San Diego Gas & Electric
New Transmission Technology Applications

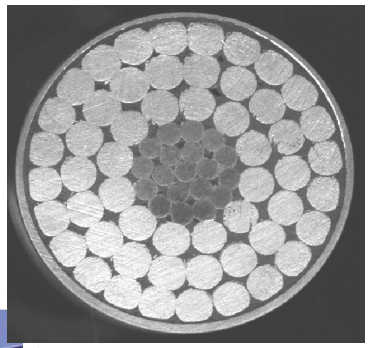
CPUC New Technologies Workshop

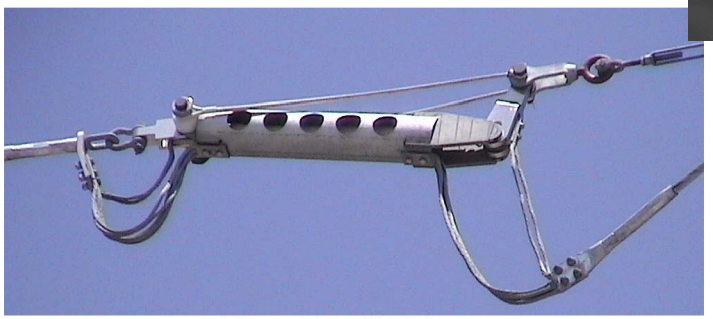
October 7, 2005

Dave Harr, SDG&E

Presentation Outline

- ACCR Conductor
- SLIM Device
- Real Time Line Ratings
  - CAT
  - Video Sagometer
- Future Projects & Interests
- Question & Answer





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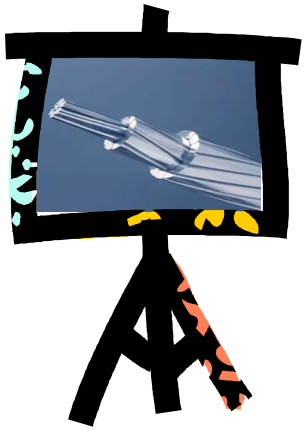
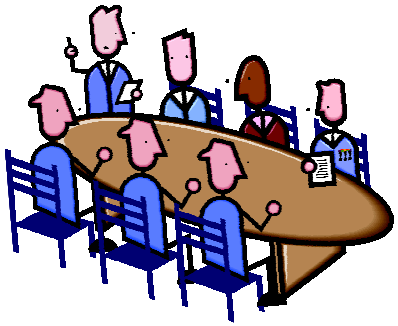
ACCR Conductor Installation

- Project Background
  - SDG&E selected for HTLS conductor field trial in early 2005
  - 3M ACCR conductor selected for trial
  - CEC funded purchase of materials
  - SDG&E identified existing 69kV transmission line for test site based on selection criteria
  - SDG&E Line Crews completed installation July 18-19, 2005
  - EPRI and 3M provided technical support





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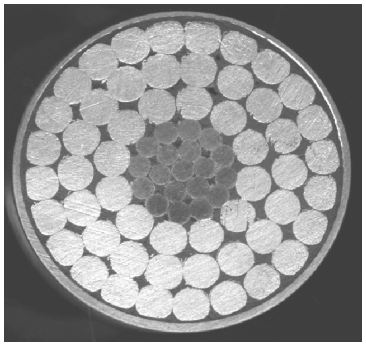
ACCR Conductor

- Core Member
  - Multi-wire stranded high strength conductive core
  - 3M metal matrix composite wires
  - Wires provide nearly 8x the strength and 3x the stiffness of aluminum
- Outer Strands
  - Aluminum-Zirconium alloy similar to 1350-H19 aluminum except that it resists annealing
  - Round or trapezoidal strands
- Conductor can be operated at high temperatures
  - 210°C continuous
  - 240°C emergency



