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WHITE PAPER / **RIGHT-OF-WAY OPPORTUNITIES**

LAND USE OPTIONS FOR URBAN TRANSMISSION CORRIDORS

BY Mike Beehler, PE, AND **Russell Neal**

As major cities plan upgrades to their utility networks to implement advanced technologies, they are examining the possibilities inherent in existing overhead electric transmission right-of-way corridors. Going underground within those corridors offers multiple potential benefits for utilities and their communities.

Urban planners have many challenges when they work to revitalize the world's older cities. Decisions made decades ago using the technologies of the day limit today's options for planning sustainable and livable "smart cities" that will compete for and capture financial and human capital.

One resource heretofore untapped by urban planners in our largest cities is the wide utility right-of-way corridors filled with large overhead electric transmission lines. Might today's advanced technology replace these very old overhead lines with a safe, reliable and efficient alternative?

This white paper examines the benefits that a transmission-owning utility and the community it serves might achieve by selling wide urban transmission rights-of-way and using the proceeds to replace the older overhead lines with new underground lines in much smaller corridors. Benefits might include:

1) Better land use options for residential development, parks, businesses or transportation
2) Replacement of aged and fully depreciated electric infrastructure with new technology that can improve reliability and reduce operations and maintenance (O&M) costs, and
3) Creative opportunities for new load growth and revenue for the transmission- (and distribution-) owning utility through more land use options.

BETTER LAND USE

Many major cities seek to renew their urban cores and bring back the populations and businesses that migrated to the suburbs decades ago. Many cities are making progress toward this noble objective. Progressive land use patterns are emerging, and urban land values are subsequently improving. City planners cannot turn time back to undo the development patterns of yesteryear, but today, they do have an opportunity to influence and master plan the next era of growth. To that end, new technologies for basic infrastructure can contribute to smarter, cleaner and more efficient urban cores. These new technologies might include point-of-use water treatment, intelligent transportation, sustainable stormwater retention and control, and underground electric, phone and other utility service. Adoption of some of these new technologies may allow the use of traditional utility right-of-way corridors for multiple land use options such as residential development, new or enhanced parks, commercial or business enterprise zones, or improved mass, public or commercial transportation applications.

The reliability and relative cost of high voltage underground transmission has improved significantly in recent decades. Increased public resistance to the routing and permitting of overhead transmission lines and this improved technology has led to a megatrend within the electric utility industry: More electricity must be delivered through existing rights-of-way. Converting overhead lines on wide urban right-of-way corridors to underground transmission lines on narrow corridors presents an opportunity to increase transmission capacity, as well as additional uses for the real estate. A real example of this potential opportunity is in Southern California, where the ports of Long Beach and Los Angeles anticipate container cargo growth to nearly triple in the coming decades. How do urban planners provide for triple the growth in the ports and the transport of shipping containers full of cargo through the heart of the Los Angeles Basin on the already choked Interstate 110 and Interstate 710 freeway corridors and beyond?

Los Angeles planners might consider a concept that has been applied in Virginia called an "inland port" (Figure 1). There, rail transportation is used to rapidly move container cargo from the port to an inland area with more space for its processing for further shipping. Virginia has improved urban land use patterns and reduced the adverse effects of congestion, noise and air pollution in the urban area. Might the ports of Long Beach and Los Angeles design an automated container movement system to coexist within the existing transportation and utility transmission right-of-way?

