

# Idaho Power designs unique line tap using variety of Hi\*Lite® configurations

## Use of Hi\*Lite to sectionalize line saves \$20,000 over cost of deadend installation

By Tim Butler  
Idaho Power Company

When Idaho Power Company was designing its new 230-kV line from Boise Bench to Cloverdale substations, we saw the need to tap the line at the Butler substation as an opportunity to utilize Hi\*Lite's light weight in a way that had never been done before.

Our design challenge was to provide proper clearance between the phases while trying to avoid the cost of building a deadend structure next to the substation. In addition, we tried to avoid the acquisition of additional right-of-way, which the use of a deadend structure would have necessitated.

The transmission line is built almost directly over the Butler substation, and the clearance between the jumpers and the conductors is less than the seven feet required for deadend structures. The station bus is perpendicular to and only 17 feet to one side of the line.

We were able to minimize right-of-way and yet maintain the necessary clearance by isolating the phases and insulating the structure entirely with Hi\*Lite composite insulators. By taking advantage of Hi\*Lite's light weight, we were able to design a line tap whose tapping structure

required only a six-foot diameter foundation. Plus, Hi\*Lite's light weight eliminates conductor sag where the insulator isolates the two line sections, and it imposes minimal vertical loading on the conductors where the Hi\*Lite taps the lines. Other Hi\*Lite advantages include those we have recognized in other applications: construction ease, gunshot resistance, high strength, and reliability.

The four-mile Boise Bench-to-Butler line, insulated for 230 kV but initially operating at 138 kV, was built by an Idaho Power construction crew through urbanized areas of Boise—another reason why it was critical that we minimize right-of-way. The double-circuit line uses Hi\*Lite braced line posts for a low visual profile and strength, thereby avoiding davit-arm or lattice-steel construction.

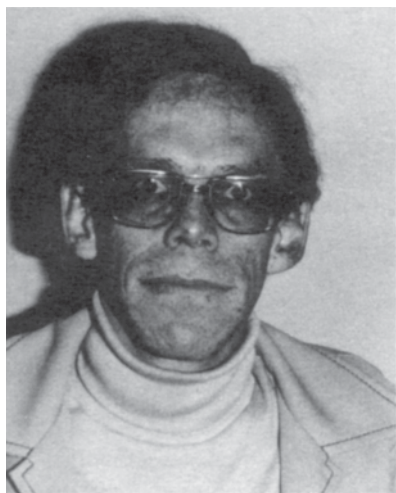
The Hi\*Lite braced line post construction continues past the Butler substation, with one of the steel poles serving as the tapping structure. Instead of using a separate deadend structure, we sectionalized the transmission line by cutting in a 20,000-pound Hi\*Lite suspension insulator on one side of the Hi\*Lite braced line post on each phase. The 69-kV underbuild, also insulated with Hi\*Lites (see photograph), is not affected by the tapping arrangement.

We tapped the phases on both sides of the sectionalizing Hi\*Lites to complete the loop feed circuit. The bottom tap, connected to the 1272 MCM ACSR Bittern conductor, is suspended from 71 feet directly into the tubular station bus.

However, it was necessary to use Hi\*Lite standoff jumper spacers for the middle and top phases to fix the clearance between the conductors and the jumpers. The jumper for the top phase is connected to the apex of the triangular Hi\*Lite spacer on the middle phase. The same spacer arrangement on the bottom phase fixes the conductor-to-jumper clearance for the middle phase.

We designed and fabricated the triangular Hi\*Lite spacers with 106-inch, 20,000-pound Hi\*Lites with eye fittings on both ends; standard suspension clamps for the conductor attachments; and simple apex fittings machined in Idaho Power's shop for the jumper connections. Vertical loading on each phase is less than 150 pounds.

We have found that this new line tap design performs as expected, provides the required support, and realizes a cost savings of at least \$20,000 for each three-phase line tap when compared to a standard deadend installation.

