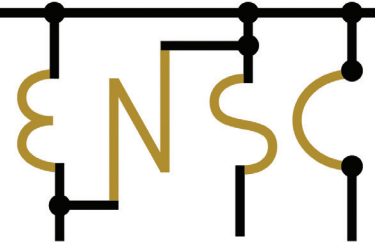


Fall 2022 | Volume 3 | Edition 1



EATON
MAGAZINE





It's been a long 2-year hiatus since we put together an ENSC event and it has been well overdue. I'm happy to announce that the 2022 ENSC event in Houston, TX hosted with CenterPoint Energy is back on schedule.

It was difficult to cancel the 2020 ENSC, especially after the 2-years of preparation that went into putting the Houston conference together. However, despite the cancellation due to COVID-19 getting back on track was easier given all the pre-work that was already completed.

The 2023 ENSC will be hosted by Alabama Power in Birmingham, AL. Make sure to mark April 24th-27th on your calendars and help spread the word!

We are very lucky to work in the secondary network and underground community and the ENSC brings a like-minded community together to tackle any problems and improve our critical infrastructures, so many thanks to all who contribute and support the ENSC and this magazine.

I look forward to seeing all of you in Houston!

Respectfully,

Mark Faulkner
Product Line Manager
Eaton

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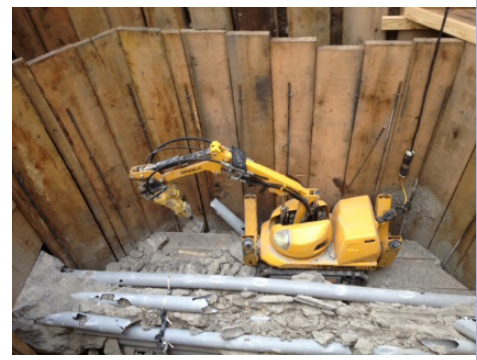
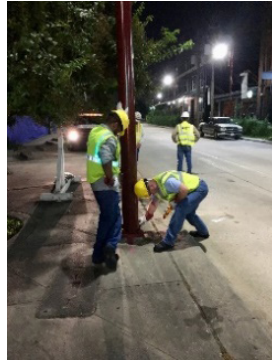
CenterPoint Energy System Overview and Equipment to Improve Safety for the Future

Deryl Tumlinson, CenterPoint Energy, Director - Major Underground Operations

Headquartered in Houston Texas, CenterPoint Energy (CNP) serves more than 2.8 million electric customers in the greater Houston area and in southwestern Indiana. Safety is our most important core value, which includes the safety of our workforce, the public, and our electrical system. By focusing on our values, we continuously look for opportunities to improve safety through innovation and process improvements.

The CenterPoint Energy three-phase underground system serves many densely populated areas in the Houston region, the nation's fourth largest city. These include downtown Houston, the Texas Medical Center, George Bush Intercontinental Airport, the Galleria, University of Texas Medical Branch - Galveston, along with multiple commercial and residential developments throughout the company's service area footprint. The underground power infrastructure in these areas includes circuits, network transformers, vault transformers, pad-mounted transformers, vaults, and manholes. Due to the critical nature of

circuits using a handheld 50-pound jack hammer. Four sets of two-man teams were typically required for two days, with teams alternating every 15 minutes due to the heat and physicality of the work. Potential hazards included exposure to silica dust, electrical flash, and heat exhaustion. With a focus on continuous improvement, an innovative solution was found in the form of a robotic jack hammer. Consisting of a small track machine with a 125-pound jack hammer attached to an articulating hydraulic arm, this unit is controlled remotely from a handheld control box. From above the pit, a three-man team (two spotters and one remote control operator) is now able to complete this task in just one day or half the time. The undesirable aspects of the work have been eliminated while the efficiency gained by this methodology paid for the robotic jack hammer unit in the first year. Through this improvement, employees witnessed one of the most physical, time-consuming, and difficult tasks replaced by a joystick.



these electric services and the high population concentration in these areas, public and worker safety is our utmost priority. This focus has driven improvements and actions on many fronts in our mission to provide safe and reliable delivery of electric service. Some examples are highlighted below.

Mobile Contact-Voltage Survey

CenterPoint Energy has deployed a specially outfitted mobile assessment vehicle with highly sensitive voltage detection equipment to survey several hundred miles in our dedicated underground areas. Where voltage was detected, the issues were promptly repaired by either CNP personnel or the customer owning the facility.

Robotic Jack Hammer

When new circuits are branched from an existing underground circuit, the underground circuit is excavated in the area to be branched to expose the concrete-encased duct bank containing the circuit. Historically, a two-man team in full PPE would descend into the excavated pit and chip the concrete off the duct bank's PVC conduits containing the energized

Non-Entry Manhole Rescue System

In the unfortunate event an employee is incapacitated and must be rescued from a manhole, there are several commonly used methods available that may be deployed. These methods generally break into two categories: "entry" and "non-entry" rescue systems. "Entry" systems require at least one other employee to enter the manhole to perform the rescue, while "non-entry" systems do not require another employee enter the manhole. In 2018, CenterPoint Energy adopted a non-entry rescue system based on the need to perform rescues in the shortest possible time and to avoid exposing another employee to the potential manhole hazard conditions that may have incapacitated the impacted employee. To enable the fastest possible rescue, employees in the manhole are required to wear a FR-rated harness and tether off to



the manhole guard railing with a breakaway FR-rated lifeline. Exceptions are allowed for the lifeline tether while employees are rapidly changing positions in the manhole or if the tether creates a greater safety risk. In the event a rescue is needed, a winch is placed onto the guard rail and the lifeline is simply disconnected from the guard rail and snapped into the winch. The winch is then hand-cranked to extract the fallen employee.

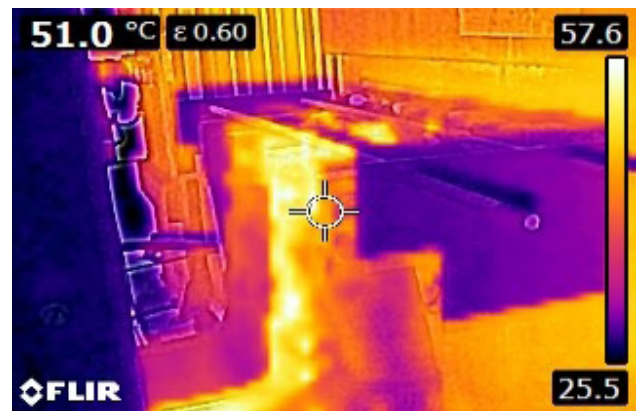
Arc Flash Reduction Maintenance System

As our network protectors approach the end of their useful lifecycle, the search began for the appropriate next generation device to replace them. This led to a safety technology improvement by adopting the use of the latest network protector technology. High energy arc flash events in work areas can result in injuries or loss of life for utility workers. In the event of an arc fault, the ARMS unit is designed to instantaneously open and clear the fault. The ARMS feature is activated by flipping an external switch as the worker enters the potential arc flash work area. The required worker PPE calorie rating can be reduced through use of the ARMS feature.



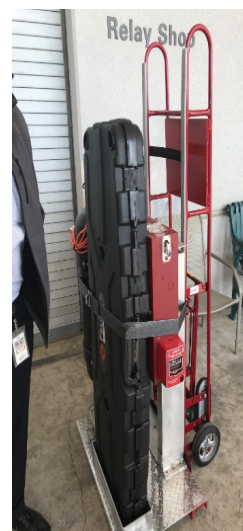
Thermal Response Guideline

An important part of entering a confined space or an area with energized equipment is scanning the vicinity with an infrared camera, searching for hot spots or overheated equipment. In 2018, CenterPoint Energy replaced "red dot" infrared gun technology with full-view infrared cameras which enabled immediate identification of overheated devices. With color images available for download, communication of problem areas became more accurate and efficient. The new infrared cameras also enabled an impactful new hazard awareness safety tool known as a Thermal Response Guideline. Based on cable and splice testing by an independent lab, and best practices of peer utilities, CenterPoint Energy developed a thermal response chart for use specifically in our facilities. With the Thermal Response Guideline, employees can confirm that it is safe to enter a workspace, and if temperatures are elevated, know what course of action to take based on the temperature of the cable and splice. Response is also determined by the temperature for various types of splices.



