it, primarily to get it to sink faster, would only be an adder to its strength. The cable will still need to be tested to ensure that there is no damage, but this will be done when the weather is better and in conjunction with other work. In the meantime, we will keep our fingers crossed that it tests fine.

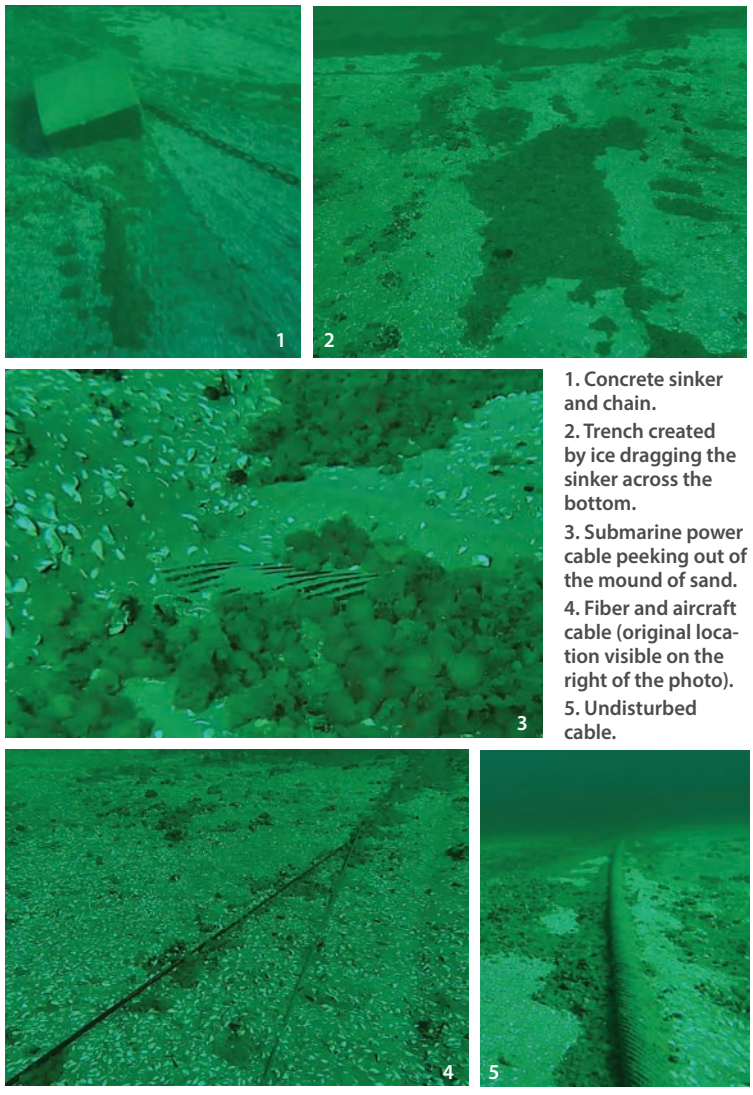
Upon retrieving the ROV, Hoyt, Kenny, and I all breathed a sigh of relief and we told Kenny that it might just be the

most valuable lift he ever made! All in all, we were quite lucky. Hoyt, myself and the crew of the new USCG Cutter Mackinaw had a conference call on Sunday morning and when we described the situation to them, they were able to divert from their ice breaking trials and lift the buoy, chain, and sinker onto the deck of the cutter and take it away. When I had further discussions with the USCG Cleveland office, which is in charge of Aids to Navigation (AToN), options to prevent this from happening in the future were discussed and it sounds as if the buoy will be physically replaced after all ice is gone, with heavier sinkers and then removed for the winter to be replaced with an electronic (virtual) AToN.


USCG Cutter Mackinaw on Station lifting the wayward AToN.

This is the first time this buoy has been more than minimally off station in the memory of longtime ferry crew, and Kenny Koyen said it is the first time he has seen it move in his 50 years of fishing. We considered this concern when planning the route of the new cable and purposely swung into the deeper trench of the Detroit Island Passage. This route kept the cable 340 feet away from the buoy at its closest. We did let the USCG AToN folks know that we would be in touch after the fiber was tested. As a side note, not many electric cooperatives (or any utility) have reason to call on the United States Coast Guard. While the AToN is their responsibility, their quick response with a vessel that was in the area for other purposes was admirable.

More importantly, when you see Hoyt Purinton and Kenny Koyen, thank them for their help!



1. Concrete sinker and chain.
2. Trench created by ice dragging the sinker across the bottom.
3. Submarine power cable peeking out of the mound of sand.
4. Fiber and aircraft cable (original location visible on the right of the photo).
5. Undisturbed cable.

BILLING SYSTEM UPDATE

Our new billing system is up and running, although not without headaches for both the cooperative and our members. Members MUST register their account and check the box for paperless billing as noted in numerous notices in order to continue receiving their bill via email. Registering your account does not mean that you need to use any of the online payment methods that are available to you with this system. In spite of numerous notices, some of our members were surprised by the fees that are associated with these payment methods. AGAIN! You do not need to use these methods to pay your bill.

You may continue to pay how you always have if you wish, but you will not receive an emailed bill unless you register your account and check the box for paperless billing. Paperless billing not only saves your cooperative time and money, but the email delivery on the same day as we read the meters increases the amount of time you have to get payment to us.

As with any new system, we expect that there will be a few stumbles and this one has been no exception. Once we get through the newness and get used to how it works, we are certain that many of our members will see the benefit and convenience of using it.

COOPERATIVE HIGHLIGHTS

The amount of information in the previous articles has taken up the pages available to us for this issue! Stay tuned for this column to return for the May edition.

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