

IntelliRupter Project Update

SWEDE 2010

May 5, 2010

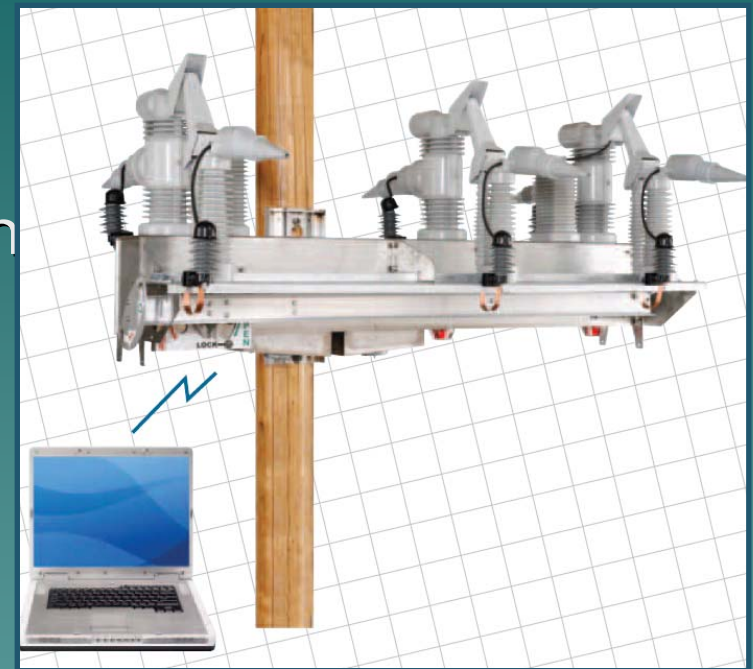
Presented
By

Frank Daniel – Oncor Electric Delivery



Outline

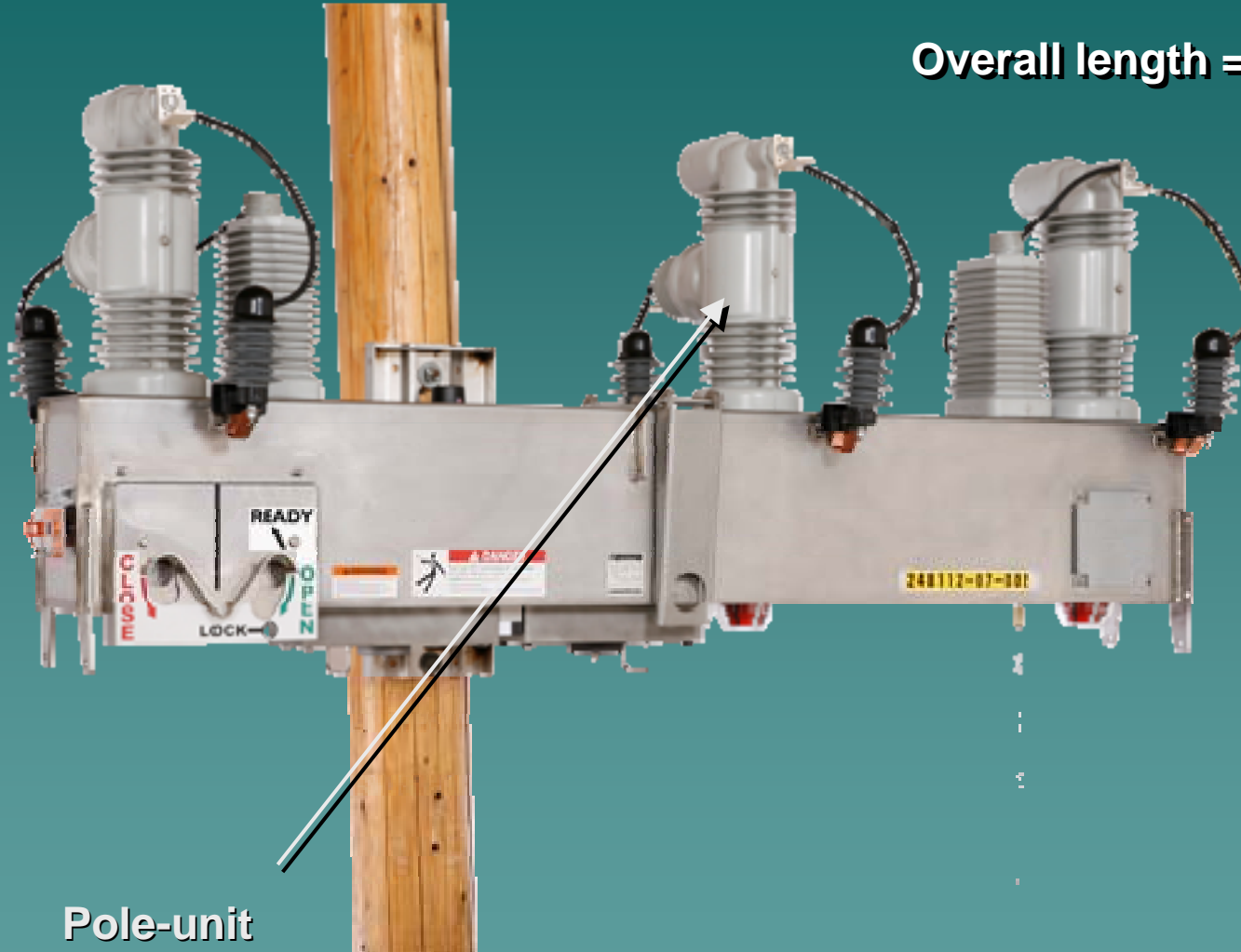
- ◆ Hardware Features
- ◆ WiFi and Security
- ◆ IntelliLINK® Operating Screen
- ◆ Time Current Characteristic Curves
- ◆ Pulseclosing
- ◆ Pros and Cons
- ◆ Oncor Installation
- ◆ Fault Operation
- ◆ Communications
- ◆ Problems with IntelliRupter
- ◆ Questions



Components



Overall length = 93"