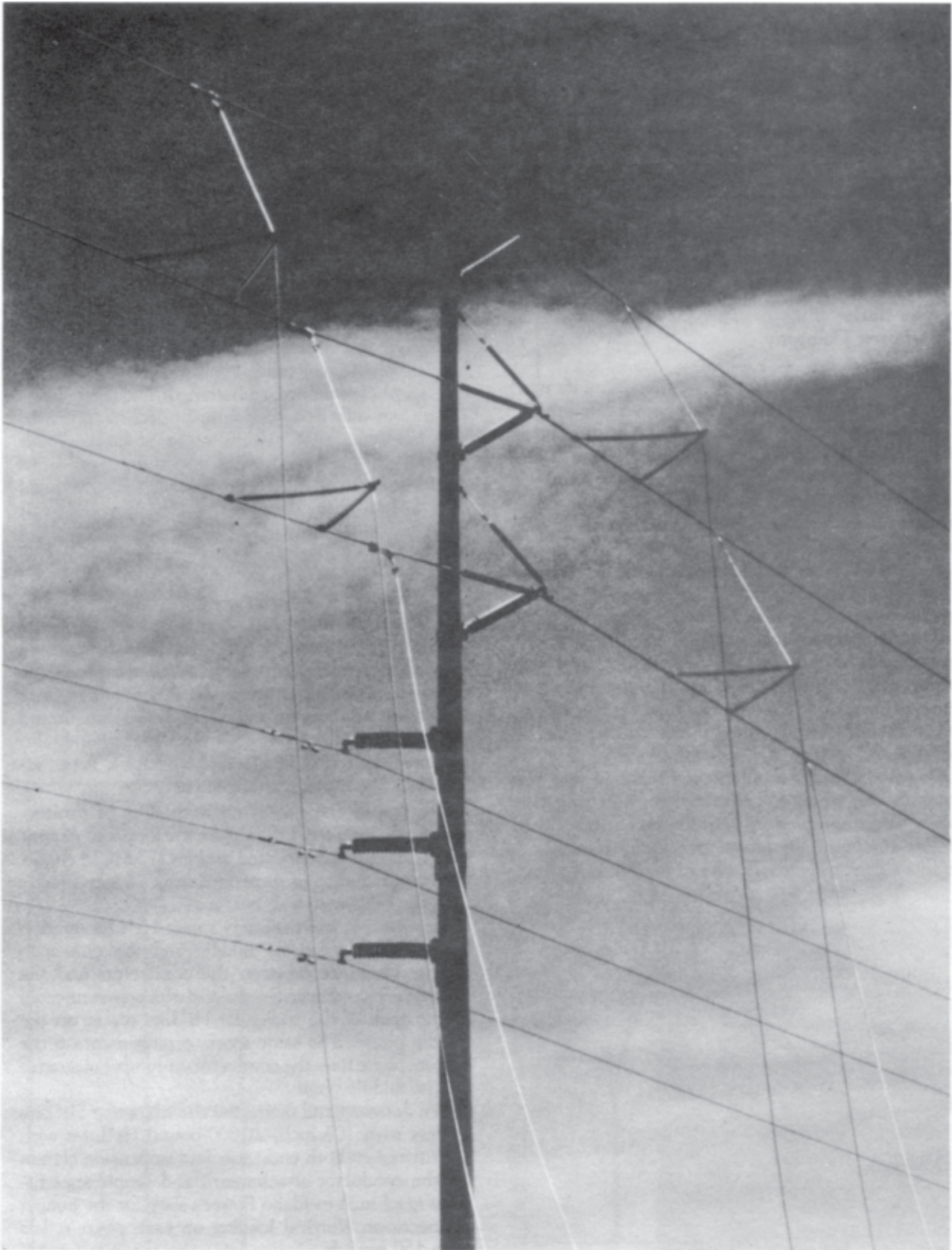


*A graduate of the Oregon Institute of Technology, Tim Butler has worked for Idaho Power Company since 1971. Presently, he is an engineering designer in the Substation Department.*