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ACCR Conductor Installation

- Located in Oceanside (approx. 5 miles from Pacific Ocean)
- 69kV circuit (TL 694)
- Installed (3) spans of 795 kcmil ACCR/AW "Drake"
- Total length approx. 910' (R.S. = 307')
- Conductor Tension
  - Stringing – Approx. 1800 lbs.
  - Design – 4000 lbs. @ G.O. 95 Light "Initial"

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ACCR Conductor Installation

Specific 3M recommendations for ACCR Conductor:

- Minimum 28" dia stringing blocks (sheaves)
- Minimum 36" dia bull wheel
- Minimum 40" dia drum puller
- Use DG-Grips for tensioning conductor instead of rigid grips, such as Chicago Grips
- 100 ton press for dead end crimping

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ACCR Hardware – Preformed Line Products (PLP)

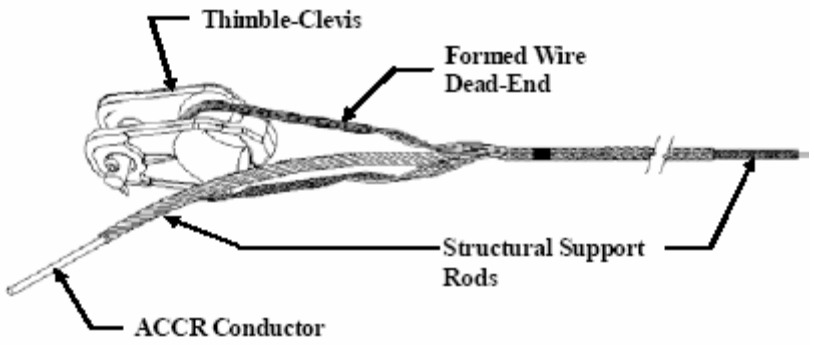
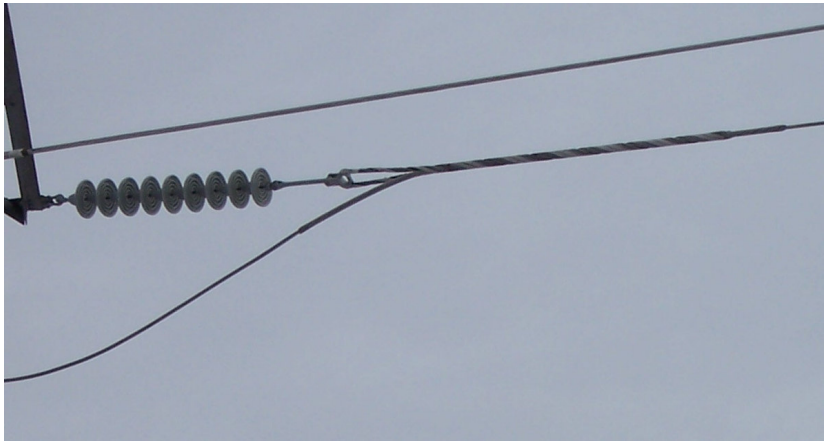
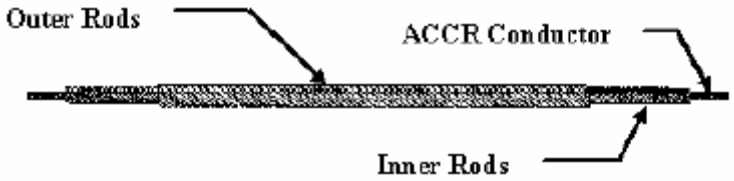


