POST

The Future is Below: Embracing Underground Electrical Infrastructure

image credit: Pixabay

JABER ABOSAAG ✧6,653
Founder of Green Chem , Green Chem

Experienced engineer with a successful track record of delivering business transformations and developing high-performance teams. Skilled in project management, risk management, and urban...

Member since 2023 **13 items added with 4,964 views**

Contact

Follow

Profile

Like (1) **Comment** Apr 4, 2023 640 views

The Future is Below: Embracing Underground Electrical Infrastructure

sponsored message

Visit Anterix at Booth #2001

Utility meets Connectivity. Now. Learn all about it at

DISTRIBUTECH International starting February 26th

As cities around the world continue to grow and expand, the demand for reliable and safe electrical infrastructure has never been more important. While traditional overhead power lines have been the norm for decades, they have some significant drawbacks, including their unsightly appearance, susceptibility to damage from storms and accidents, and potential risks to public safety. As a result, many forward-thinking cities are looking to the future and embracing a new approach: underground electrical infrastructure.

Underground electrical infrastructure involves placing electrical cables, transformers, and other components underground in order to improve the reliability, safety, and aesthetic appeal of a city's electrical system. While this approach can be more expensive and time-consuming to install than traditional overhead power lines, it offers many significant benefits that make it well worth the investment.

One of the primary advantages of underground electrical infrastructure is improved reliability. Because underground cables are less exposed to the elements and potential damage from accidents and storms, they are less likely to experience power outages. This can be especially important in areas prone to severe weather or other natural disasters, where a reliable electrical supply can be critical for public safety and emergency response efforts.

Add to reliability, underground electrical infrastructure also offers significant safety benefits. Traditional overhead power lines can pose a risk of electrocution to people or animals that come into contact with them, as well as a potential hazard for drivers of tall vehicles such as trucks and buses. Underground electrical infrastructure eliminates these risks, creating a safer environment for both people and vehicles.

Another benefit of underground electrical infrastructure is aesthetic appeal. Overhead power lines can be unsightly and can destract from the natural beauty of a city's landscape. By placing electrical components underground, cities can improve the appearance of their streets and neighborhoods, creating a more pleasant and attractive environment for residents and visitors alike.

Of course, the switch to underground electrical infrastructure is not without its challenges. The cost and complexity of installing underground cables, transformers, and other components can be significant, especially in established urban areas where space is limited and construction can be disruptive. However, many cities have found that the long-term benefits of underground electrical infrastructure far outweigh the initial challenges, making it a worthwhile investment in the future of their communities.

For example, in cities like Tokyo, Japan, and Seoul, South Korea, underground electrical infrastructure has been in use for decades, and has helped to support these cities' rapid growth and development. In the United States, cities like Chicago and San Francisco have made significant investments in underground electrical infrastructure in recent years, recognizing the benefits it can bring to their communities.

In addition to the advantages discussed above, underground electrical infrastructure can also play a key role in supporting the growth of renewable energy sources like solar and wind power. Because these sources of energy can be decentralized and distributed across a city, they

can be more easily integrated into an underground electrical infrastructure system than into traditional overhead power lines. This can help to create a more sustainable and resilient electrical system that is better able to adapt to the changing needs of a city and its residents.

There are several benefits to placing distribution transformers underground:

1. Improved reliability: Underground transformers are less likely to be affected by severe weather events such as storms and floods, which can result in improved reliability of the power supply.
2. Reduced maintenance costs: Underground transformers require less maintenance compared to above-ground transformers, as they are protected from environmental factors such as wind, rain, and sunlight.
3. Aesthetically pleasing: Underground transformers are not visible, which can be a more attractive option in areas where above-ground equipment might be considered unsightly.

It is certainly true that underground electrical network systems have the potential to offer several benefits, including improved safety and security. By placing electrical infrastructure underground, it is possible to reduce the risk of accidents and damage caused by storms, wind, and other external factors, as well as minimize the visual impact on the community.

There are several additional reasons why future electrical network systems may be implemented entirely underground:

1. Improved safety: One of the main benefits of underground electrical networks is the improved safety they can offer for both workers and the general public. By

placing electrical infrastructure underground, it is possible to reduce the risk of accidents and injuries caused by contact with overhead lines or equipment.