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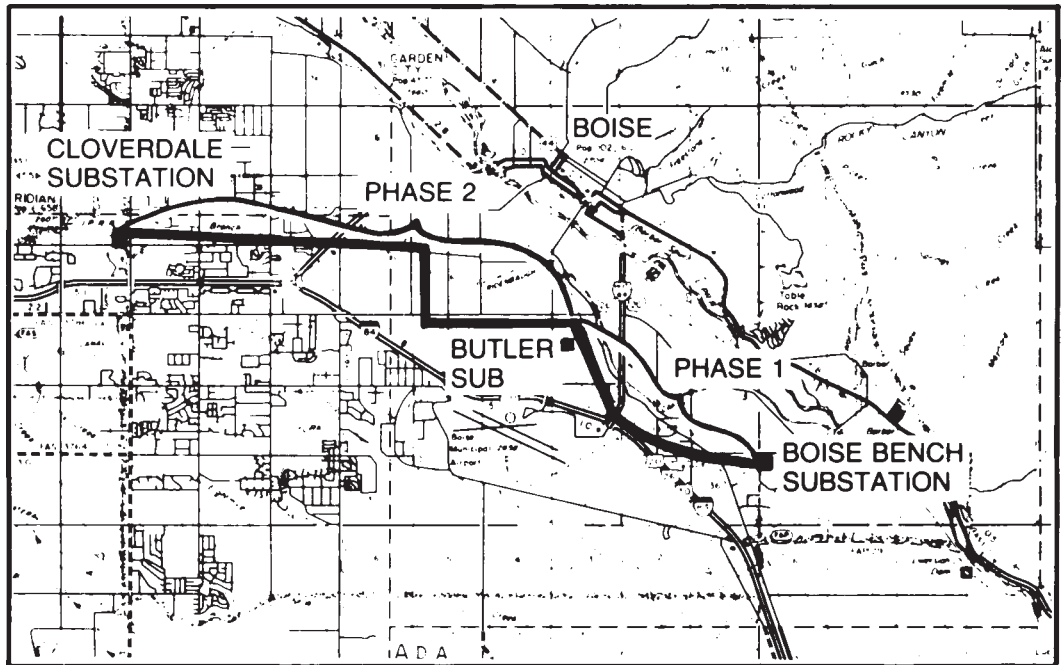
**Bulletin EU1089-H**



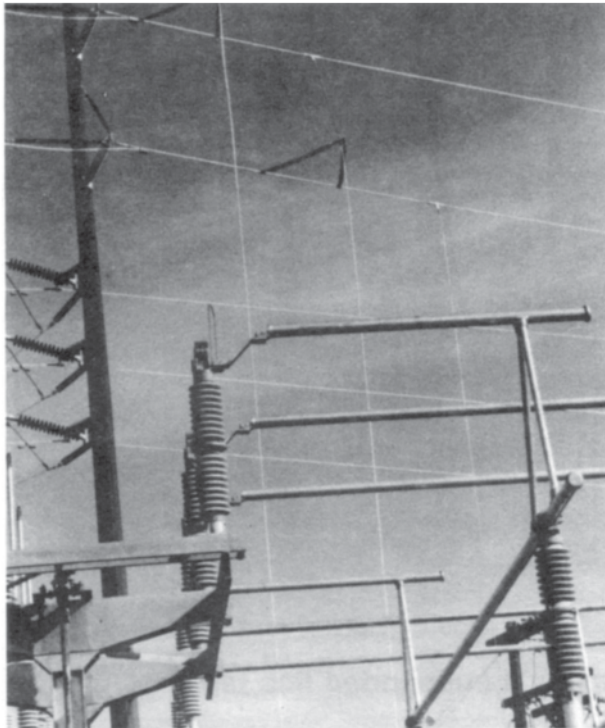
*Idaho Power Company saved at least \$20,000 by tapping a 230-kV line with Hi\*Lite phase isolators and Hi\*Lite standoff brackets instead of building two deadend structures on additional right-of-way.*

*Continued on next page*

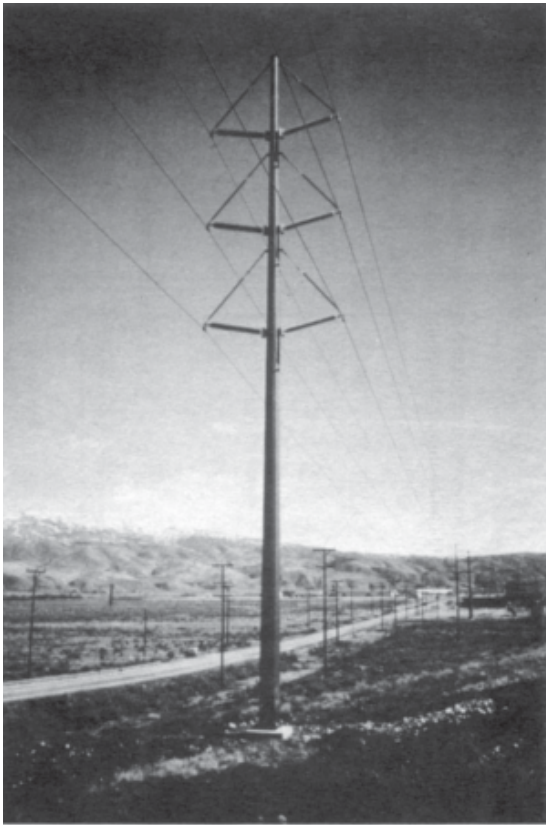
## Idaho Power designs unique line tap (continued)