Figure 12: Helical-rod dead-end assembly





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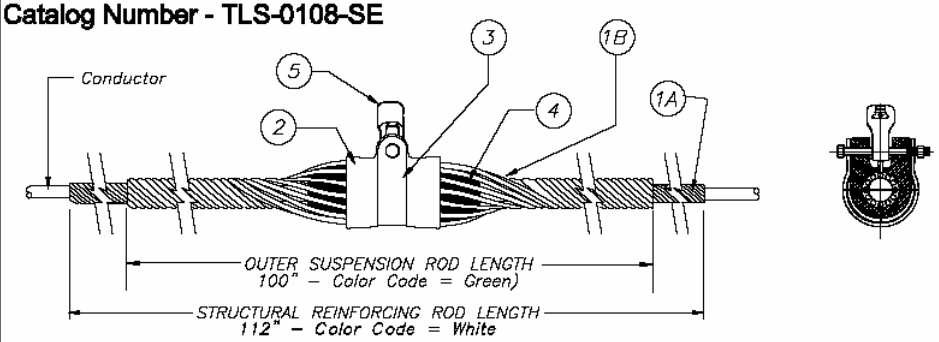
ACCR Hardware – Preformed Line Products (PLP)

THERMOLIGN® Suspension Assembly
Catalog Number - TLS-0108-SE



CONDUCTOR INFORMATION
ACSS or ACCR ROUND WIRE
DIAMETER RANGE 1.080" – 1.112"

Item	Req'd	Description	Cat. No.	Part No.
5	1	SOCKET EYE (25K)	SE–5155	00065105
TLS–0108–SE – Suspension Assembly Components				
4	2	SUSPENSION INSERT–ELASTOMER		
3	1	SUSPENSION STRAP		
2	2	HOUSING HALF		
1B	1	OUTER SUSPENSION ROD LAYER		
1A	1	STRUCTUAL REINFORCING LAYER		

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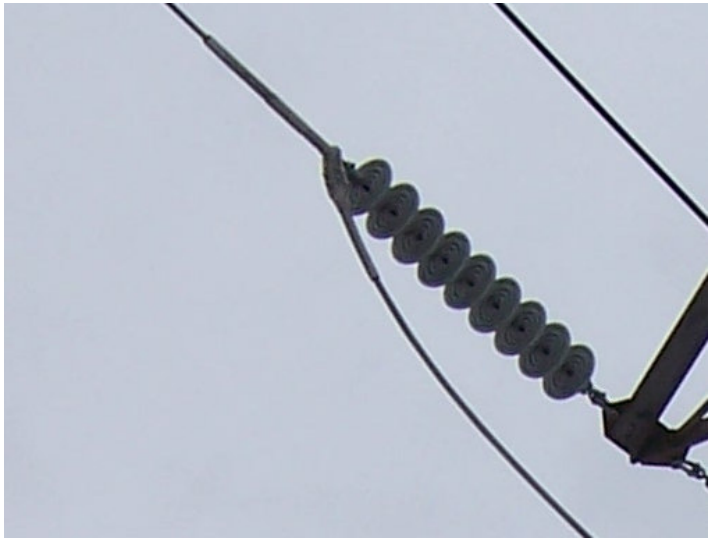
ACCR Hardware - Alcoa