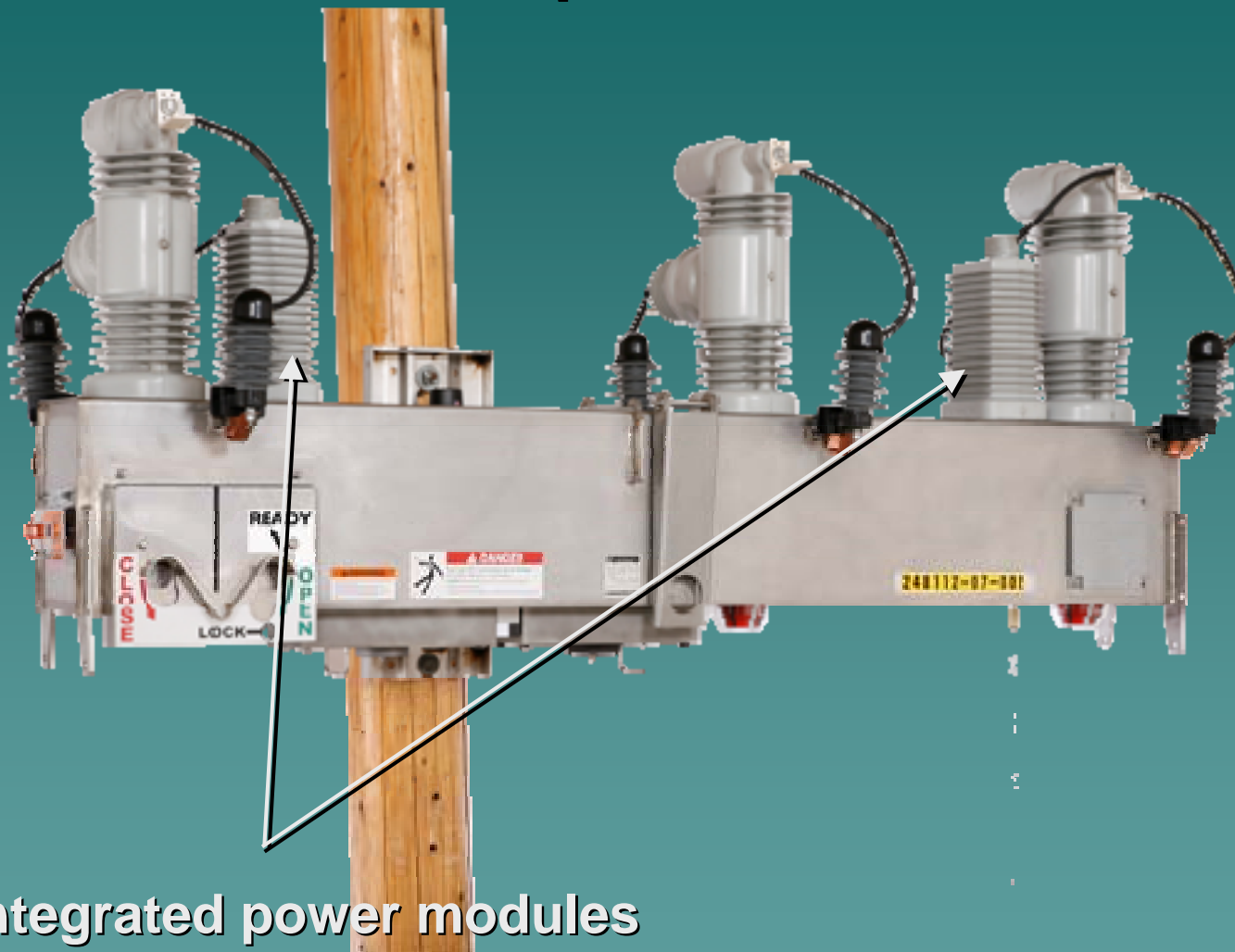


Pole-unit

- Integral three-phase voltage and current sensing
- System accuracy better than $\pm 2\%$



Components



Integrated power modules

- One or both sides of the IntelliRupter (50 or 60 Hz)
- No need for fusing or separate power transformers



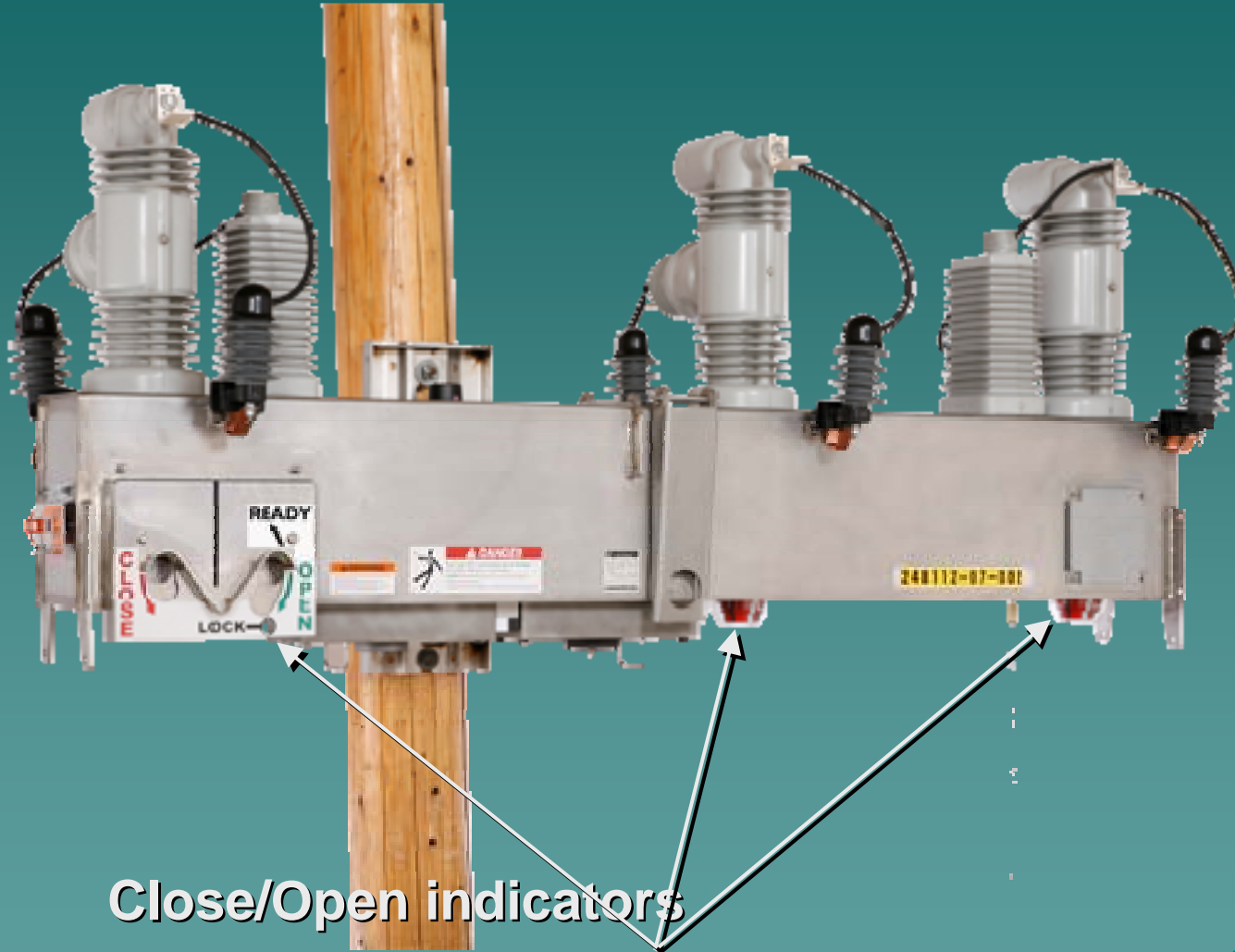
Components



Surge arresters (optionally available installed and wired)