Improved Gas Detection

A requirement for safely working in a confined space is to test for air hazards, which can include unsafe oxygen levels, as well as flammable, toxic, or corrosive gases before entering. In 2018, CenterPoint Energy transitioned away from self-maintained handheld gas detectors to newer gas detection technology. The new gas detector system includes handheld units and docking stations with an internet connection. At the end of each shift, crews place their handheld units into the docking station where they are recharged and tested for accuracy. In the event the handheld unit does not pass self-test, a signal is transmitted to the manufacturer to send another handheld unit and the failed unit is flagged as unusable. Operational information is also uploaded to a cloud-based user area that documents the use and readings taken during the previous day from each unit. The operational information from each handheld gas detector provides confidence the units are being used and are operating properly.



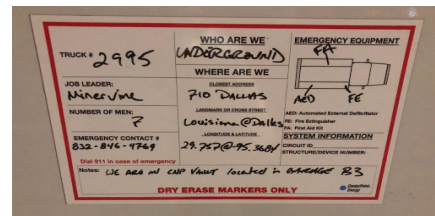
Collaboration with the Houston Fire Department

Over the past two years, CenterPoint Energy has collaborated with the Houston Fire Department on effective response to electrical vault fires and manhole events. This effort was inspired by the example set by Captain Chris Greene of the Seattle Fire Department in collaboration with Seattle City Light. While such events are rare, it is paramount that firefighters understand the hazards and protocols to respond safely. The ongoing collaboration allows the exchange of information and knowledge to assist firefighters in performing their jobs safely and effectively. Success of this collaboration was evident in a recent building fire as the Houston Fire Department and CenterPoint Energy worked together to safely respond to the event.



Magnetic Tailboard Sign for Trucks

Borrowing from Southern Cal Edison and demonstrating collaboration for best practices among utilities, CenterPoint Energy adopted their use of mounting magnetic tailboards on operation crew trucks companywide. Our crews typically park their trucks on the street for convenient access to a building or to enter a nearby manhole. Magnetic tailboards, mounted on the side of the lead truck, contain information on the identity of the crew and their exact work location. During an emergency, the information on the magnetic tailboard can be used by a member of the public to convey vital information to emergency service providers.



Energy Providers, the Fire Service Needs Your Assistance

Chris Greene, Fire Captain, Seattle Fire Department

“Your first responders need your help.”

Those are words that read in stark contrast to everything we have ever been taught about in the fire service. I have spent the last 26 years preparing for every type of emergency imaginable, but this one has first responders stumped.

The fire service has developed training and response protocols that guide us through every type of emergency. Our training and experience have always been what keeps first responders and our public safe. When all the safety devices and standards that have been designed to keep Americans safe fail, your national first responders are there to turn that tragedy around. The men and women of your first responder communities stand watch over this great nation every minute of every day.



Broad Street Substation Fire

A Call for Assistance

Energy related emergencies are on the rise around the world. Unfortunately, the formal training needed for the fire service to properly address these incidents is absent. Closing this gap has occupied a significant portion of my life since July of 2014 when the Seattle Fire Department responded to a substation fire in downtown Seattle that went awry. Shortly after this incident, the Fire Chief asked me to “close the gap on energy fire-incidents.”

I don’t think he had any idea of the can of worms he had just opened. He asked a passionate, type “A” Fire Captain to “look into” this issue. I spent the next few years working side-by-side with Seattle City Light (SCL) on this project. We traveled around the country looking for answers as to how other fire departments were handling this challenge. What we found, or didn’t find, was troubling.

Apart from substation incidents, most first responders do not recognize energy emergencies until it is far too late. Emergencies involving energy infrastructure are still being addressed with traditional tactics. Traditional personal protection equipment (PPE) and forecasting methods are designed for structural fires but do not address energy fire-incidents. The success and/or failure of each incident goes undocumented and any valuable lessons learned rapidly disappeared at shift change.





SCL/SFD Ops. Training - June 2017

We identified 4 key areas of concern for this national trend:

- First responders and electrical industry (Energy) providers do not have an intimate working relationship (just as books and binder do not equal a relationship)
- First responders do not understand the hazards associated with energy emergencies
- Emergencies involving energy occur daily and yet we are not adjusting our tactics
- Best practices for addressing these emergencies will come from Energy, not the Fire Service

That last bullet is key. The fire service cannot correctly respond to these incidents without the help of our Energy providers. Protocols developed without close collaboration from Energy will confuse, delay and fail our first responders.

Hazard recognition begins with understanding the hazard and where one is likely to encounter it. For example, we would be hard pressed to find many members of the fire service that have heard the term "Arc Flash Energy." This is no slight on the fire service; rather it is the un-sanitized truth that I found myself in 7 years ago.

My experience in creating the Nation's first and only Fire Department Energy Response Team (VRT) will be presented at the 2022 ENSC in Houston. The VRT was created in collaboration with Seattle City Light and is a 44-member team that operates out of Fire Station #25. We are tasked with addressing all energy emergencies in the City of Seattle. The success of this team is rooted in the closeness that exists between SCL and the Seattle Fire Department (SFD). They are part of our crew and our family, and together we are committed to providing for the safety of our City and the Fire Service.

Working with the men and women of Seattle City Light and Energy providers across the nation has been the highlight of my career. The VRT and I look forward to continuing our development of the necessary planning and procedures to fight against this dilemma in the future.

Avista Vault Expansion and Lessons Learned

Landen Grant, Brian Chain, Avista Corp.

AVISTA NETWORK

Avista's Downtown Network service territory is contained entirely in downtown Spokane, from I-90 to the Spokane River, and between the two main north-south corridors through town (Division and Maple). The system consists of four 120/208V secondary street grid networks, fed by fourteen 13.2 kV primary feeders out of two urban substations. There are approximately 180 transformer vaults; around thirty of them serve spot networks while the rest supply the street grid. Spots may be 120/208V or 277/480V while the street grid is 120/208V only.

THE PARKADE VAULT

As in other cities, transformer vault upgrades in Avista's Downtown Network have accelerated over recent years as structures reach end-of-life and electrical equipment upgrades become necessary. In the case of Vault #88, issues existed with both the structural and electrical infrastructure; the network protectors were of an older live-front variety and needed to be upgraded and the structure was both undersized and showed severe deterioration of roof beams. The largest challenges with the vault had to do with the site itself, which was under a sidewalk off one of two main north-south thoroughfares through downtown and adjoining basement walls with a nearby building and vaulted sidewalk. While two major electric services are connected directly to the Parkade vault, it is also critical to serving the 208V network grid load in the area.