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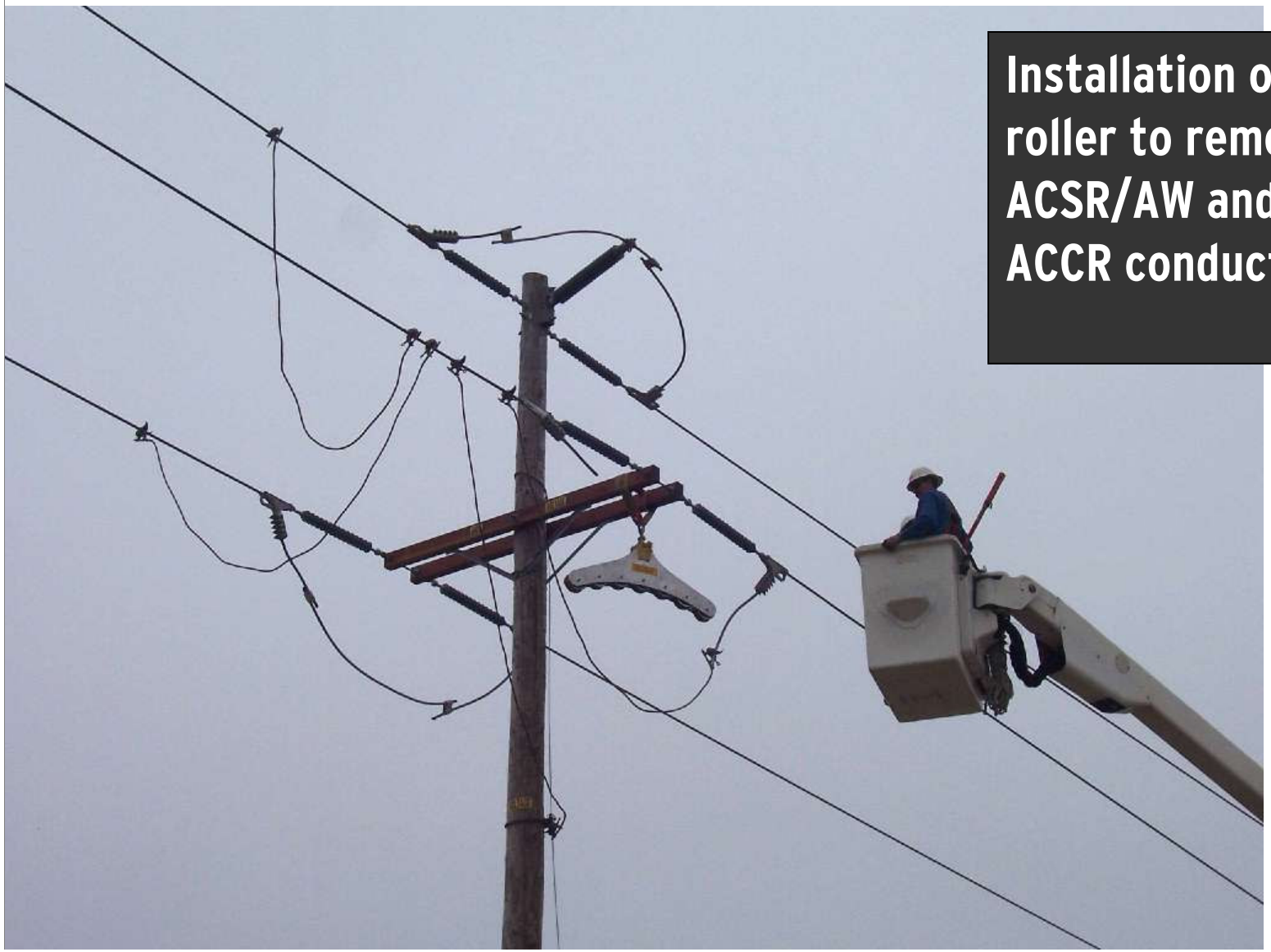
Removal of Existing Conductor



Installation of compound roller to remove old 636 ACSR/AW and install 795 ACCR conductor