Components



Close/Open indicators



Components



Closed

Open



Components



Protection and control and communications modules



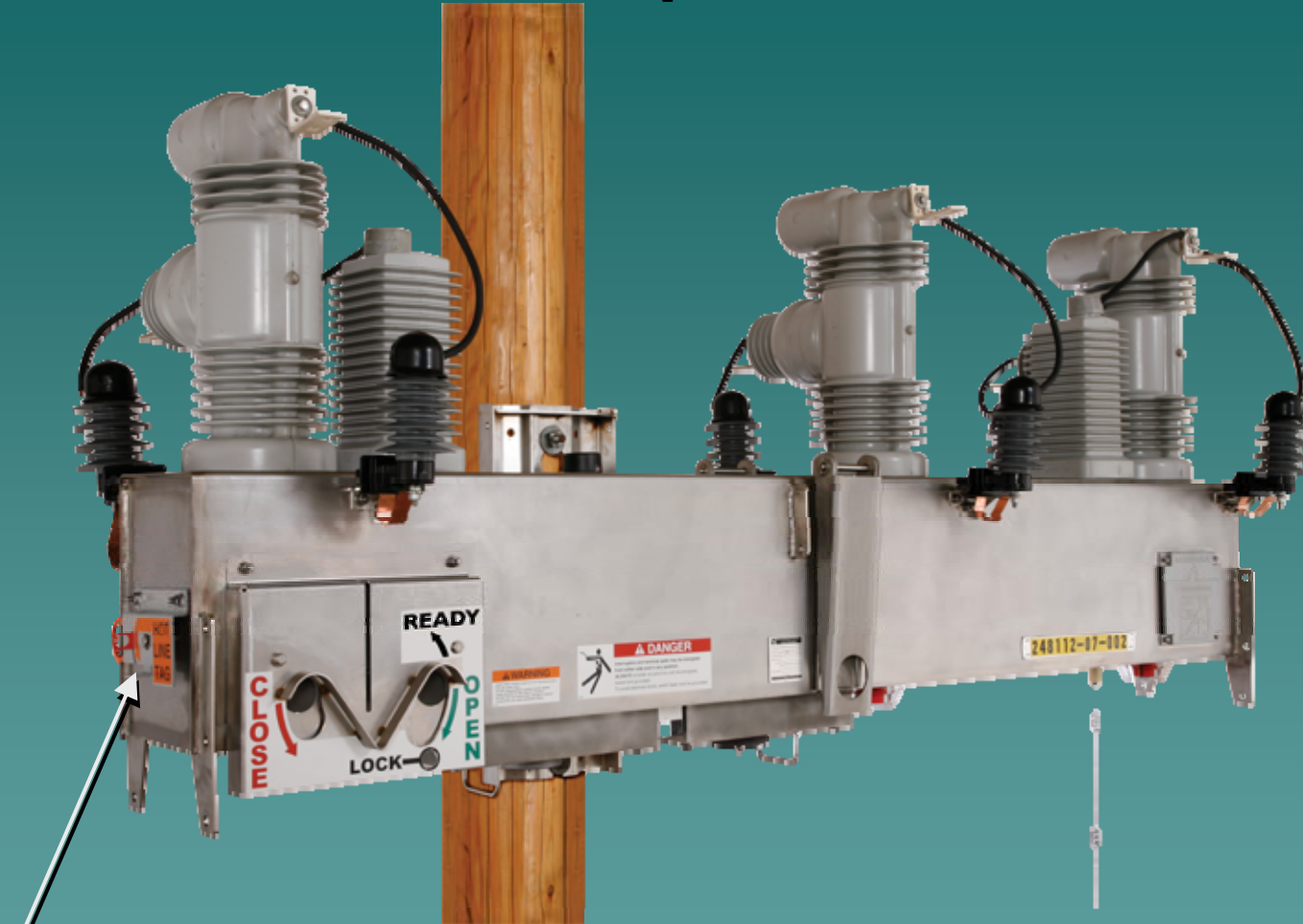
Components



Open/Close/Ready lever



Components

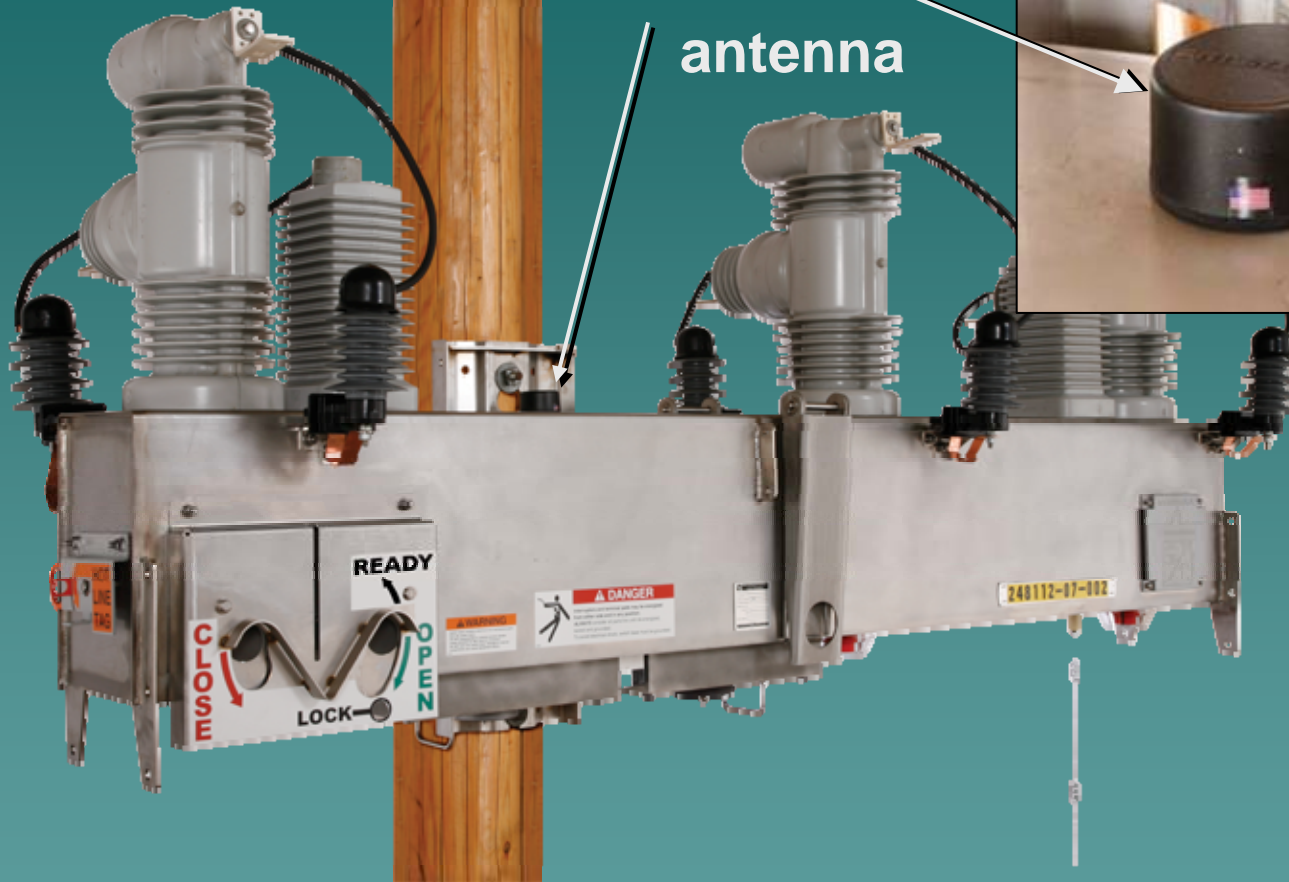


Hot line tag lever



Components

GPS
antenna



Details of the Offering

- ◆ Protection and control module
 - application, coil driver, and power supply boards
- ◆ No user-serviceable parts
- ◆ Hookstick removable
- ◆ ~ 21 pounds



Hot line tag indicator

Status indicator



Details of the Offering

- ◆ Communication module
 - WiFi board
 - GPS clock
 - provisions for radio
 - user-replaceable
12-Vdc 8-Ah battery
- ◆ Hookstick removable
- ◆ ~ 26 pounds



Simple Day-to-Day WiFi Connectivity

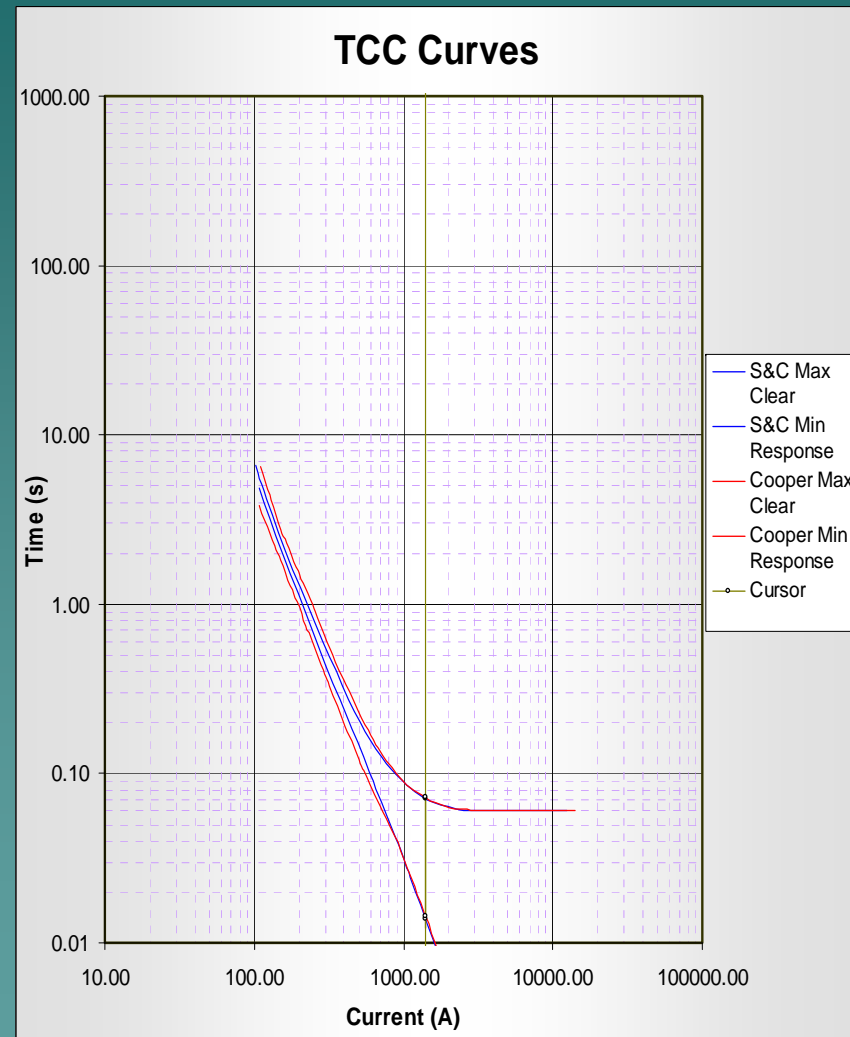
A screenshot of the IntelliRupter PulseCloser software interface. The window title is "S&C IntelliRupter® Remote Setup Software- IntelliRupter - [Operation-Main]". The interface is divided into several sections:

- Left Panel:** Contains the IntelliRupter PulseCloser logo, the date and time "15 Apr 2008 14:31:58", and a navigation menu with links for "Main", "Profiles/Commands", "IntelliTEAM II", "Setup", "Metering", "Diagnostics", and "Logs".
- Operation - Main:** The central area displays three circuit diagrams labeled 1, 2, and 3. Each diagram shows a vertical stack of components: a "Direc2" switch (0.1V) at the top, a "Direc1" switch (0.1V, 0A) in the middle, and a ground connection (1-grd, 2-grd, 3-grd) at the bottom. Below each diagram is a green "OPEN" button.
- Control Status:** Located on the right, it shows a "Control Status" indicator with a "OKAY" button and a "Disconnect" indicator with a "Not Installed" button.
- Control Panel:** A blue section at the bottom containing:
 - Large green "OPEN" and red "CLOSE" buttons.
 - "Active Profile:" set to "General Profile 1".
 - "Hot Line Tag" section with "On" and "Off" buttons.
 - "Remote Operation" section with "On" and "Off" buttons.
 - "User-Assignnable Commands" section with "Enable" and "Block" buttons for "Ground Trip", "Test on Backfeed", and "Circuit Testing".
 - "IntelliTEAM II Restoration" section with a "Profiles/Commands" button.
- Footer:** Shows "Connected to: IR" and "Location: Street Address".