SOLUTION SELECTION

As with all Avista's major downtown network projects, a high-level alternatives analysis was performed during the project initiation phase. Running a project alternative analysis is almost always a fruitful effort and pays dividends down the road as it helps guide the project governance team in the selection of the most cost-effective solution. The alternatives analysis also helps utilities with project cost justification and shows prudent spending of capital dollars. In the case of Vault 88 (Parkade), a new urban "greenfield" vault location was highly desired in a location near the existing vault. Unfortunately, the urban geography had the existing location hemmed in with a public plaza to the west that

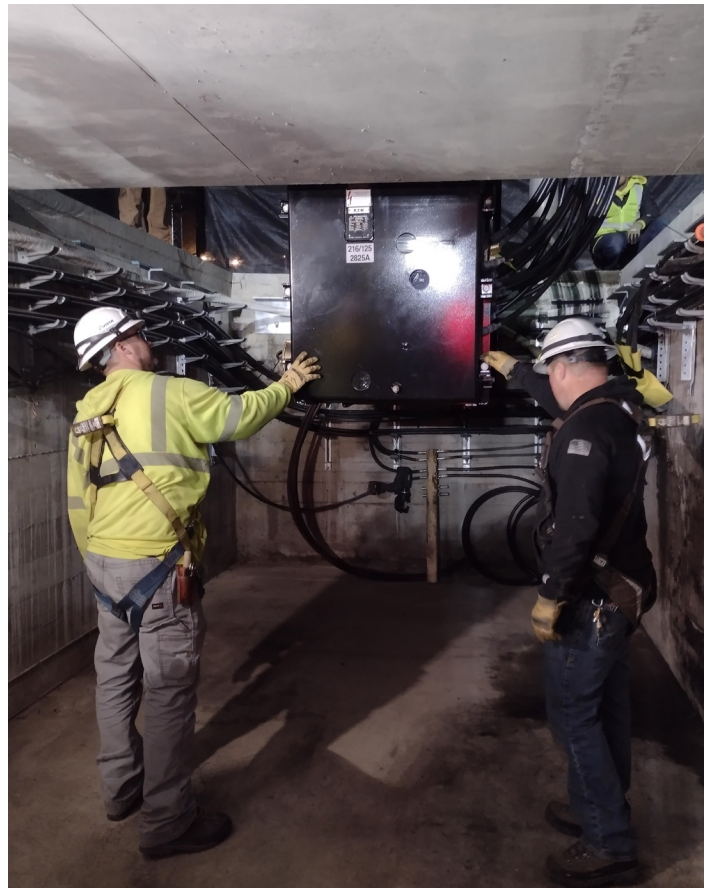
was littered with other underground utilities, a busy downtown arterial to the north and south (not ideal from a worker safety point-of-view), and an existing spot transformer vault across the street to the east. Any available "greenfield" spaces in the area were too far away to adequately serve load. This left the project team with an alternative to expand the existing vault to the south in the sidewalk. The existing vault was in terrible structural condition; allowing the public/employee safety issue to continue after an electrical-only upgrade was not an option. Expanding the vault to the south was an option, but there was one major hurdle - the vaulted sidewalk space to the south (located in public right-of-way) was already occupied by the building tenants. The project team engaged with the customers in the building about overtaking the occupied space and what construction impacts would be involved.

LESSONS LEARNED

As with any project, there are lessons to be learned, mainly through failures and oversights. The V88 project had some key takeaways that Avista's Downtown Network wanted to capture and memorialize so as not to repeat again. One of the primary lessons learned was getting the structural contractor on-board during the project planning/design phase. The contractor is a key team member, and it is often a mistake to only



have them involved in the project when the project is ready for construction. During the planning/design phase, the contractor can provide constructability reviews, which can prevent re-designs, provide cost-saving solutions and ideas, and help set realistic expectations with impacted property/building owners. Setting realistic expectations with impacted stakeholders is key because it lays a foundation of expectations and trust. One of the goals of planning a project is to have all stakeholders go into the project with no major surprises. An experienced contractor would have been able to best identify the construction related logistics and business impacts (e.g. noise, access to building, construction footprint, etc.) as well as been able to walk the customer through the series of activities and associated timelines. For this project, the customer requested that most work be performed at night to minimize the noise impact to building tenants. Avista was reluctant to oblige the request but agreed in the spirit of showing good faith in working with the customer. Night work included a host of logistical challenges as well as increased labor costs.



Unfortunately, during the design phase there was very little as-built information and since the vault expansion included utilizing most of the existing walls, many assumptions were made. One assumption was that the existing walls were 8" thick, but during excavation it was discovered that the existing walls were actually 6" thick. A 6" wall wasn't a deal breaker in terms of loading, but it caused issues with aligning the precast dimensions of the new vault with the existing. The lesson learned for the project team was to spend some extra planning dollars to perform some exploratory work (coring walls) in order to verify dimensions if no as-built documentation is available. The few extra planning dollars will likely save time, money, and stress during construction.

STRUCTURAL & ELECTRICAL SYNERGIES

As with many projects in the electric utility world, order of operations is incredibly important to have mapped out early. In the case of the Parkade vault, while some critical-path items were dialed in ahead of the project, several were not. Unfortunately, this did lead to some delays with contract structural crews waiting on Avista cablemen, and vice versa. Scope changes, inevitable during any real-world project execution, further exacerbated the issue.

For example, prior to project kickoff, powerflow studies showed that it was necessary to both reinforce sections of the local street grid, and temporarily cut open a grid path down a local alley, to avoid grid overloads that would occur otherwise as outages were taken during the rebuild. While we patted ourselves on the back for seeing these issues ahead of time, we missed that the time taken to get them done would introduce delays prior to certain phases of the structural work.

We had also planned to install some of the final structural attachments after all cabling (over a mile worth of secondary in a 11'x40' space!) had been racked on the vault walls. It was only after most of it was racked that it became painfully obvious that the hammer drill work would have to occur in very close proximity, and even through the middle, of newly-racked cabling. The final structural work proceeded slower because of this lack of foresight.

CONCLUSION

It is difficult to adequately describe the amount of pain undergone during this project by all parties involved. In post-mortem meetings, we documented improvement ideas, many of which have already been implemented on subsequent projects. It is also difficult in a short article to communicate the little nuances that had caused this site to be left for last as part of our system-wide live-front network protector upgrade project. Suffice it to say that this was never going to be an easy location to fix.

That all being said, the new Vault #88 is energized today, serving both local building and grid-connected load, and is vastly improved over the old vault in terms of capacity, reliability, and customer/public/employee safety. It seems utterly simple in hindsight, but our premier "Lesson Learned" is that good planning pays off with less stress throughout the project.

"Plan the work - and then work the plan."

Enabling Distributed Generation on Urban Networks

Hossein Ghassempouraghamolki, Swaroop Gajare, Amit Kolge & Amal Thomas, Eaton

Introduction:

With the advancements made in power electronics technology, Distributed Energy Resources (DERs) has gained great popularity as viable sources of energy to meet the world's growing power demand. Driven by the environmental commitments, government incentives, increasing electricity prices, and reduction in the cost of DER technologies, there is a growing penetration of DERs into the electric grid. Most utility companies have promoted & largely invested in the use of DERs especially the ones based on renewables, considering its low carbon footprint. These sources also qualify the state regulated mandates for Non-Wired Alternatives (NWA) because of the ease and speed at which it can be implemented, commissioned, and brought online compared to conventional energy sources. Due to these advantages along with the state mandated policies pushing for NWA & net-zero, renewable penetration in the grid is expected to grow at a faster rate in the coming years. US Energy Information Administration (EIA) projects that the share of renewables in the U.S. electricity generation mix will increase from 21% in 2020 to 42% in 2050, with Photo Voltaic sources (PV) being a popular choice. However, the increasing adoption of DERs pose serious challenges in terms of protection, power quality, reliability etc. for the existing distribution networks.

Impact of DER penetration:

Distributed generation offers excellent opportunities to reduce the environmental impact of the greenhouse gas based traditional electric grids, but also makes grid operation more complicated as systems originally designed for one-way flow of power must now handle customers' own generation resulting in bi-directional power flow. Bi-directional power flow if unaddressed poses serious threat to grid reliability resulting in power outages. Grid operators have also started to observe detrimental effects on the existing devices in operation.

One such issue in the distribution network is back feeding or reverse power flow when the renewable (mostly PV) power generation exceeds the load demand at times which can affect the reliable operation of network protectors in place. Network Protector, a protective device used in the distribution network to detect undesirable reverse power flow and to trip open to avoid dangerous back feeding has now started malfunctioning and giving false tripping because of reverse power flow due to excess PV generation. Unintended tripping of the existing network protectors leading to frequent outages incurs huge loss in terms of time and money. The increased number of tripping also reduces the equipment life and adds up to the maintenance costs.