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ACCR Compression Splice

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ACCR PLP Helical Rod Splice

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PLP Deadends

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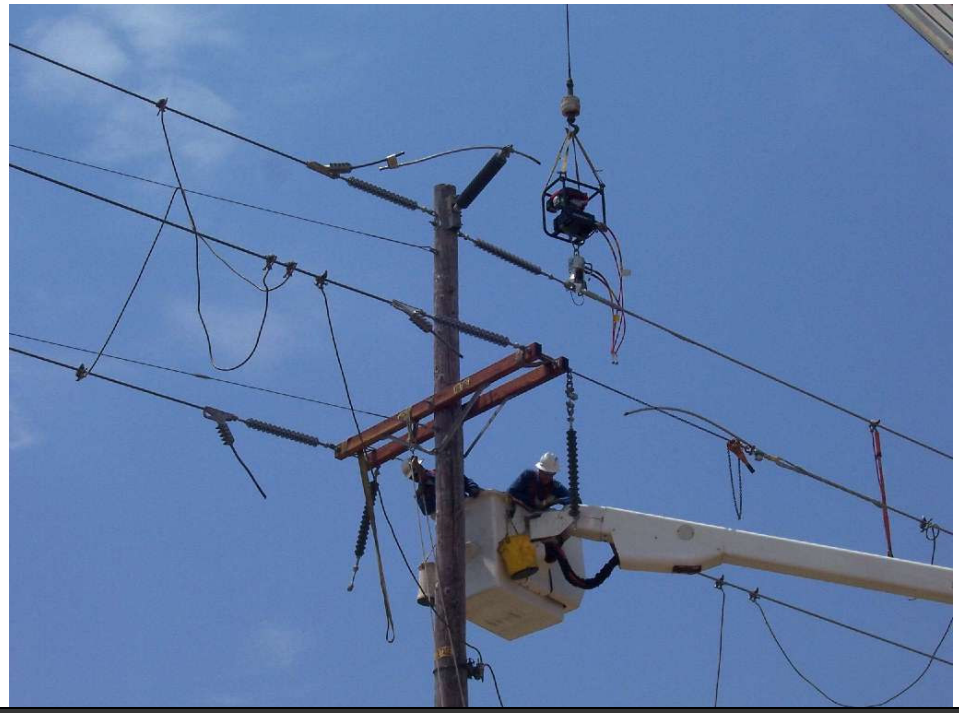
Compression Deadends



A Manitex is used to lift the 100-ton press and generator into place for the compression deadend installation

Courtesy of EPRI Solutions

Monitoring Equipment

Solar power supply, wind stations, rain gauge, wireless antenna, and sagometer are installed on the same pole.

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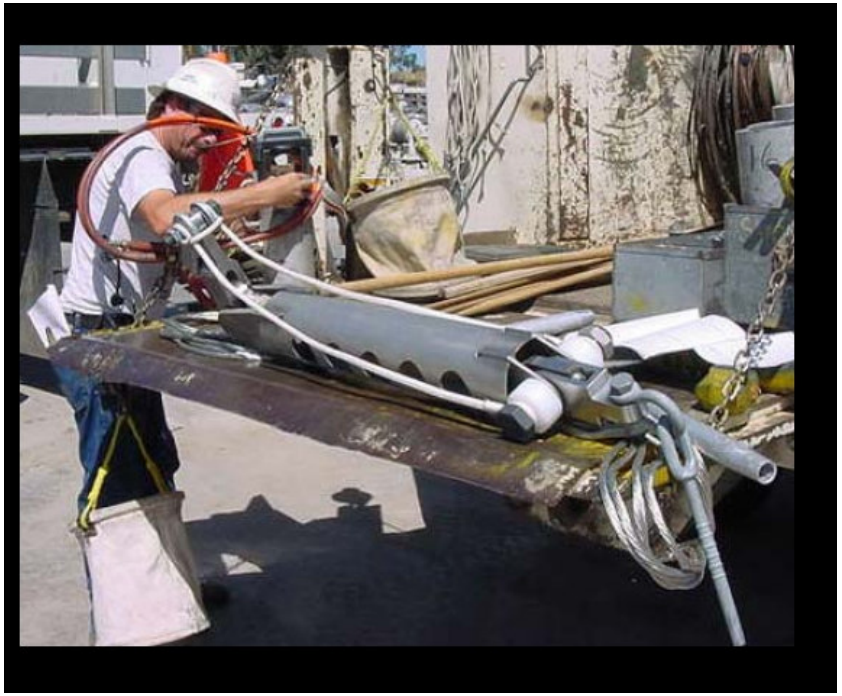
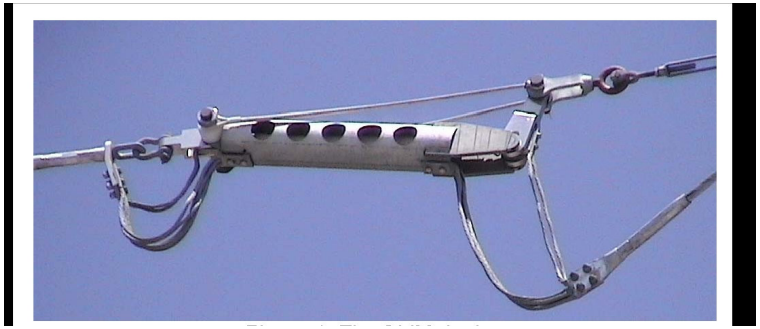
SLiM Device

