Title:

Expanding an Existing Substation in an Operating Mine’s Condensed Footprint

From:

[redacted]

Discipline:

Mining

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A [redacted] active mine site with a substation that was installed in [redacted] is due for an upgrade. There are multiple contributory factors in the requirement to replace. The first being the age of the substation, and its equipment being at end of life although there's a remaining mine plan exceeding the year 2060. The second, being the need for more power to not only go deeper, requiring more ventilation and cooling but also greener, thus eliminating Diesel vehicles and going electric. The challenge with the upgrades is not only a limited footprint for expansion/ replacement but the inability to decommission the existing substation in order to build the new one as the mine must remain active.

The service life of the existing power equipment has been reached and the substation requires significant upgrades for the mine to continue to operate, however has limited space available to retrofit the new and additional equipment needed. Having to maintain power to the existing substation during the building phase adds complexity as the regulations require clearance from live electrical equipment to construction equipment. The methodology that will be used to solve this problem will begin using laser scanning technology to develop an accurate 3D as-built point cloud of the existing site and all the surrounding infrastructure. A trade-off study will then be performed to analyse the multitude of layout options that respect limits of approach to existing live equipment as well as the OEC electrical clearance requirements (live to ground, phase to phase, and live to adjacent steel). During the trade-off, an analysis will also be done to evaluate the impact a lattice type structure can have on the footprint versus the alternate and equally as common HSS type structures that can be used to support

electrical equipment. It will also consider the site-specific clearance requirements for items such as transformer oil containment that will impact the amount of space required to complete the installation. Additionally, the existing pole line will be taken into consideration as a temporary feed may be required in order to allow power to be maintained for the entirety of the construction phase. The above mentioned will be done using the aid of 3D modeling of the substation equipment, the foundations and the required supporting steel directly within the as-built point cloud to be certain all regulation requirements for clearance have been met and in the most cost-effective way (as far as the civil construction is concerned). Finally, in order to maintain power, the project construction will be planned with the help of the three-dimensional model and phased appropriately to pre-determine when shutdowns are required limiting down-time to the mine.

I hypothesise that with the use of 3D technology, we can safely and effectively complete the retrofit of this large substation into a condensed and active area of the mine surface yard by simulating multiple iterations of the potential final layout within an accurate point cloud model of the existing footprint, all while respecting codes, site specifics standards, and operational requirements.