Fig.1. shows the power flow in a conventional distribution network with power flowing from the MV substation to the LV loads through a distribution transformer during a normal/ healthy operation. Fig.2. shows the power flow in a distribution network when one of the Medium Voltage Circuit Breakers (MVCB) is open due to a fault in the primary side. Feeder 2, where the fault occurs, gets disconnected by its overcurrent protection relay. However, the fault continues to be fed from Substation Feeder1, resulting in dangerous back feeding. Network protectors are designed to protect the system from this undesirable condition by detecting the reverse power flow and tripping the system in the presence of a fault in the primary or in general for de-energizing the feeder whenever the corresponding feeder's MVCB is opened. Also, once the faults are cleared, Network Protectors should automatically reclose restoring the normal operation of the network.

Challenges faced by existing Network Protectors

1: Unintended tripping under high DER penetration

With increased PV penetration in the distribution network, there can be operating conditions, with generation due to PV exceeding the load demand. This excess power tends to flowback towards the substation to feed the other primary loads connected. This would result in a reverse power flow in the network as shown in Fig.3. Network Protectors, that are meant to protect the primary network from reverse power flow or back feeding from secondary distribution networks, cannot distinguish between the desirable reverse power flow due to renewables and dangerous back feeding due to faults or feeder breaker openings. As a result, there is unintentional tripping of the existing network protectors leading to frequent outages incurring huge losses. The increased number of unintended tripping results in the reduction of life of the equipment and increased maintenance costs.

To address this issue, many T&D companies have come up with solutions that include imposing generation curtailment on thousands of DER sites. Generation curtailment solution not only leads to customer dissatisfaction but also poses a challenge to the implementation of NWA mandates. Another proposed solution is to increase the relay desensitization of the network protector to allow higher levels of reverse power for a longer period without tripping. However, this solution is not reliable and can create serious damage in presence of high impedance or single-phase faults. Other solutions that involve communication-based network protectors require expensive communication channels in place that adds up to huge installation costs and also raises concern on cyber security.

Fig.1. Power flow direction in conventional system

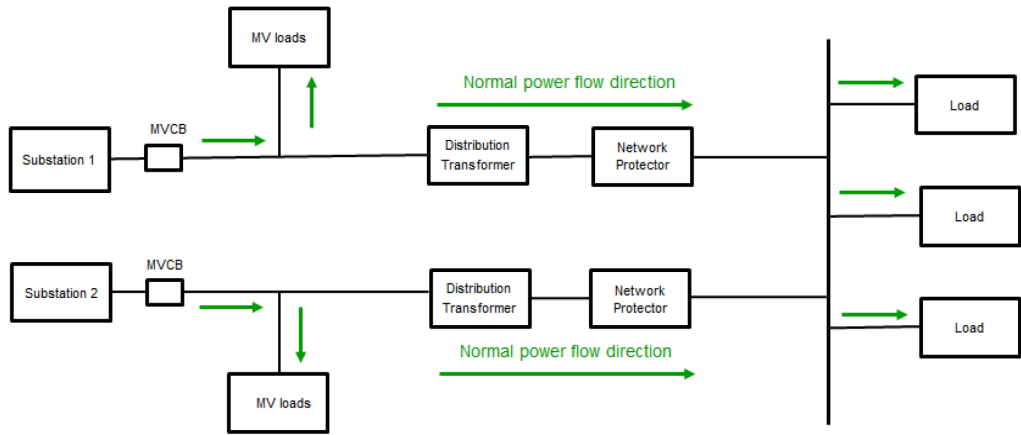


Fig.2. Power flow during a fault in primary side of distribution transformer

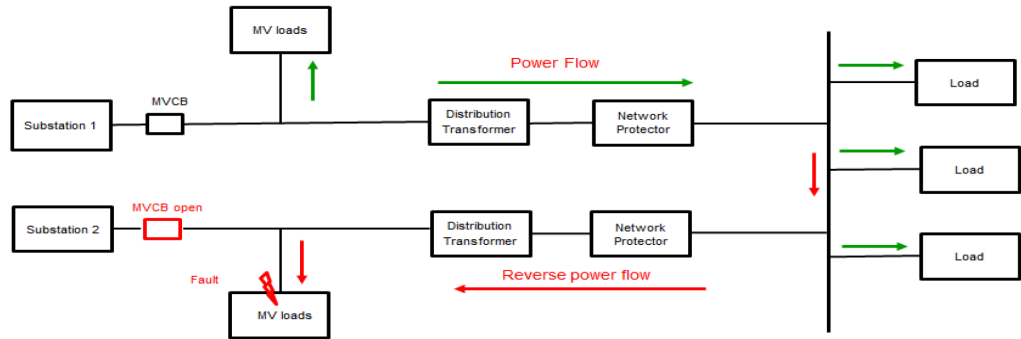


Fig.3. Reverse Power flow because of excess generation due to PV

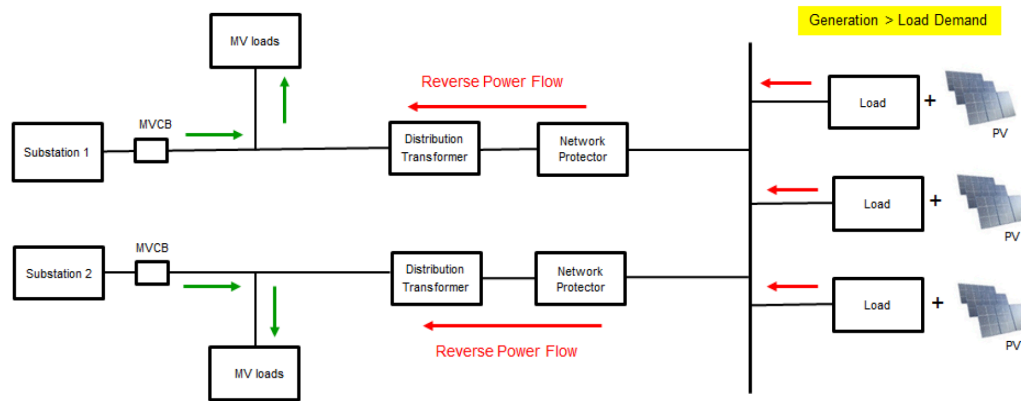
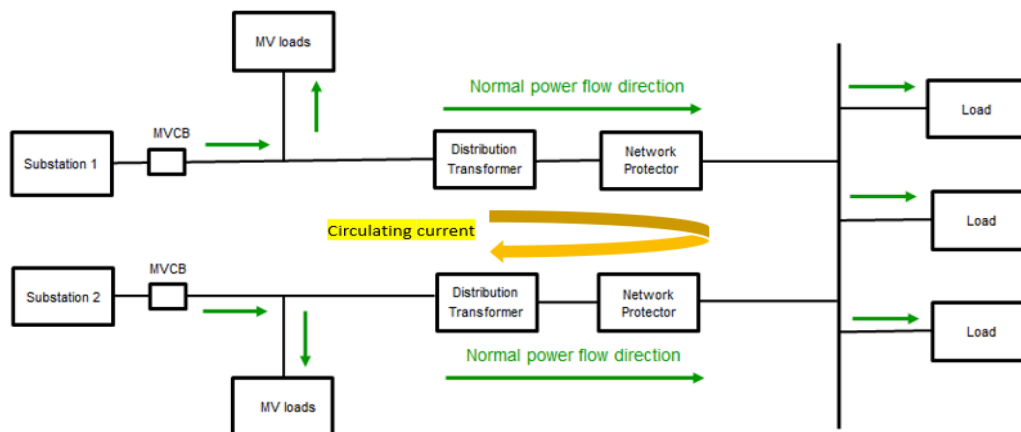


Fig.4. Circulating current flow due to voltage and angle between different substations



2: Reclosing action failure due to circulating current in case of power fed through more than one substation

For a secondary distribution network fed by two or more different substations, there can be issues with automatic reclosing of network protectors. Even though the reverse power flow due to fault or MFCB opening is rectified, the reclosing operation fails because of the circulating current flowing due to voltage or angle difference between the two substations as shown in Fig.4.

