

ELECTRIC *from the publisher of POWER DAILY* TRANSMISSION WEEK

Aerial laser survey technology gives utilities new tool for transmission asset management and planning

Network Mapping Ltd. has developed a technology that links aerial laser mapping with global positioning system data to create incredibly detailed and accurate three-dimensional maps of transmission corridors.

Utilities can use the data generated by these surveys to create and update a precise inventory of transmission assets, as well as for managing existing transmission corridors, planning new transmission lines and calculating the modifications needed to re-rate existing transmission lines to carry more power over them.

Network Mapping is a subsidiary of British firm National Grid Transco. It initially focused on National Grid's electricity and gas system in England and Wales, but has also performed work for National Grid subsidiaries in the United States as well as for utilities in France and Norway.

The company previously mapped all 3,000 miles of National Grid's New England transmission system and has just started a similar project for National Grid's Niagara Mohawk subsidiary in New York. Network Mapping Project Leader Hugh O'Donnell explained that the Niagara Mohawk project is expected to take five years. Initial priority is being given to mapping about 800 miles of the 345-kV system, he said.

O'Donnell explained that the heart of the system consists of a 50-Mhz laser operating in the infrared spectrum and a 6 million pixel digital camera mounted on a helicopter. The helicopter flies over the target corridor at an altitude of 850 to 1,000 feet at 60 to 70

miles per hour.

The data output is prodigious and accurate, O'Donnell said. The laser provides 100,000 3-D data points per second. An hour of flight time results in two gigabytes of laser data as well as seven gigabytes of digital photos. O'Donnell said it takes about 10 hours of computer time to process each hour of data.

In addition, the system correlates very accurately surveyed ground-based GPS reference points with the helicopter-based GPS to determine the precise location of the helicopter at all times. Network Mapping states that its data is accurate to within inches.

Identifying additional line capacity

The processed data is entered into PLS-CADD, the industry standard software for transmission line planning and design. The client receives a detailed plan view of the corridor consisting of a digital photo with all transmission structures identified as well as other major corridor features such as trees, structures and any paths or roads that intersect or cross the corridor.

This information is also presented in elevation form, showing topography and vegetation.

In addition, with the data in PLS-CADD format, the utility can easily run simulations to see how different weather and load conditions affect line sag. Although a utility may have extensive records of its system "as designed," a survey by Network Mapping will record the system as actually built, and provide data for the entire system in a uniform PLS-CADD format.

Mark Browne, manager of transmission line engineering for National Grid US, noted that line ratings are typically restricted by ground clearance. The laser can verify the exact ground

clearance at known load and weather conditions.

Browne said the utility can then use PLS-CADD to model increased load and determine exactly what remediation, such as vegetation management, conductor over-tensioning or suspension clamp offset, would be required.

Network Mapping states that on average, up to 10% additional capacity can be realized on a circuit following minor remedial work.

The detailed mapping data also provides benefits for transmission planning. For example, once a corridor is surveyed, different tower configurations and routing can be easily modeled. Furthermore, the data allows the utility to create a virtual 3-D image of a proposed line and potentially could even show the view of the line from any affected property in the survey area.

O'Donnell said that next year, the system will get a new laser generator that will emit more pulses per second and allow the helicopter to fly faster without degrading data quality. In addition, there are plans for multi-spectral imaging. He said this would allow the identification of individual tree species in the corridor so that the faster-growing species can be specifically targeted. SM

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