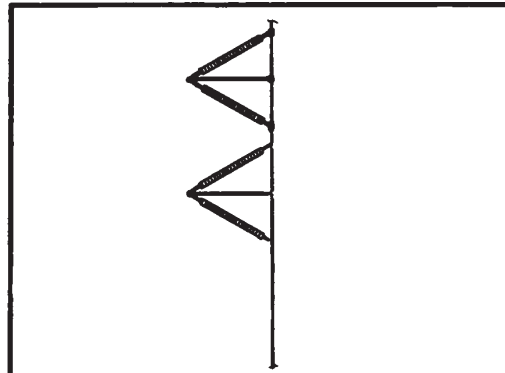
*The Butler substation line tap sectionalizes the 11-mile 230-kV line from Cloverdale substation to Boise Bench substation.*



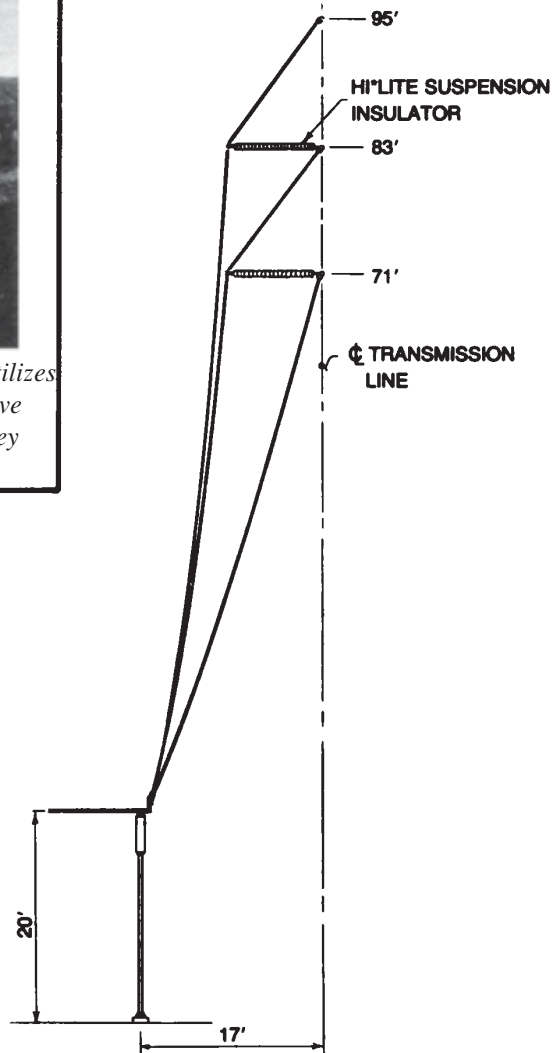
*Idaho Power designed the Hi\*Lite standoff bracket, which is attached to the conductor with standard suspension clamps. The apex fittings that join the standoff brackets to the jumpers were made in Idaho Power's shop.*



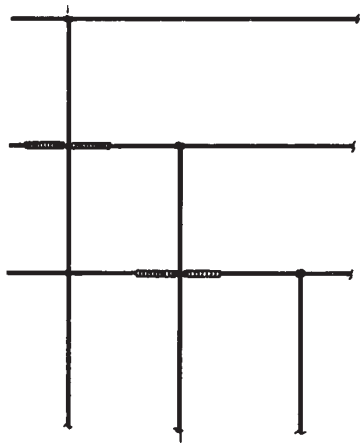
The four-mile Cloverdale-to-butler 230-kV line utilizes Hi\*Lite braced line posts to provide an unobtrusive visual appearance in an urban environment as they add to the strength of the conductor support.



Overhead plan view of Hi\*Lite triangular line taps



Side view of line taps and buswork



Front view of line taps

**Design of Idaho Power Company's suspended line tap**



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