Network protectors are not only responsible for the opening of the system in abnormal conditions but also should detect when the system becomes healthy and restore the system automatically. To reclose the system after MFCB closing operation, network protectors rely on voltage angle and magnitude difference between transformer and network side. However, having a permanent voltage angle difference between two or more substations would undermine the current reclosing logic of the network protectors and create reclosing failure. That is the main reason for the utilities not being able to use network protector devices for loads that require highly reliable system design with multiple substations feed such as airports and hospitals.

Therefore, the existing network protectors need to be upgraded to address the abovementioned problems in order to facilitate the optimal usage of DERs. Network Protectors, that enable smart low carbon urban networks, by being able to distinguish between desirable reverse power flow caused by DERs and dangerous back-feeding conditions due to faults is the need of the hour. Also, the network protector controls should be updated to address the reclosing failures in presence of DERs and in case of power fed by different substations. The proposed solution, discussed in this document, addresses all the problems mentioned above enabling reliable operation of network protectors.

Eaton's Smart Low Carbon Enabling Network Protector:

With Eaton's vast experience in Network Protector business and stronghold in developing innovative & cost effective solutions, the above mentioned challenges are now resolved. The proposed solution, with minimal changes, solve the problems without altering the existing Network Protector design in both spot & grid/mesh networks. It takes into account both the trip & reclosing actions and addresses the issues of unintended tripping and automatic reclosing failure.

- The proposed solution would allow a utility to accept the desirable reverse power flow in secondary distribution systems created by distributed generation and guarantees the reliable operation of Network Protectors in a distribution network with significant DER/renewable penetration.
- Also, it would allow the utility grid operators to accept circulating current under normal operating conditions and ensure the reliable operation of Network Protectors in both spot & mesh/grid networks.

The proposed solution has been tested and validated successfully for different network operating conditions in both simulation and real environments. The below section discusses the simulation studies performed.

Simulation Studies:

The proposed Network Protector solution has been implemented in a PSCAD simulation and tested on customer use case systems. CYME's customer secondary system has been modified to represent both Spot and Area network design fed by two substations. Distribution network with two network protectors (150A, 480V L-L) in an urban network with power fed from two different substations (as shown in Fig.5 and Fig.6.) was considered for the study. A time varying load profile of an actual feeder based in Galveston and a solar irradiance profile (3 hours profile, 9am to 12 pm) was used in the study to account for the load variations & solar intermittency.

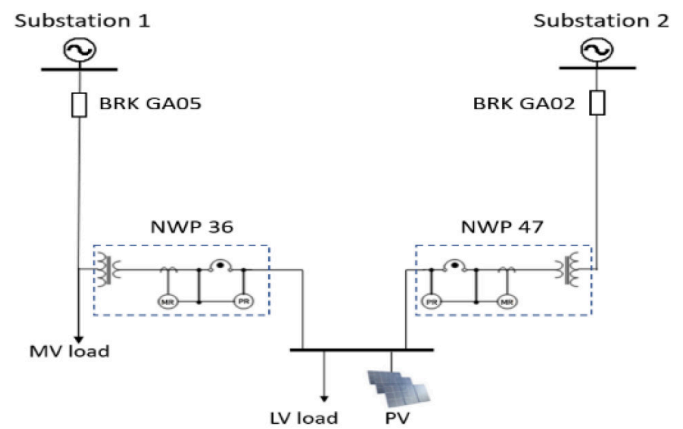


Fig.5. SLD of the Spot network model simulated

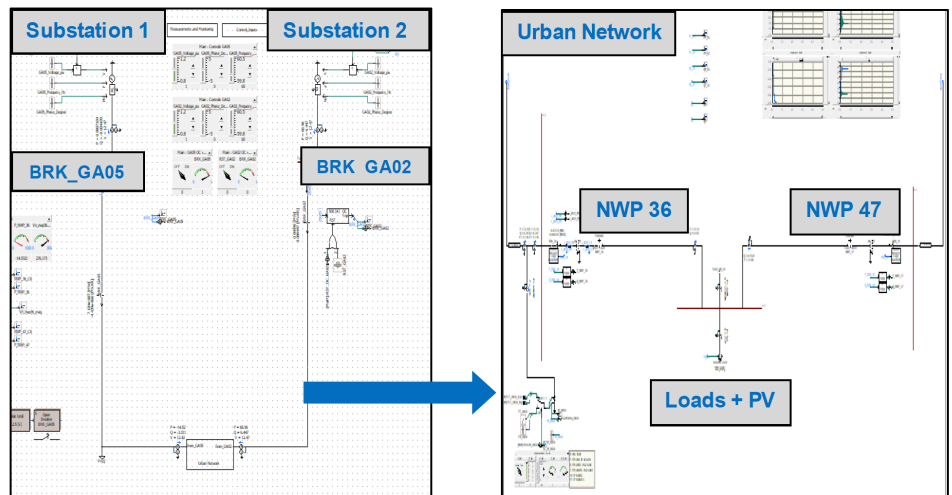


Fig.6. Spot network model in PSCAD

The figures given below show the unintended tripping of network protectors due to the reverse power flow caused by a high PV penetration of 90%. The existing control logic fails to distinguish between reverse power flow due to PV and the undesirable ones caused because of MFCB opening due to faults or substation maintenance operations. It also shows the automatic reclosing failure of the NWP's because of the presence of PV power at the load side.

