IP Transport Communications for Power Stations and Other High-Reliability Locations- Challenges and Protection

Presented by:

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IP Transport Communications- Overview

- The big picture- Staying connected
- Particularly challenging service locations (and why)
- Specific service architectures
- Comparison of service options
- Discussion

Who (or What) needs connecting?

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IP

Interconnect and Protect.

How?

Interconnect How?

Service Challenges

- Build/Construction
- Bandwidth
- Maintenance access
- Low latency
- Security
  - Vandalism
  - Sabotage
  - Regulatory/DHS Requirements
- Ground Potential Rise (GPR)

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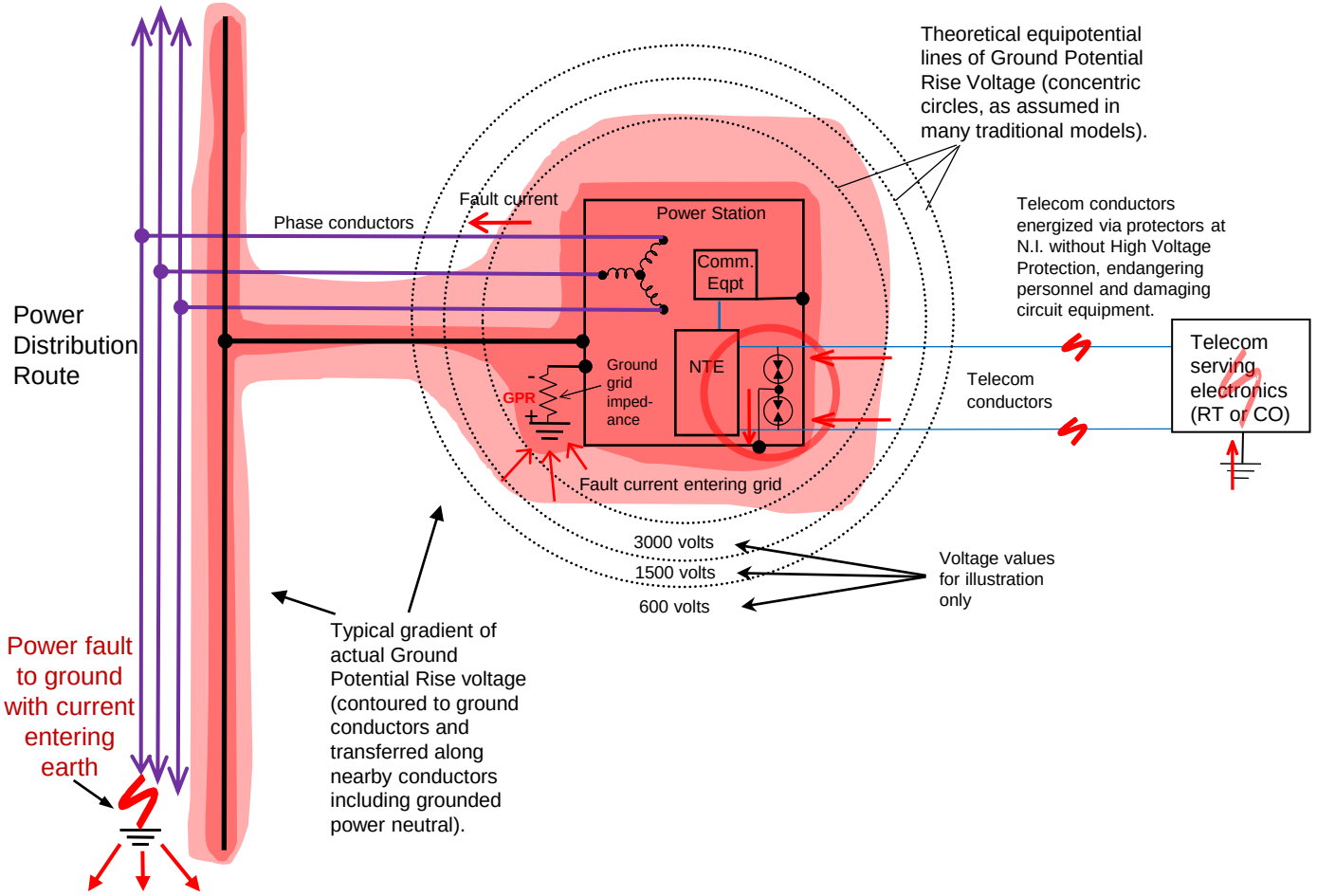
Power GPR Illustration




DANGER
DANGER
NOTICE
PG&E
DANGER


Lyte Lynx™ AC/DC Power Supply
Station
4W/T-1
CARRIER
LYTE LYNX
Remote
Station
CARRIER
LYTE LYNX
Remote

What not to do, cont'd.

Physical Security- the “Dog Pen”


HVI
LVI

Service Challenges (Cont'd)

- High reliability
  - Service Performance Objective (Class A, B, C)
  - "Smartgrid" requirements- IEEE 1613 environmentals
- …in addition to the usual concerns:
  - Personnel safety
  - Cost

IEEE 1613.1-2013

IEEE Standard Environmental and Testing Requirements for communications Networking Devices Installed in Transmission and Distribution Facilities

Scope

This standard establishes the requirements for communications networking devices supporting electric [ ] transmission and distribution inside/outside an electric power substation. It addresses issues such as equipment enclosures, temperature ranges, electrical phenomena, and others that are [c]haracterized by a transmission and distribution environment. This includes the different communication methods used in these locations, such as wireless and power line carrier/communications[.]

