California Wildfire Safety Advisory Board

Jessica Block
Chair

Christopher Porter
Vice Chair

Ralph Armstrong, Jr.

Diane Fellman

Timothy Haines

John Mader

Alexandra Syphard

September 22, 2023

TO: Wildfire Safety Advisory Board (Board) Members

FROM: Staff Advisors: Jonathan Frost & Sang Soble

RE: ABOVE-GRADE DISTRIBUTION SYSTEMS INFORMATIONAL MEMO

In advance of the October 3, 2023 Board Meeting, this memorandum informs the Board about a promising electric system design for distribution circuits called above-grade distribution systems (AGDS). AGDS refers to circuits that have conductor that is installed in conduit that is further encased in polymer or concrete and mounted at or above ground level or in some cases in shallow trenches. This Memorandum describes the technology, identifies current barriers to installation and recommends that the Board initiate a stakeholder engagement process. This process would help the Board to better understand the challenges and opportunities with this design, including the necessary regulatory changes for it to be used at broader scale.

Executive Summary

Currently California Public Utilities Commission (CPUC) and certain local regulations define the parameters of the California utility distribution network to a limited number of system designs and technologies. Advances to this infrastructure cannot be utilized without regulatory modifications that will allow the utility industry in California to construct AGDS as an alternative to converting overhead lines to underground (undergrounding). Under appropriate circumstances, AGDS construction may offer a safe, time-efficient and cost-effective alternative equivalent to undergrounding and other fire hardening measures.

Office of Energy Infrastructure Safety

Attn: Wildfire Safety Advisory Board Staff

715 P Street, 20th Floor
Sacramento, CA 95814

wsab@energysafety.ca.gov

https://energysafety.ca.gov/who-we-are/wildfire-safety-advisory-board/

Background

California's investor-owned utilities are generally limited to overhead pole and wire construction and underground buried cable in conduit construction for their electrical distribution systems under General Order (GO) 95 and 128 respectively. One exception, GO 128 Rule 15.2, allows the utilities to pilot experimental installations distinct from currently accepted overhead and underground construction.[i] Currently, there is one such pilot is planned to begin later in 2023 in PG&E's service territory.[ii] However, no process exists within GO 128 for revising the current regulations to accommodate new designs once they prove successful. Thus, without a CPUC rulemaking or legislative changes, new, innovative and possibly superior system designs cannot be deployed at scale.

In 2019, the State Legislature passed Assembly Bill (AB) 111 which added Section 326.a.7 to the Public Utilities Code (P.U.C.) which requires the Office of Energy Infrastructure Safety (Energy Safety) to review utility safety regulations in coordination with the Board and provide recommendations to the CPUC to address the dynamic risk of climate change and mitigate wildfire risk.[iii] As part of its effort to coordinate with Energy Safety and inform the review of the CPUC's utility safety regulations, the Board is preparing policy papers such as this.

Discussion

While the construction of AGDS systems is not broadly in use by electric utilities in California or in North America, above-grade construction has precedents in the gas transmission sector and by sewage utility corridors (utilidors) in locations with geologies where it is infeasible to construct underground sewage systems.[iv] In California, there has been a growing acceptance to alternative construction techniques to mitigate wildfire risk besides overhead bare conductor with its associated risks, and underground construction with its high costs (up to $6.1 million per mile).[v] AGDS with its variety of benefits may soon be among the promising alternatives.

One of the main benefits of AGDS is that it offers a construction alternative to underground conversion where the geologies or topographies are unsuitable, such as in the California Sierra Nevada where many locations are characterized by solid granite and steep topography. This would be analogous to other alternative distribution construction techniques such as installing conduit in concrete stanchions or installing armored, exposed conduit along the sides of bridges crossing water bodies. This construction method would not be suitable for all locations but would be appropriate for low or no traffic areas such as in the wildlands.

From a safety perspective, AGDS may offer comparable wildfire ignition reduction risk to undergrounding and covered conductors due to encapsulation with materials such as polymers. Above-grade systems are protected against most vegetation contact that bare, overhead conductors are exposed to and are not at risk of falling over due to high winds knocking trees or limbs into the lines or poles toppling. By having the lines installed in secure, above-grade facilities, operators can significantly de-risk their systems in the event of high-fire risk conditions. For instance, the Dixie fire in PG&E's service territory, which resulted from a tree making prolonged contact with overhead powerlines, could have been prevented if above-grade construction was used on the system rather than overhead lines.