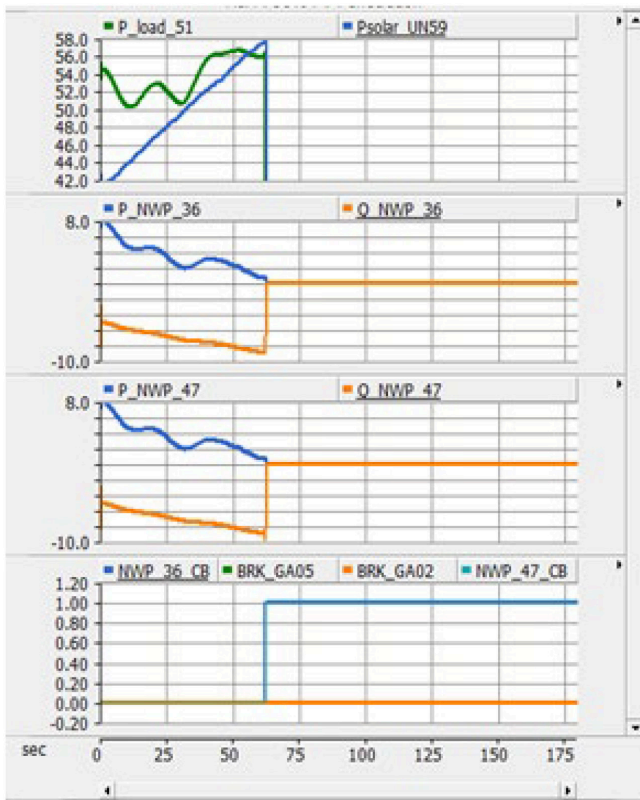


Fig. 7. Unintended tripping at 90% PV penetration

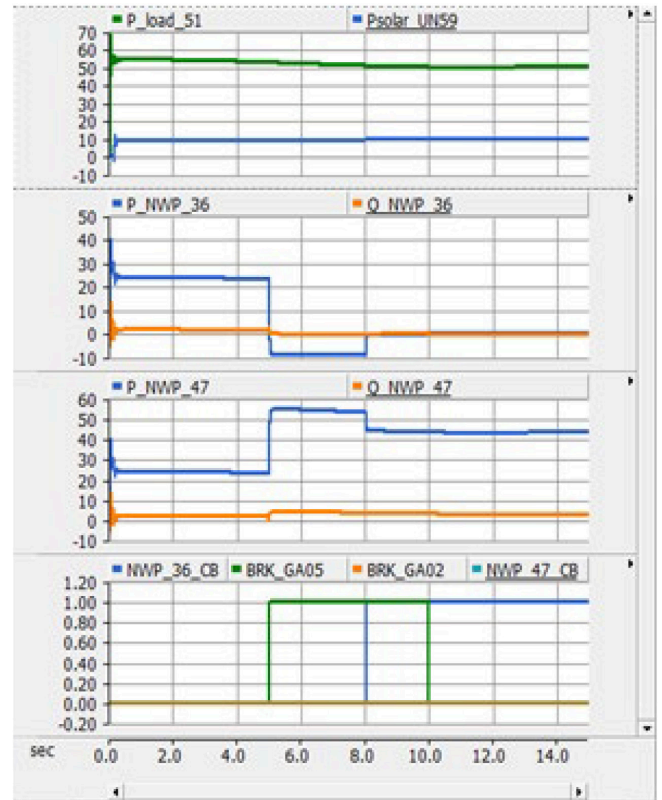


Fig. 8. Reclosing failure at 90% PV

Power flow through NWPs, load & PV; NWP Status (Open: 1; Closed: 0)

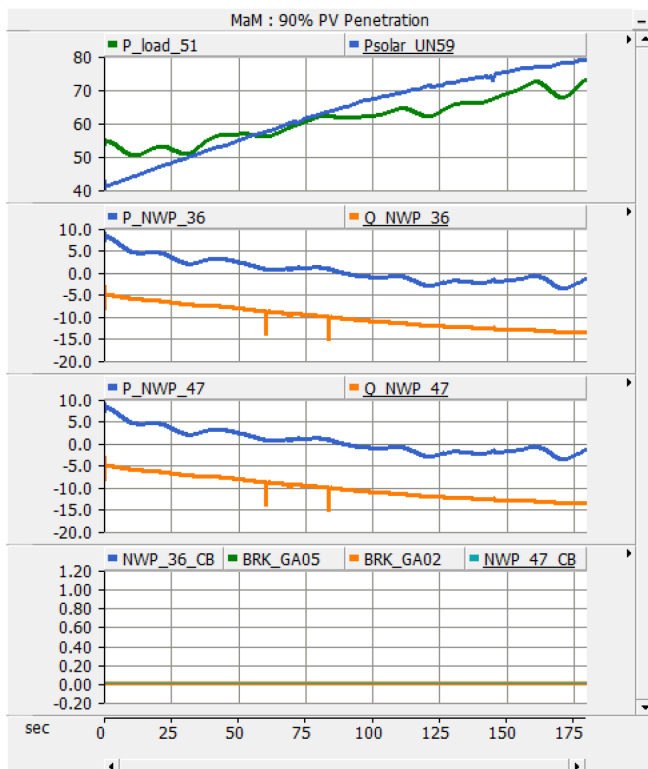


Fig.9. No false tripping at 90% PV penetration

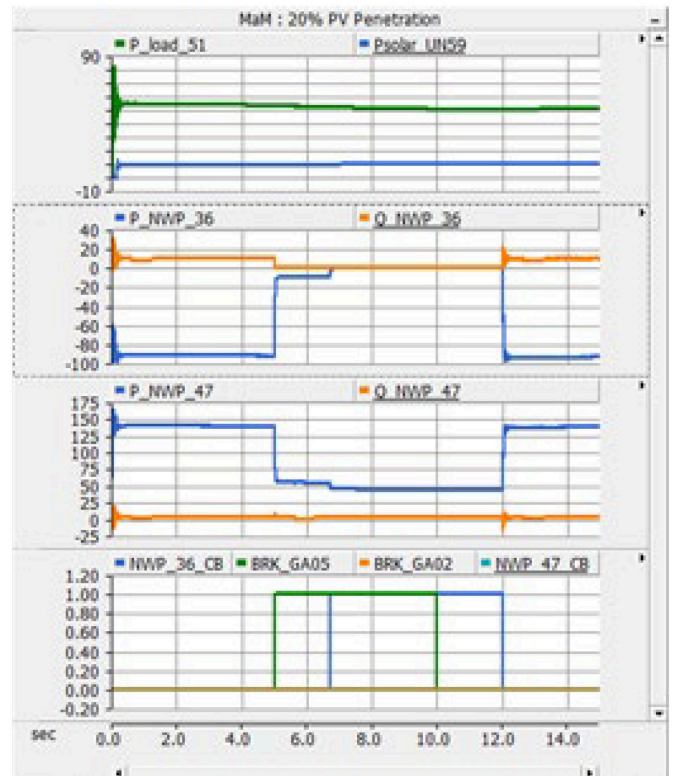


Fig.10. Automatic Reclosing failure resolved

The above graphs show the power flow through load (P_load_51) and Solar PV (Psolar_UN59); power flow through Network Protectors (NWP) NWPs 36 & 47 (P/Q_NWP_XX) and the operating state of NWP (NWP_XX_CB) & MVCB (BRK_GA_0X) corresponding to both the feeders for the spot network operating with 90% PV penetration. As shown in Fig.7, the NWP 36 & 47 trips due to the reverse power flow caused by high PV power and it remains in open condition until manually reclosed. This validates the first problem statement claim that the existing NWP trips unintendedly when there is a reverse power flow due to high PV penetration. Fig.8 shows the operation of NWP 36 following the opening & reclosing of its associated MVCB (BRK_GA05) at t = 5s and t = 10s respectively. The old logic is able to respond to the MVCB opening and trips at t = 8s after a slow trip time delay of 3s. However, the network protector fails to reclose even after MVCB reclosing at t = 8s, due to the presence of reverse power flow due to PV.

The same test case was simulated with Eaton's proposed network protector solution as shown in Fig.9. At time t = 100s, the PV generation exceeds the load demand and both the NWPs in the spot network under study starts to observe reverse power flow through them. The proposed solution allows reverse power flow due to PV and thus prevents unintentional tripping of the Network Protectors.

Fig.10. shows that the proposed solution solves the automatic reclosing failure when power is fed from different substations with a voltage magnitude & angle difference (2 volts and 2 degree lag). There is a reverse power flow through NWP 36 from the start of the simulation due to the voltage and angle difference. With the proposed solution, Network Protectors doesn't trip and also automatically recloses successfully followed by the MVCB open (at time, t = 5s) & close (at time, t = 10s) operations when power is fed from two substations with a voltage & angle difference.

Summary:

Distributed energy sources, mainly the ones based on renewable sources like PV, have become a popular choice for grid companies and consumers to meet the growing power demand. With the added advantages of clean, low carbon and cheaper power, DERs also pose threats to the reliable operation of existing grid components. Protective devices like Network Protectors that ensure safe & reliable power delivery to secondary distribution networks are badly affected by the DER penetration. This article discusses the challenges faced by Network Protectors that affect the grid operation resulting in load outages, thereby limiting the use of DERs. Eaton's state of art DER solution successfully resolves these challenges caused by DERs in the secondary distribution network, thereby enabling DER penetration in the grid ensuring reliable operation. Please contact your local Eaton representative for more details on this new technology.

The Case For Authenticity

Dr. Todd Dewett



I'm Dr. Todd Dewett and I have the honor of speaking at the 2022 ENSC Conference in Houston. I've spent my career trying to understand and help people. My main focus is life at work: great leadership, productive teams, innovation, culture, etc. If you would like to know more about me, just take a peek at the bio at the back end of this article for a bio and website.