IEEE 1613.1-2013

IEEE Standard Environmental and Testing Requirements for communications Networking Devices Installed in Transmission and Distribution Facilities

Purpose

This standard will fill critical gaps, as today no IEEE standard exists for Smart Grid devices installed in substations, on distribution feeders, or the communications devices installed in Smart Meters--and utilize radio frequency, power line communications, or Ethernet cables. This standard (as an extension of IEEE Std 1613-2009) will fill those gaps. It adds new frequencies, now in use by cell phones and portable devices, not covered in IEEE Std 1613-2009. It also adds five new immunity tests (Clause 6 and Clause 9 through Clause 12) not previously covered by any IEEE standard. Thus, Clause 6 and Clause 9 through Clause 12 are additional requirements for IEEE 1613 devices.

IEEE 1613.1-2013

IEEE Standard Environmental and Testing Requirements for communications Networking Devices Installed in Transmission and Distribution Facilities

- Not clear whether this standard addresses wire-line communications devices.

While the above Purpose includes Ethernet connections, the purpose as derived from the abstract reads: "…establishes a common reproducible basis for designing and evaluating devices utilizing radio frequency (RF) up to 6 GHz, power line communications, and broadband over power line (BPL) technologies. It also requires immunity to five IEC electromagnetic compatibility standards for which there are no IEEE equivalent standards. This standard is an extension to IEEE Std 1613(tm)-2009 and IEEE Std1613a(tm)-2011."

DHS- Telecommunications Service Priority (TSP)

…a program that authorizes national security and emergency preparedness (NS/EP) organizations to receive priority treatment for vital voice and data circuits or other telecommunications services. NS/EP telecommunication services are those used to maintain a state of readiness or to respond to and manage any event or crisis that causes or could cause injury or harm to the population or damage to or loss of property or that degrades or threatens the NS/EP posture of the United States.

Comparison of Service Options

Transport Type	Personnel Safety	Circuit Reliability		Latency
		Security of Communications	Resiliency (Single- Path)	
Point-to-Point Radio				
Satellite Radio				
Cellular- Ext. Provider or Internal				
Point-to-Point Laser				
Copper Pairs- On-Grid Demarc- with dogpen or inside premises				
Copper Pairs- On-Grid Demarc- without dogpen				
Optical Fiber- Internal Network				
Optical Fiber- Leased- demarc inside prem or with dogpen				
Optical Fiber- Leased- outside demarc				

Comparison of Service Options

Transport Type	Personnel Safety	Circuit Reliability		Latency
		Security of Communications	Resiliency (Single- Path)	
Point-to-Point Radio	High			
Satellite Radio				
Cellular- Ext. Provider or Internal				
Point-to-Point Laser				
Copper Pairs- On-Grid Demarc- with dogpen or inside premises				
Copper Pairs- On-Grid Demarc- without dogpen				
Optical Fiber- Internal Network				
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Comparison of Service Options

Transport Type	Personnel Safety	Circuit Reliability		Latency
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Point-to-Point Radio	High	Medium		
Satellite Radio				
Cellular- Ext. Provider or Internal				
Point-to-Point Laser				
Copper Pairs- On-Grid Demarc- with dogpen or inside premises				
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Point-to-Point Radio	High	Medium	Low	Low
Satellite Radio	High	Medium	Low	Very High
Cellular- Ext. Provider or Internal	High	Medium	Medium	Medium-Low
Point-to-Point Laser	High	Medium	Low	Very Low
Copper Pairs- On-Grid Demarc- with dogpen or inside premises	Medium	Medium	Medium	Low
Copper Pairs- On-Grid Demarc- without dogpen	Medium	Low	Medium	Low
Optical Fiber- Internal Network	High	High	High	Low
Optical Fiber- Leased- demarc inside prem or with dogpen	High	High	High	Medium-Low
Optical Fiber- Leased- outside demarc	High	Low	High	Medium-Low

Comparison of Service Options

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Point-to-Point Radio	High	Medium	Low	Low
Satellite Radio	High	Medium	Low	Very High
Cellular- Ext. Provider or Internal	High	Medium	Medium	Medium-Low
Point-to-Point Laser	High	Medium	Low	Very Low
Copper Pairs- On-Grid Demarc- with dogpen or inside premises	Medium	Medium	Medium	Low
Copper Pairs- On-Grid Demarc- without dogpen	Medium	Low	Medium	Low
Optical Fiber- Internal Network	High	High	High	Low
Optical Fiber- Leased- demarc inside prem or with dogpen	High	High	High	Medium-Low
Optical Fiber- Leased- outside demarc	High	Low	High	Medium-Low

Comparison of Service Options- Cost factors

Transport Type	Personnel Safety	Circuit Reliability		Latency	Cost		
		Security of Communications	Single- Path Resiliency		Initial Cost	Recur-ring Fees	Mtce. Cost
Point-to-Point Radio	High	Medium	Low	Low	High	None	Med
Satellite Radio	High	Medium	Low	Very High	High	High	Med
Cellular- External Svc. Provider	High	Medium	Medium	Medium -Low	Low	Med	Low
Cellular- Internal System	High	Medium	Low	Very Low	High	None	High
Laser- Internal System	Medium	Medium	Medium	Low	High	None	Med
Copper Pairs- On-Grid Demarc with Dogpen	Medium	Low	Medium	Low	?		
Copper Pairs- On-Grid Demarc without Dogpen	High	High	High	Low			
Copper Pair(s)- Off-Grid Demarc	High	High	High	Medium -Low			

QUESTIONS, COMMENTS?…

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