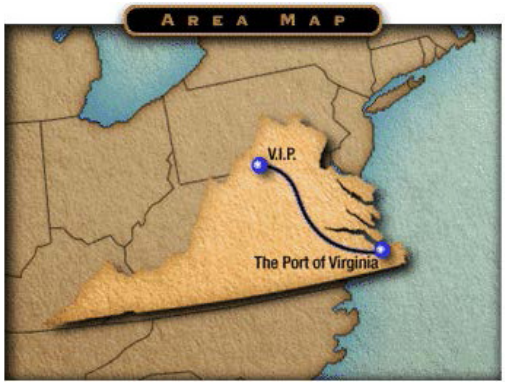

FIGURE 1: *An "inland port" in Virginia*

IMPROVED INFRASTRUCTURE

New technologies such as point-of-use water treatment, intelligent transportation, sustainable stormwater retention and control, and underground electric, phone and cable service present a unique opportunity for public/private utilities to replace aged and fully depreciated electric, water, gas and communication infrastructure with new technology that can potentially improve reliability and reduce O&M costs. Most mature major cities have basic civil infrastructure that is decades old and has served well beyond its originally intended useful life. In fact, the American Society of Civil Engineers gives the condition of America's infrastructure an overall grade of D+. (See the 2017 reprint at www.asce.org/reportcard.)

Using the electric utility example in Los Angeles' overloaded 110/710 corridor, local utilities Southern California Edison (SCE) and Los Angeles Department of Water & Power (LADWP) might apply the new technology of undergrounding 66-kV and 220-kV transmission lines to open up the wide utility corridors along some of the 710 route. Narrow underground corridors free up valuable land resources and options for urban land use, and subsequent undergrounding can also improve overall system reliability and reduce O&M costs. Most, but not all, would agree that new underground transmission is more reliable and will have lower O&M costs than old(er) overhead lines susceptible to fire, wind, lighting, tree and animal contact, human impacts and other more insidious causes of outages.

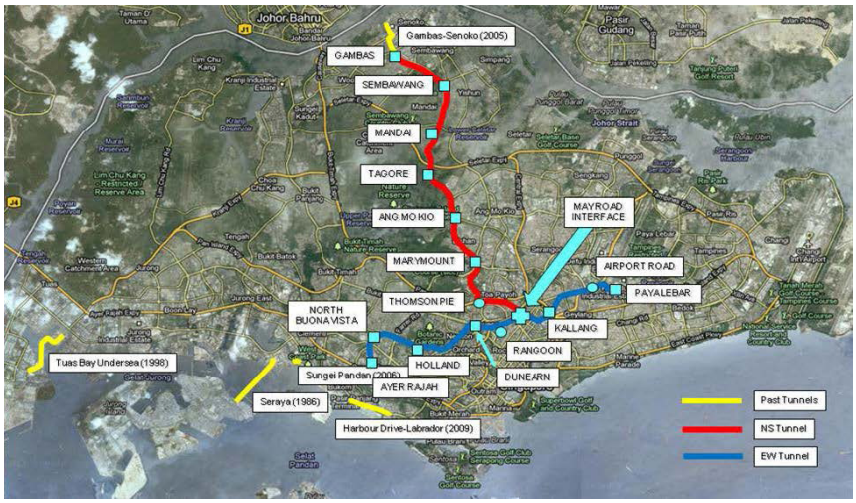

FIGURE 2: *Large high voltage underground transmission project in Singapore*

Underground high voltage technology has some challenges, not the least of which is the higher capital cost, but for the most part, there is enough 69-kV and 230-kV (class) underground transmission installed in the United States and the world to confidently quantify both reliability and O&M relative to older overhead lines.

Significant undergrounding of transmission cables does occur around the world. Singapore is currently completing a project to build six-meter-diameter tunnels, one running for 11 miles north and south and another running 10 miles east and west, both carrying 400-kV cables (see figure 2). This undergrounding allows for many other land use options.

NEW REVENUES

Better land use options and improved infrastructure using new technologies provides stakeholders in the urban planning process — such as utilities, transportation agencies, business and environmental organizations, and political leaders — with creative opportunities for new sources of revenue through smart, sustainable development and growth. Good, long-term jobs in the commercial and industrial sectors can be created and sustained. Property and sales tax receipts can increase. Revenues from the sale of electricity, gas, water and communication services can increase. And the intangible value of master planned land use that provides a safe, clean and more livable environment is priceless.