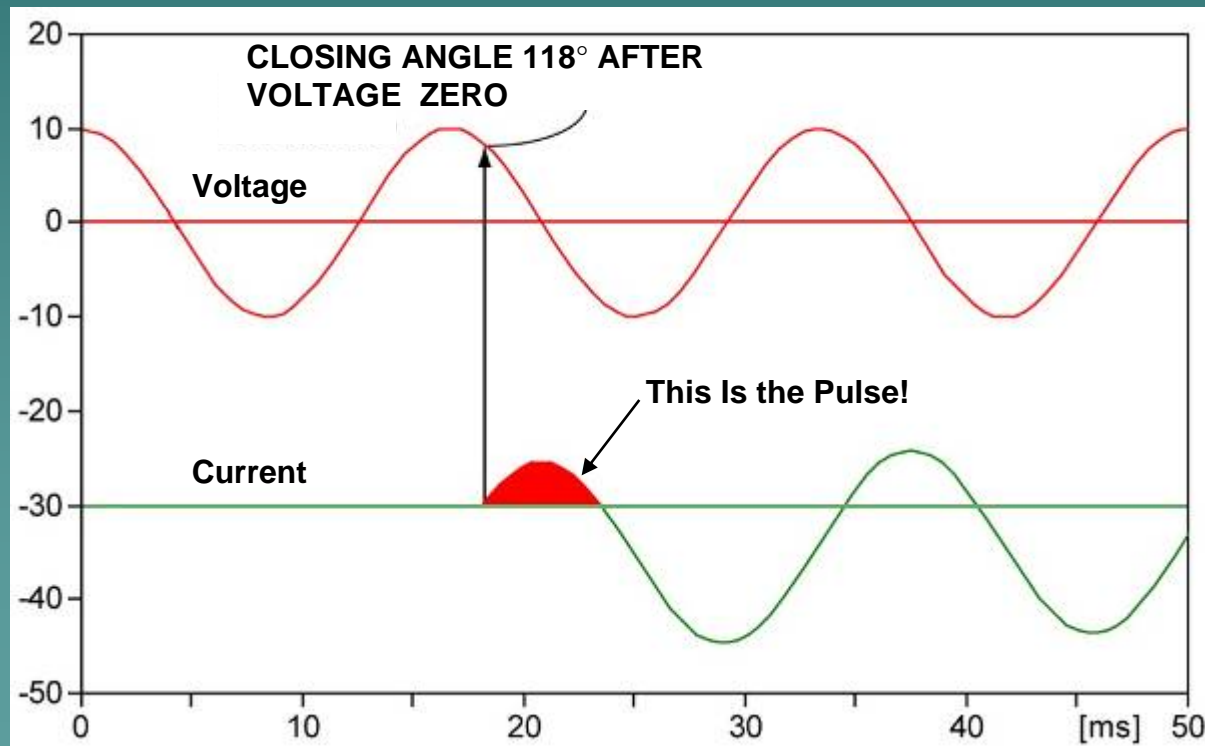
TCC Tolerances

- ◆ S&C vs. Cooper with full tolerances

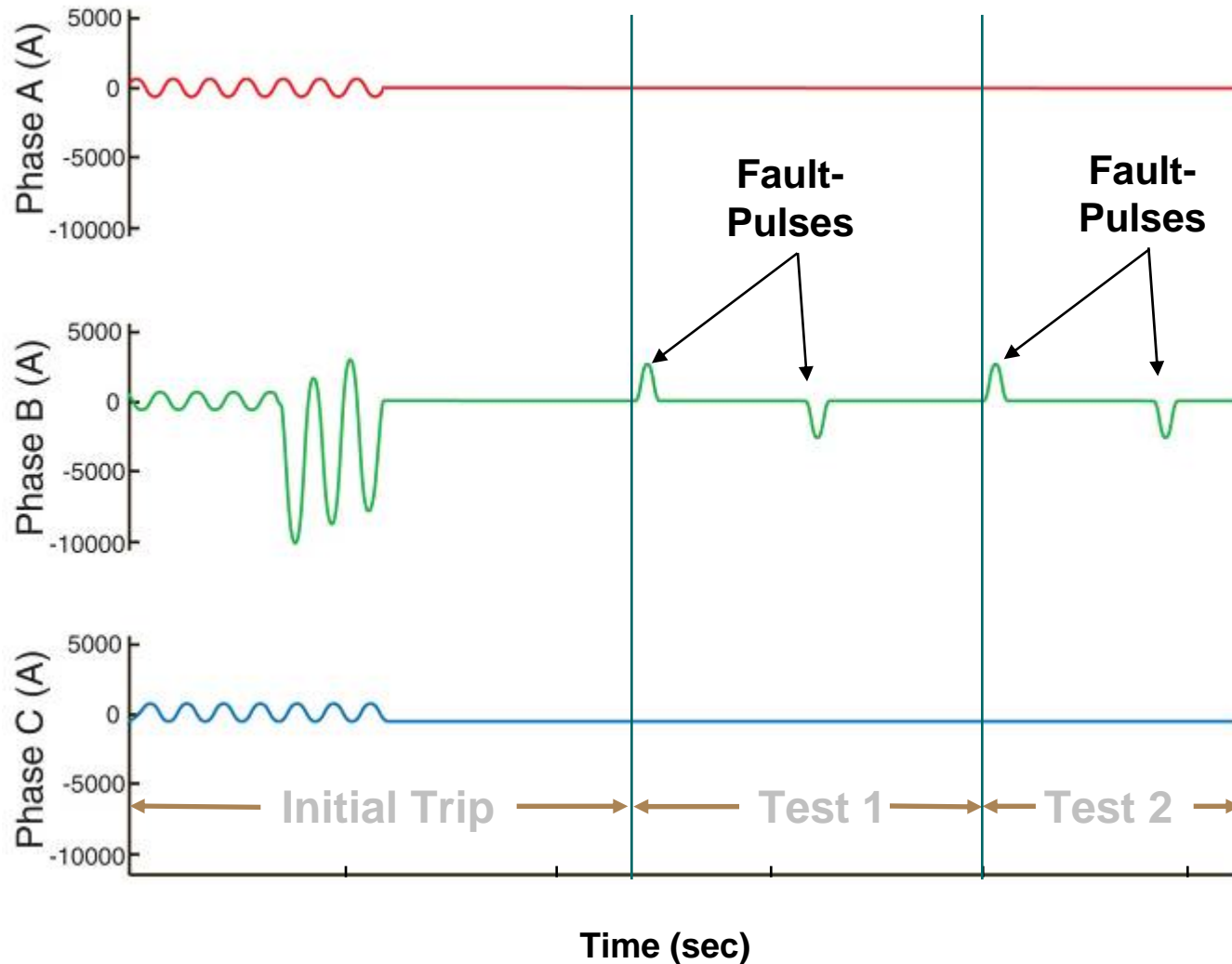


Point-on-Wave Closing

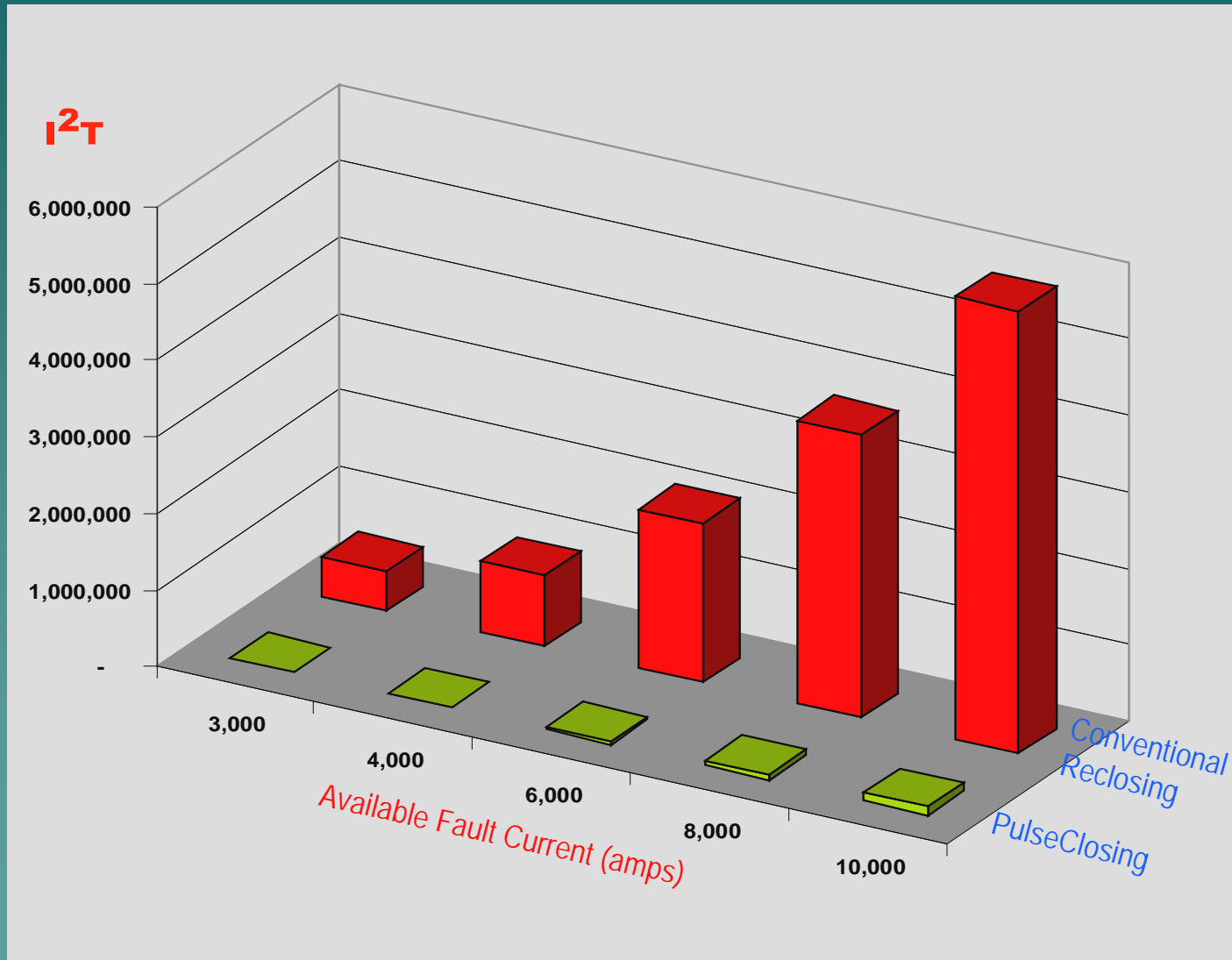
- ◆ If closing angle is 118° after a voltage zero, you get initial minor loop plus major loop of asym. fault current
- ◆ By opening before major loop, you get only minor loop



Pulseclosing B Phase Permanent Fault



Energy Let-Through



Pros and Cons

◆ Pros

- Pulse closing
- Recloser operation
 - ◆ Substation does not operate for fault beyond Intellirupter
- No control cables

◆ Cons

- Price is High
- Firmware revisions had to be made
- Requires bucket truck for maintenance