2. Enhanced reliability: Underground electrical networks can also be more reliable than overhead systems, as they are less vulnerable to damage from storms, wind, and other external factors. This can help to reduce the frequency and duration of power outages and other disruptions to the electrical network.

3. Aesthetically pleasing: Underground electrical networks can be more aesthetically pleasing than overhead systems, as they do not require the use of poles and wires on the surface. This can be particularly beneficial in urban areas where the visual impact of electrical infrastructure can be a concern.

4. Improved security: Underground electrical networks can also be more secure than overhead systems, as they are less vulnerable to tampering or sabotage. This can be particularly important in areas where there is a risk of terrorism or other threats to critical infrastructure.

5. Environmental benefits: Underground electrical networks can also offer environmental benefits, such as reduced greenhouse gas emissions, as they do not require the use of large diesel-powered trucks for maintenance and repair. Additionally, underground networks can help to protect wildlife and habitats by reducing the risk of collisions with overhead lines.

There are a number of measures that can be taken to protect electrical power networks from war and sabotage, including:

1. Physical security measures: Physical security measures can help to prevent unauthorized access to electrical infrastructure and reduce the risk of sabotage or damage. This can involve the use of fencing, gates, and other barriers to restrict access to critical infrastructure, as well as the deployment of security personnel to monitor and protect these facilities.

2. Cybersecurity measures: Electrical power networks are increasingly reliant on computer systems and networked devices, which makes them vulnerable to cyber-attacks. Implementing strong cybersecurity measures, such as firewalls, encryption, and secure authentication protocols, can help to protect these systems from cyber threats.

3. Redundancy and diversification: Building redundancy and diversification into the electrical power network can help to mitigate the impact of attacks or failures by ensuring that there are multiple pathways for electricity to flow and multiple sources of power. This can involve the use of distributed generation sources, such as solar panels or small-scale wind turbines, as well as the deployment of backup generators and other emergency power sources.

4. Hardening of infrastructure: Hardening critical infrastructure, such as substations and transformers, can help to make it more resistant to damage from attacks or natural disasters. This can involve the use of reinforced concrete, blast-resistant materials, and other structural enhancements.

5. Emergency response planning: Developing robust emergency response plans and procedures can help to minimize the impact of attacks or failures on the electrical power network. This can involve the establishment of emergency response teams and the creation of contingency plans to ensure that power can be restored quickly and safely in the event of an incident.

In times of war, an underground electrical network provides a significant advantage over an overhead network. During an attack, overhead electrical lines can be easily targeted, damaged or destroyed, causing widespread power outages that can take days or even weeks to repair. In contrast, underground electrical infrastructure is much less vulnerable to damage from attack, as it is well-protected and hidden from view. This makes underground electrical infrastructure a valuable asset for maintaining critical infrastructure during times of crisis. In addition, underground infrastructure can be more easily and quickly repaired in the event of damage, allowing power to be restored much faster than with overhead lines.

Another advantage of an underground electrical network is its increased level of security. Overhead lines can be easily accessed and sabotaged, either by criminals seeking to steal valuable metals or by malicious actors seeking to cause harm. Underground infrastructure, on

the other hand, is much more difficult to access and tamper with, providing a higher level of security for the electrical network. This added level of security can help prevent power outages and other disruptions that can be caused by malicious actors seeking to disrupt critical infrastructure.

underground electrical infrastructure offers a number of benefits over overhead lines, including increased safety, improved aesthetics, and increased reliability. By embracing underground infrastructure, cities can ensure that they are equipped with a resilient, secure, and reliable electrical network that can meet the demands of the future.

it is important for electrical power networks to be protected through a combination of physical, cybersecurity, and emergency response measures in order to ensure their reliability and resilience in the face of war or sabotage, while underground electrical networks may present some challenges and costs, they can also offer a number of benefits in terms of safety, reliability, aesthetics, security, and the environment.

In conclusion, the future of electrical infrastructure is below ground. While there are certainly challenges involved in making the switch to underground electrical infrastructure, the benefits it offers in terms of reliability, safety, and aesthetic appeal make it a compelling choice for cities looking to invest in the future of their communities. With proper planning and investment, underground electrical infrastructure can help to support the growth and development of cities around the world, while also providing a safer, more reliable, and more attractive electrical system for all.

asset management engineering grid infrastructure transmission utility business