In our example of the 110 and 710 corridors, how might SCE and LADWP benefit financially from the application of new underground transmission technology on more narrow rights-of-way? Potentially, the new urban corridors made available (sold) by SCE and LADWP will give urban planners the needed space to accommodate new, clean and efficient alternatives for the increased container traffic coming through the ports of Long Beach and Los Angeles. Some of the options planners are considering include electrification of a truck or magnetic

levitated train system that would significantly increase electricity sales for the local electric utilities while reducing in-basin emissions. In addition, electrification of a 110/710 and beyond container corridor would accommodate the growth of the ports with relatively clean, quiet and safe access out of the crowded LA Basin and onto vast North American markets.

One past example of a successful project that resulted in an improved rail transportation system from the ports of Los Angeles and Long Beach is the Alameda Corridor. The project moved much of the railway carrying the original cargo traffic volumes below grade, permitting the replacement of crossing barriers on roads with bridges. This project was executed by a special agency, the Alameda Corridor Transportation Authority, which was able to resolve local issues in a timely manner. Building on this success, a follow-up project, the Alameda Corridor East, is in progress, aiming to make similar improvements for a 70-mile eastward path through the San Gabriel Valley.

A major project to upgrade the transportation and utility corridors through the LA Basin would likely require a similar authority over a larger and more diverse area than either the Alameda or Alameda East authorities. These previous authorities were created by the local associations of governments. A larger-scale authority might require state legislation to create.

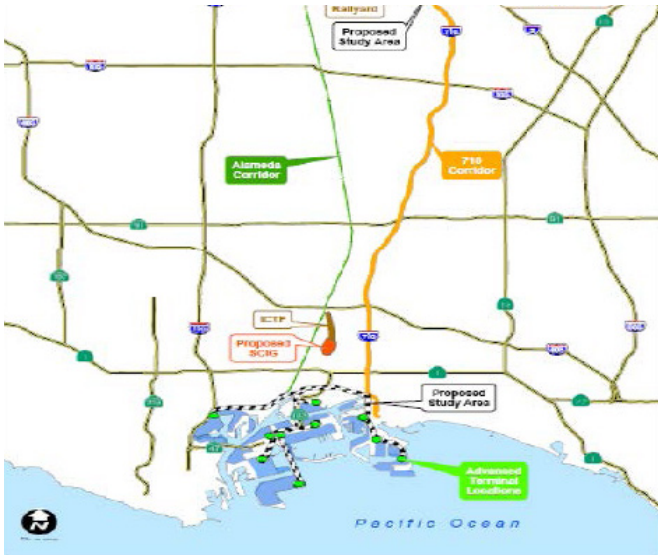

FIGURE 3: *The Alameda Corridor and Alameda Corridor East in Los Angeles*

CONCLUSION

Might today's advanced technology — including high voltage extruded cable, HVDC and superconductivity — replace current utility infrastructure with safe, reliable and efficient alternatives and give urban planners more options for sustainable and livable "smart cities" that will compete for and capture financial and human capital? We have explored the potential benefits of such a concept and applied a real example of the potential that lies within the Los Angeles Basin along the already congested 110/710 freeway corridor as it grows to accommodate a booming port industry that will bring jobs and revenue to the region. The cargo transportation corridor in the LA Basin has many stakeholders. The next steps in developing better land use options there remain to be taken. The undertaking will be an enormous challenge, but the alternative may be unacceptable economic stagnation. Visionary leadership is required. Ultimately, a leader will emerge and the region will be better served for it.

BIOGRAPHY

MIKE BEEHLER, PE, a vice president at Burns & McDonnell, has written and presented extensively on the subjects of security, reliability-centered maintenance, program management and the smart grid. More recently, he has written, presented and consulted on industry megatrends, advanced technologies and smart cities. Mike has a Bachelor of Science in civil engineering from the University of Arizona and a Master of Business Administration from the University of Phoenix. He is a registered professional engineer in eight states, a member of IEEE and CIGRE, and a Fellow in the American Society of Civil Engineers.

RUSSELL NEAL retired as Principal Advisor, RD&D for Southern California Edison, specializing in Smart Grid with an emphasis on distribution. He was responsible for advancing SCE projects in this area. Russ was responsible for SCE's Distribution Circuit of the Future.

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