Intellirupter Switches Installed

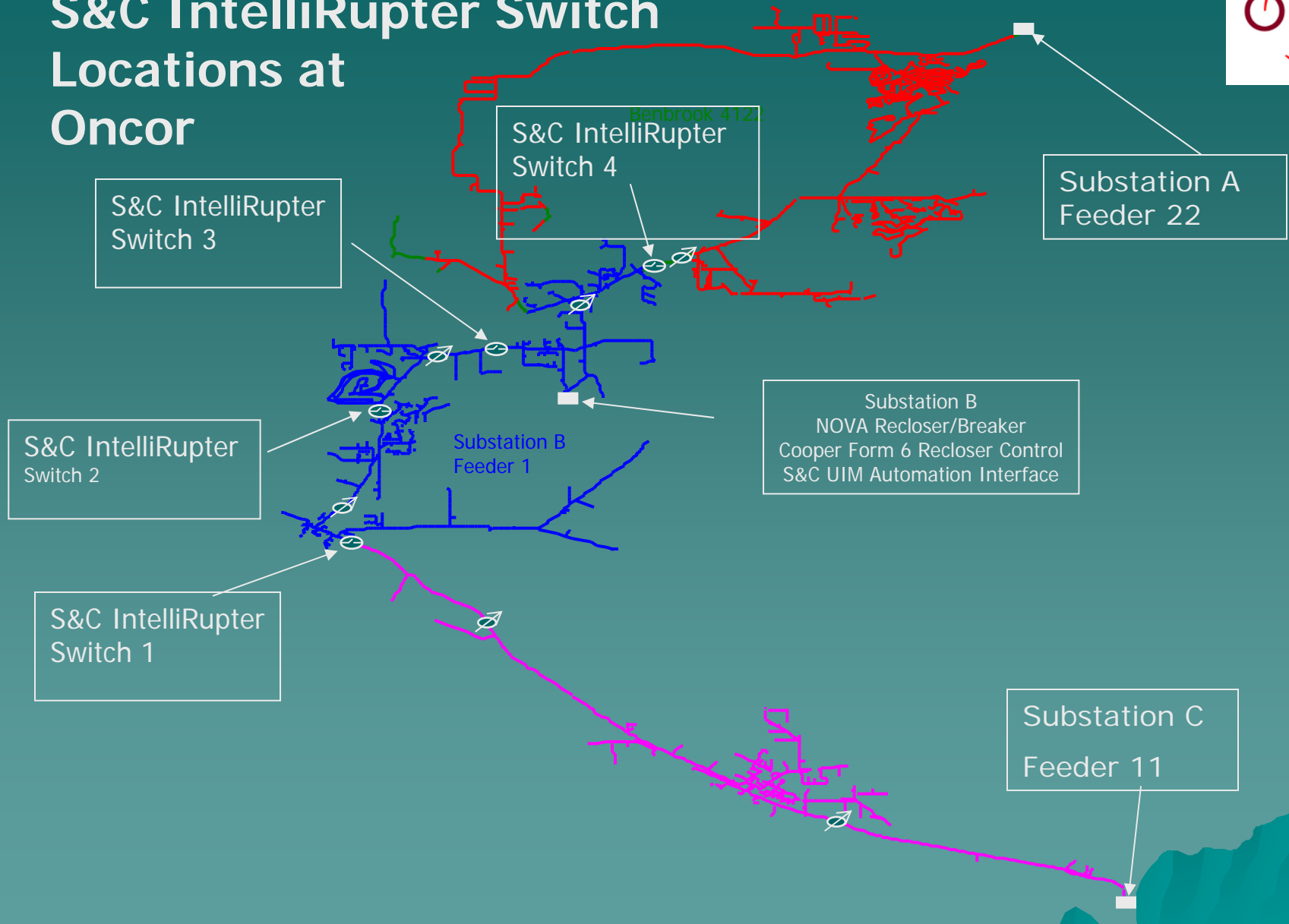


- ◆ Irving Area – 2
- ◆ Dallas Area - 1
- ◆ Ft. Worth Area – 24
- ◆ Killeen Area – 3
- ◆ Tyler Area – 26
- ◆ Round Rock (pending) - 4





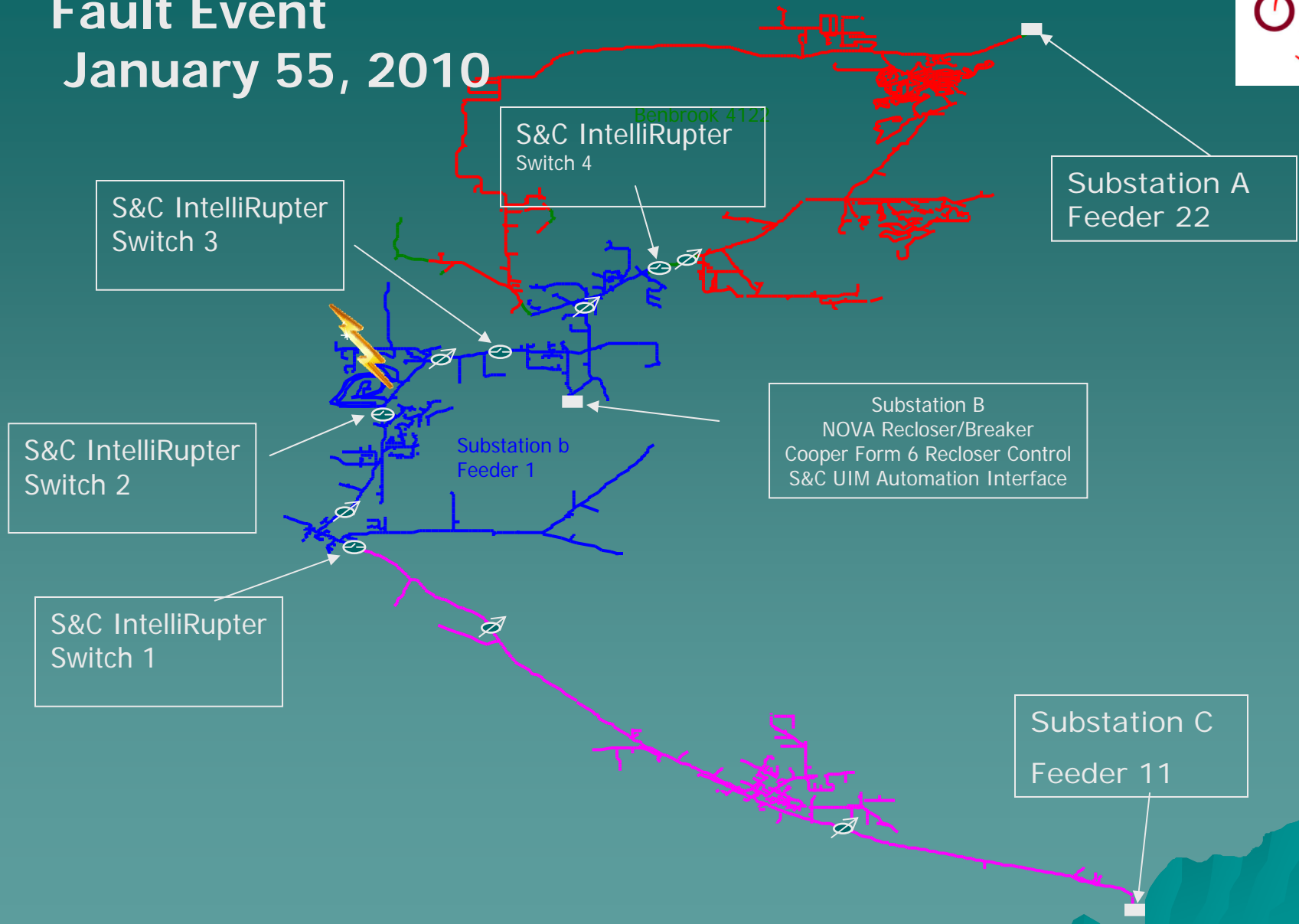
S&C IntelliRupter Switch Locations at Oncor



Note: All regulators are equipped with bi-directional controls.



