



What's the GPR?

IT IS MOST LIKELY NOT WHAT WAS CALCULATED

THE UNNECESSARY COSTS: The answer to that question has a dramatic impact on the cost of installing communication circuits at substations. Tens of thousands of dollars hang in the balance over the answer to the Ground Potential Rise (GPR) question. The High Voltage protection equipment necessitated by the GPR answer represents only a small portion of the actual cost!

The current criteria in the industry were established by the peak GPR of a site compared to the 17.5kV dielectric strength of the insulated safety mat used by installation personnel. If the GPR calculated is above 17kV, a different, much more costly approach to serve the site is required involving inserting a fiber span across the Zone of Influence (ZOI) of the substation and establishing a Copper/Fiber Junction (CFJ) at or near the edge of the ZOI. Or, the operating telephone company may insist on a new direct fiber service entrance. This would involve the replacement of existing communications facilities and/or infrastructure. A difference of only 1kV can add many tens of thousands of dollars to a communications build-out. The resulting GPR figure have a dramatic impact on costs.

THE PROBLEM: Using a purely mathematical approach based on empirical data generally yields an incorrect GPR value. The reason for this is that general "rules of thumb" for establishing the GPR adopted at power stations are often used to calculate the GPR. The problem is compounded by assumed soil resistivity approximations listed in IEEE 367. These resistivity values are used in the GPR calculation, but do not take into account the actual site soil resistivity and other real-world conditions, such as local buried metallic infrastructure and MGN influences, which are factors that can contribute to a lower GPR. These factors contribute to lower earth resistivity and subsequently to a lower GPR and are not taken into account in IEEE 367. Because of this, the GPR value that results from a pure mathematical application of IEEE 367 can vary significantly from the actual ground potential rise at the site.

THE SOLUTION: Each site is different. Positron's GPR specialists use no "rules of thumb". Real-world resistivity measurements are made with sophisticated instruments on-site by professionals. The real electrical parameters of the substation and surrounding area are established so real data is used in the calculations to establish what the real GPR value is, as well as the associated ZOI.

Positron's GPR specialists use the latest in measurement technology to establish the real parameter values to use in the GPR calculation. Since real values are used, the resulting GPR figures are more accurate and defensible. When investing in Positron's GPR services, you can rest assured that you will get real data instead of approximate numbers that can end up costing many thousands of dollars unnecessarily and potentially cause major delays in service provision.

THE BENEFIT: Knowing the actual GPR is very useful and can lead to significant cost savings and less disruption and civil works. The GPR of most sites is less than the 17kV threshold above which costs escalate. Positron's GPR services yield accurate data, save money and minimize disruption. These services provide real value and can be done quickly. In the majority of cases, this will result in much lower facility and infrastructure costs, and an excellent return on an investment.

EXPERIENCE HAS SHOWN

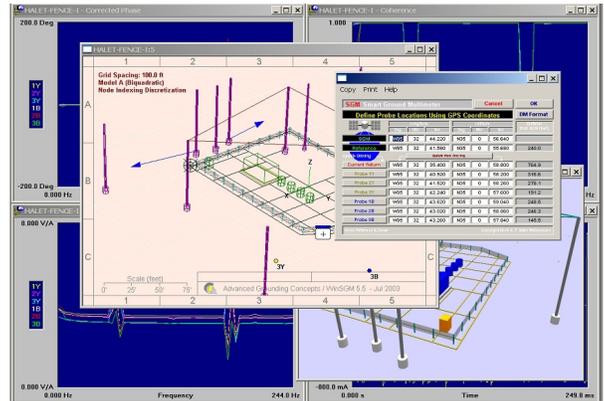
We have learned from over 1,000 GPR studies that:

- Less than 10% had GPR's over 17kV
- In over 80% of the cases the actual GPR was less than the GPR derived from purely mathematical calculations based on the 'standards'
- In many cases the actual GPR was less than 50% of the calculated GPR
- Significant costs were saved



Positron Services for Telecom High Voltage Interface

Positron's service organization leverages Positron's 40 year history of industry involvement and active participation in professional bodies such as ATIS and IEEE. Positron offers all of the services required for high voltage environments such as GPR/ZOI studies, Telco HVI submittal forms, planning, project management, installation of high voltage isolation equipment, safety/lightning issues analysis, circuit turn-up and audit of existing installations.



GPR Studies

Service Code **770001** (Basic GPR Studies)

- Modeling the substation ground grid
- Measuring and modeling the soil resistivity
- Calculating the grid impedance
- Calculating the ZOI
- Report preparation and submittal
- Completing the Telco HVI submittal form

Service Code **772001** (Premium GPR Studies)

- Overview of grounding system
- Assessment of transmission and distribution lines subtending the site
- Detailed report of soil resistivity test
- Report on how the two-layer model is determined
- Detailed drawings of computer modeled ground system design
- Safety calculations and recommendations
- Report of split factor derivation
- Detailed of the GPR calculations
- Written report with executive summary

Service Code **772002** (Premium/Standard GPR Studies)

- All deliverables from the Basic GPR Study
- Measuring the grid impedance with a Smart Ground Multimeter

Substation Ground Analysis

Service Code **770002**

- Point-to-point continuity measurements of the substation ground grid
- Step and touch potential measurements at various locations within the substation
- Locating of the various metallic grid elements within a substation

On-Site Diagnostics & Troubleshooting

Service Code **770003**

- Issue identification
- Determine probable cause of issue
- Solution recommendation

HVI Installation Services (EF&I)

Service Code **771004** (Basic HVI Installation)

- Mounting of HVI equipment
- Make-Ready work for Telco connection
- Circuit Turn-up and Test

Service Code **772004** (Premium HVI Installation)

- Trenching
- Laying of conduit
- "H-frame" erection
- Mounting of HVI equipment
- Station cable routing
- Circuit Turn-up and Test

HVI Project Management

Service Code **770005**

- Project management of broad HVI deployments or upgrades

HVI Integrity Audit

Service Code **770006**

- Audit of existing HVI installation related to safety and to ensure isolation integrity

Lightning Damage Investigation

Service Code **770007**

- Perform root-cause analysis on damage caused by lightning and provide recommendations

For information, please contact Positron Customer Service
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