The keynote I will deliver is called Show Your Ink. It's about understanding authenticity and the relationship drivers that professionals use to build rapport and productivity.

Authenticity fascinates me. For many years there has been a lot of talk about the essence of leadership. Thinkers of all varieties have offered up their list of basic elements, forgotten secrets, and magic ingredients. Their essays and models speak of things such as trust, service, self-reflection, integrity, and so on. Without a doubt, these are very important concepts.

However, after years of research, reflection, and coaching I have concluded they are all missing something. For me, there is only one foundational catalyst that helps the other concepts spring to life in practice: authenticity. To be authentic is to strive to look, speak, and behave in a manner that reflects your personal thoughts, interests, and beliefs. It's about openness and honesty as you express yourself and interact with your environment.

Authenticity exists on a spectrum. Too many of us exist at the low end. We don't speak up. We choose not to share our real views. We feel anxiety about being open. A smaller group strives for the other end of the spectrum. They share pointed perspectives and personal stories. They discuss and sometimes delight in talking about the mistakes we all make. Thankfully, this form of frankness and openness most often elicits strong authenticity in response. Thus, the fire is started, rapport has begun.

For such a powerful elixir, surely the cost must be high. No. Authenticity does not cost you as much as an executive training program, not as much as a weekend seminar, and not even as much as a good leadership book. It's free - if you have patience and the guts to open up a little.

Too much of a good thing can hurt

Social decorum matters. Putting your best foot forward is important. Understanding contextual norms is vital. In short, smart people know they must manage impressions, especially at work. That's a good thing, right?

Managing impressions involves some combination of the following: talking about one's accomplishments, refraining from saying anything that might be risky or making any references to one's imperfections, complimenting others, feigning interest where there is none, and censoring disagreement or disgust in order to show respect or to preserve group harmony.

All of these are understandable in small amounts on occasion. However, they are typically very common, if not heavily overindulged. The result is predictable. You successfully share a limited and somewhat plastic version of yourself. You maintain largely uninformed views of others at work. The ultimate outcome is minimally satisfying and minimally productive relationships.

We are starving for authentic connection

We are naturally wired to desire real connections with other humans. This is partially why we love family and friends so dearly. This human need is seen as fundamental, right along with the need for food and safety. We need to belong. We need to have our voice heard. We need to feel that our most common human interactions matter and that they are not fake or overly contrived.

Unfortunately, too many people believe that at work you are to be "professional" and at home you can be "personal" - and never shall the two meet. As it turns out, this is not a useful perspective. Granted, you are not trying to make friends with everyone at work. That is unrealistic and potentially problematic. You are, however, supposed to strive to be more than merely professional. A little intentional authenticity amplifies your professional potential immensely. People want to believe in the person, not just the professional.

We fear that which makes us great

It takes a truly massive effort to reverse a natural human tendency. We are born with a strong desire to try new things, to explore, and to seek deep connections with others. Don't believe me? Spend five minutes with a small child and you are sure to remember. When the child falls, they simply get up. When they break something, they keep moving. The exploration continues with glee. It's the adults who make this process difficult and unnatural.

These same adults often say predictable things when talking about the virtues of humanity. They mention only bravery, strength, accomplishments, and other positive and safe notions. This of course is a very incomplete view of who we are. They passionately disavow the other half of the human experience: the mistakes, failures, uncertainties, and doubts.

Yet it's these more difficult concepts that ultimately make us interesting. Surely great thoughts and great learning are fueled by our mistakes and failures. We must remember what that child within us knows about what it means to be human. You can unleash that child by helping realize the fears are false.

There is no monster under the bed

You have been told by an army of people that certain things are bad and to be avoided: failure, mistakes, setbacks, etc. The army is vast: parents, neighbors, teachers, colleagues, and bosses. Over time they beat you into submission and convince you there is a monster under your bed. It looms ever present, claws out, ready to pounce on you and make you consume another dose of self-hatred, fear, doubt, and shame.

In truth, there is no monster under the bed. In fact, that thing under the bed is actually your friend, possibly your best friend in life. What the successful people in life have taught us

is that failure is an inevitable positive part of the learning process. Mistakes happen. Things don't work out. So what. Everyone experiences these things. What differentiates the successful from the rest of us is how passionately they learn and grow as a result. They don't ignore the monster. They tame the monster and make friends.

Step one on the path to success is embracing authenticity. Don't get me wrong. It's not risk-free. Some will always cling to the false distinction between "professional" and "personal." You don't need them. The more you take the risk of being authentic: honest, open, vulnerable; the more you attract authentic people and the more your tribe grows.

The path forward

It starts with a simple desire to increase your personal authenticity. You must consciously choose to bring more of the complete and raw you into every new situation. Through self-reflection, begin to take an inventory of how you're doing. When are you good at being real? When do you tend to censor and why? The more you become aware and focused, the faster you gain comfort being you, and the less you feel compelled to manage impressions.

Next, begin to intentionally model authenticity for others. Start slow and safe by just putting one toe in the water. Ask about what they really think. Throw out a challenging perspective on a work topic and let them react. Ask them about their children. Tell them about a book that really moved

you. As you begin to filter yourself a little less, others will reciprocate, and deeper connections become possible.

When others say something brave, don't just offer a reaction - tell them you respect the bravery of their position. If someone mentions their weekend plans, be inquisitive. If they admit a vulnerability or recall a difficult moment, let them know how much you appreciate the gesture. Ask them about it. Seek to understand. Show appreciation. Reciprocate by slowly lowering your wall.

Choose one person

Your authenticity journey is a marathon, not a sprint. Consider starting with just one person in mind. It might be a colleague, your boss, a mentor, or even a client or vendor. Chose to find a new more honest way to let your humanity show when interacting with them. It might be a question, a topical focus you adopt, a comment about one of your interests, or

just your curiosity about some aspect of who they are. Go slow and gain a new level of comfort with that one person. Then, try another person.

You might be surprised what you learn when you lower your defenses and reveal a little more of who you are as a person. After finding comfort, it may even become fun. Before long you'll be jumping off of the bed regularly to play with that friend

hiding beneath. It will change how you view your potential and the potential of those around you - and it doesn't cost a penny!

Join me in September at the 2022 ENSC Conference in Houston. I promise a keynote that is fun, engaging, and practical. No slides, no lectures - just emotionally stirring stories that help bring the message to life. See you in Houston!

[Dr. Todd Dewett is a globally recognized leadership educator, author, and speaker. After working with Andersen Consulting and Ernst & Young, he completed his PhD at Texas A&M University in Organizational Behavior and enjoyed ten years as an award-winning professor. He's delivered over 1,000 speeches around the world and created a library of online courses enjoyed by millions of professionals. His clients include Microsoft, IBM, GE, Pepsi, ExxonMobil and hundreds more. Visit his home online at www.drdebett.com.]