Fault Event January 55, 2010

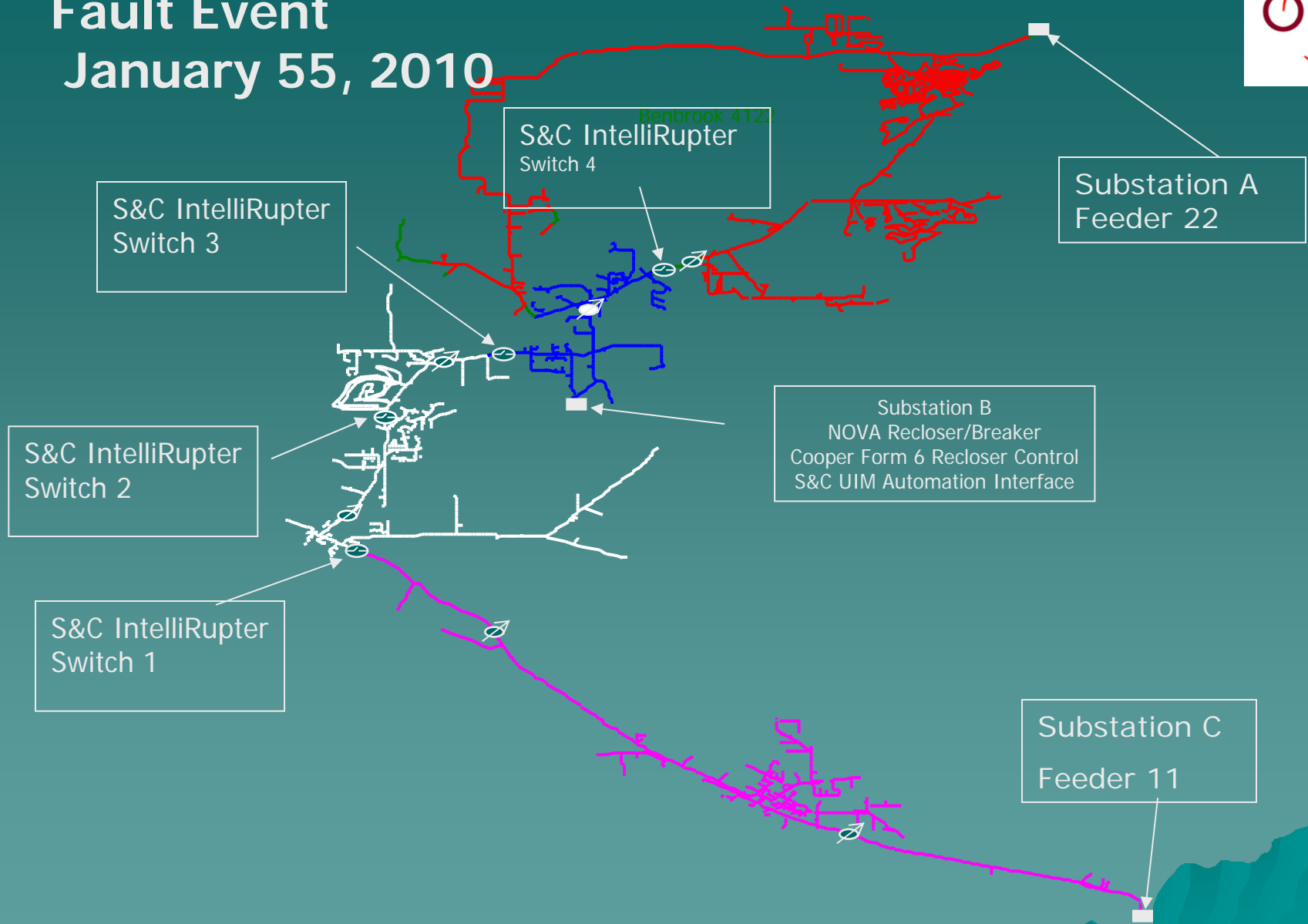


Note: All regulators are equipped with bi-directional controls.





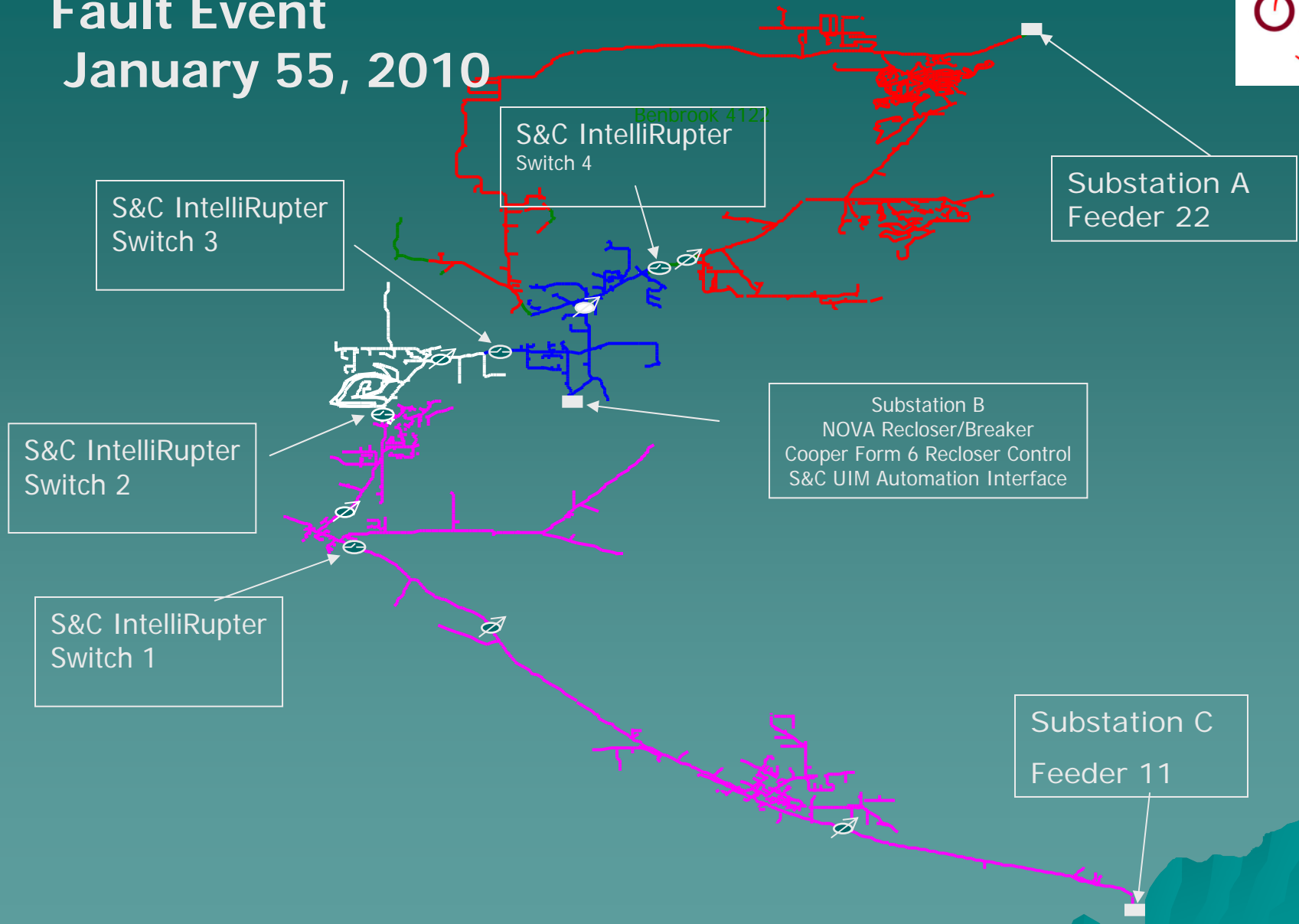
Fault Event January 55, 2010



Note: All regulators are equipped with bi-directional controls.



Fault Event January 55, 2010



Note: All regulators are equipped with bi-directional controls.



Communications

- ◆ Initially installed Utilinet Radios
 - Terrain is very hilly
 - Packets were lost
 - Time for packets to get to last switch too long
- ◆ Replaced with SpeedNet Radios
 - Communications was much faster no packets lost.



Problems with Speednet

- ◆ Radios would go to sleep
- ◆ Firmware upgrades
 - Problems still exist, but nearing final solution



Problems with IntelliRupters

- ◆ Pole closing issue
- ◆ Bad connection of Antenna
- ◆ Firmware problems



Questions?