With proper engineering techniques, the safety profile may be comparable to risers, where the overhead lines transition to underground, as conductors are encased in insulating materials so they can be securely mounted along the side of the pole. AGDS construction can also potentially reduce workforce injuries related to undergrounding work and/or vegetation management.

Additionally, AGDS systems may be constructed more quickly than undergrounding. AGDS components can be off-the-shelf and quickly installed. If, as we recommend to the relevant regulatory bodies that AGDS is permitted for wider scale use, and appropriate, compliant construction techniques are used, then construction timelines would be shortened. In lieu of the current excavation processes involved with trenching, boring, and repaving roads as is the case for most undergrounding work, AGDS has the ability to be constructed above-grade or installed just below grade in shallower trenches. This may also limit the environmental impact by eliminating the need for intrusive excavation work in addition to fewer vegetation thinning operations. Moreover, AGDS construction would likely be more cost effective due to shortened project timeframes and reduced labor and machinery needed. In addition to reduced construction timeframes and costs, above-grade systems would also likely enjoy shorter permitting and environmental review processes relative to undergrounding.

Furthermore, above-grade systems may have a longer lifespan than overhead conductors and be as easy to maintain when installed with geolocation devices to help locate the system when covered in snow or debris, such as when a fault occurs or when it comes time to replace the conductor.

However, AGDS will not be able to scale and achieve any of these benefits without modifying or adding to the existing regulations concerning the design and construction of electric distribution systems. An additional caveat is that the benefits including cost and wildfire risk reduction are not fully clear as the technology has never been deployed to date. Additional testing will be needed to bear out the benefits and to shape any programs for deploying the technology at scale.

Next Steps

We offer the following recommendation on next steps:

- The Board should host an initial public workshop to discuss the use of AGDS in electric distribution networks and better understand the use cases and benefits on such designs. This workshop should include the utilities and stakeholders such as prospective vendors, the California Department of Forestry and Fire Protection (CAL FIRE) and the U.S. Forest Service.
- Based on the outcome of the workshop and comments from stakeholders, the Board should proceed to issue policy recommendations to help inform Energy Safety as part of its P.U.C. §326.a.7 process.

Thank you for your consideration of the above points and recommendations and we look forward to discussing further during the October 3, 2023 Board Meeting.

Endnotes

[i] GO 128 Rule 15.2 reads:
It is the intent of this rule to assist in advancements or changes in the art without mitigation of safety. For this purpose, experimental installations which deviate from one or more of these rules may be made, provided: Precautions are taken to secure safety to property and to persons engaged in the construction, maintenance, and operation of underground systems, and to the public in general; and A full statement of the conditions involved in such experimental installation is filed with the Commission not less than 15 days prior to experimental modification of facilities or construction of any experimental facilities. Where such experimental construction would result in the installation of direct buried cable, duct, grounds, handholes, manholes or services with clearances, depths or protection other than provided by these rules, a copy of such statement shall concurrently be mailed to all utilities, local agencies or persons likely to be affected by such installation.

[ii] The project is scheduled for construction in the fourth quarter of 2023 in the small, rural town of Woodside, California in the San Francisco Bay Area. The project will convert 0.75 miles of overhead distribution lines to the ground-mounted system which will be characterized by cable in conduit that will be encapsulated in a geopolymer composite and fully enclosed in an exterior fire-proof cable tray assembly. (PG&E Letter to the CPUC dated March 28, 2023, p.2,4).

[iii] P.U.C. §326.a.7 requires energy Safety to "Review, as necessary, in coordination with the California Wildfire Safety Advisory Board and necessary commission staff, safety requirements for electrical transmission and distribution infrastructure and infrastructure and equipment attached to that electrical infrastructure, and provide recommendations to the commission to address the dynamic risk of climate change and to mitigate wildfire risk."
https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=326&lawCode=PUC.

[iv] For instance in Canada's far northern communities such as in Inuvik, utilities cannot be constructed undergrounded due to the permafrost. (Mackenzie Scott, "Inuvik's utilidor, nearly 65 years old, will cost $80M to replace," *CBC*, December 11, 2019, https://www.cbc.ca/news/canada/north/inuvik-utilidor-replacement-1.5391835).

[v] California Public Utilities Commission, "CPUC Undergrounding Programs Description," accessed July 10, 2023, https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/electric-reliability/undergrounding-program-description.