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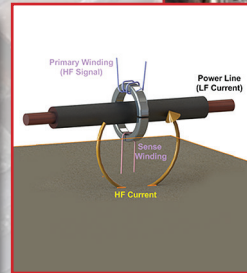
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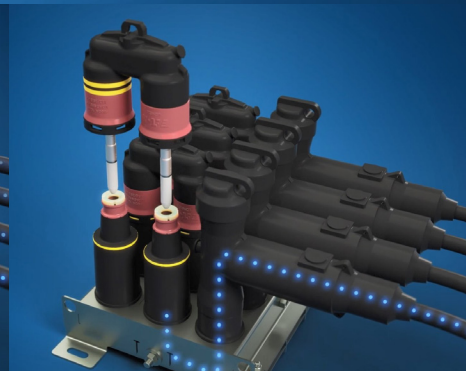
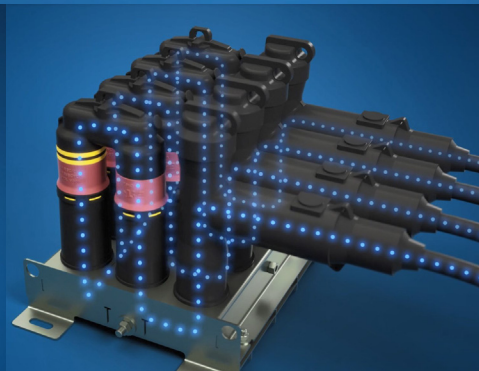
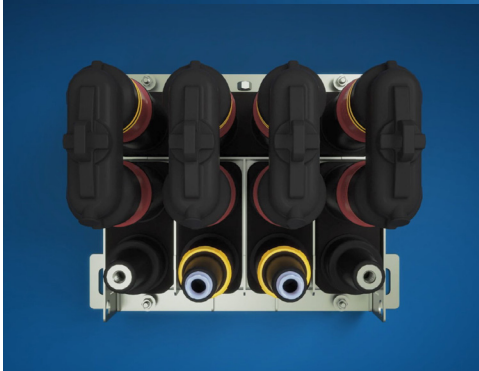
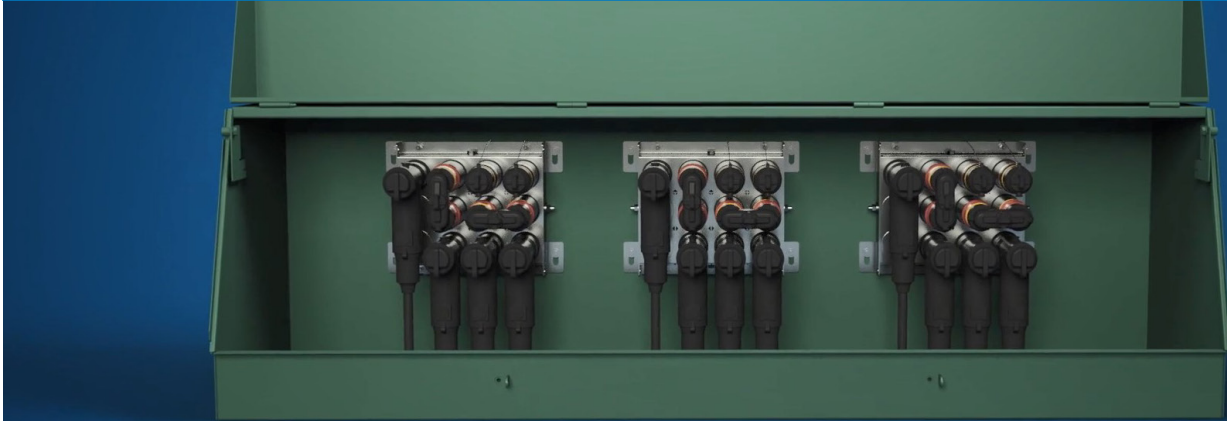
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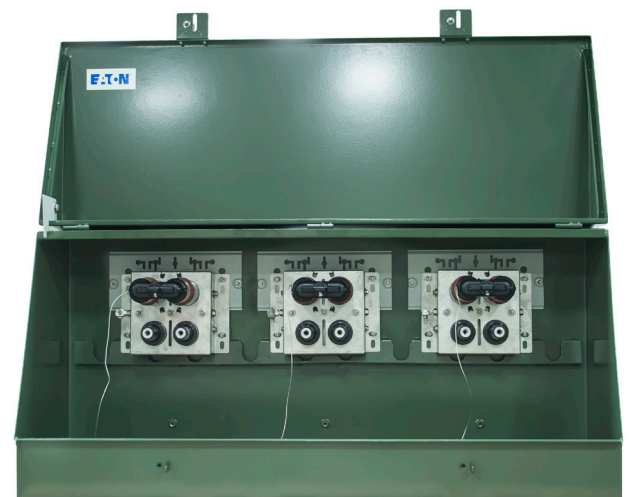
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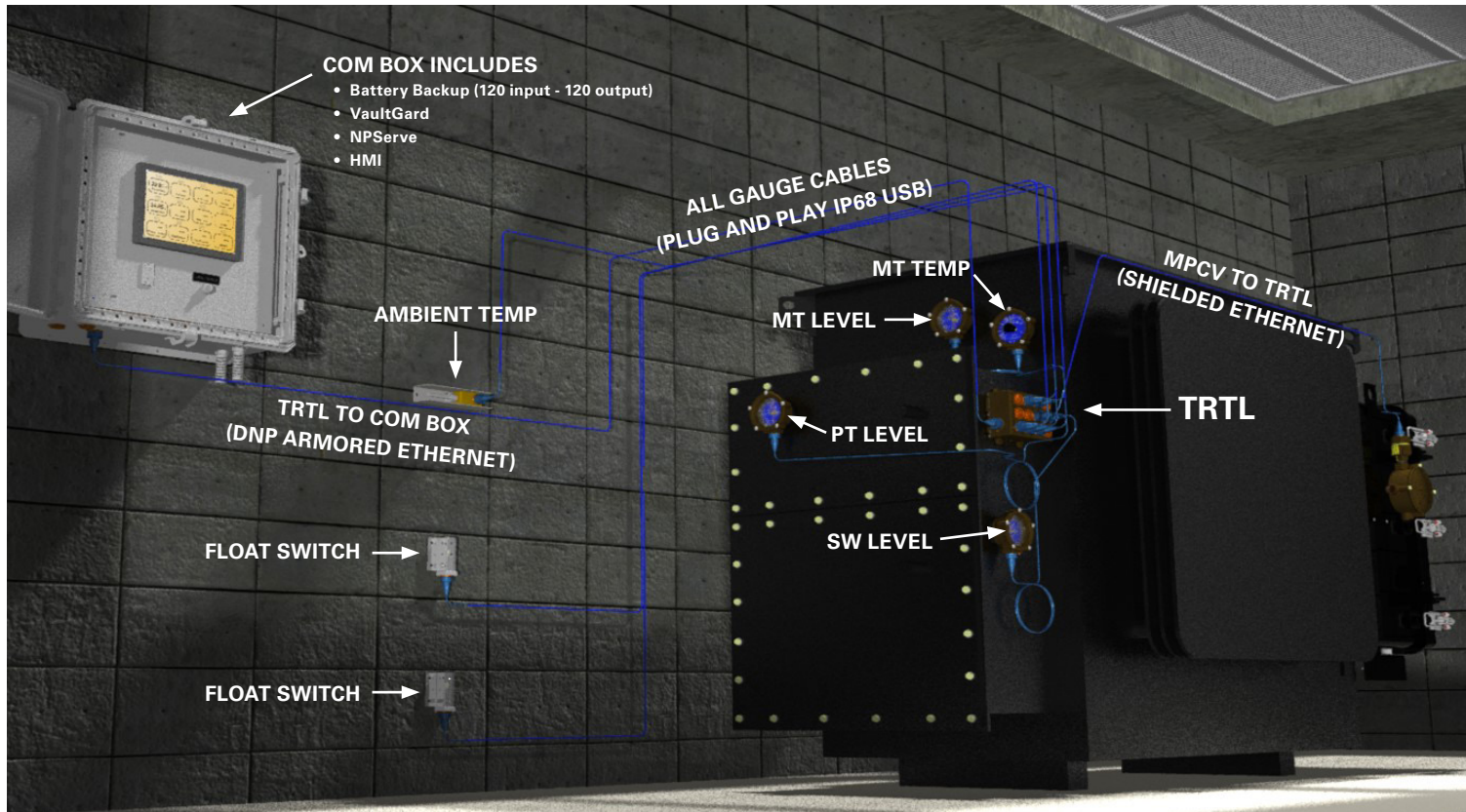
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