- Sagging Line Mitigator
- SDG&E Installation part of EPRI Study
- CEC Funding for Project





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SLiM Device

- Existing 69kV Line (TL 696)
- Device Installed in May 2004
- Installed with Line Outage
- Monitoring Equipment Installed in June 2004

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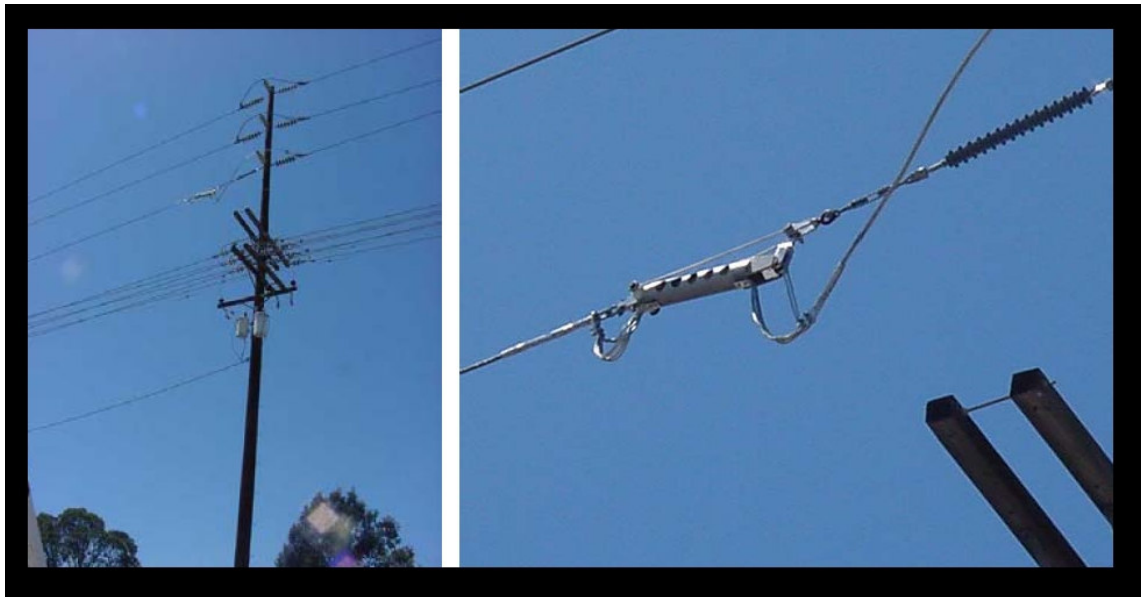
SLiM Device Results

- Reduced sag up to 21" @130°F
- Line Loading did not reach Design Limit of SLiM (30" Sag Reduction)



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Real Time Line Rating Devices

- CAT-1 Devices
  - Installed on (4)-230kV Transmission Lines
  - Utilized EPRI DTCR Software
  - Performed as Expected
  - Limited Results due to Low Current

- Video Sagometers
  - Installed on 69kV for ACCR
  - Planned installation on 230kV Line

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Future Projects and Interests

- High Temperature Low Sag Conductors
- Real Time Line Rating Equipment
- Fiber Reinforced Composite (FRC) Poles
- Smart Substation Controls
- Fuel Cells for Substation Batteries
- Gas Insulated Substations
- Optical Current and Potential Transformers

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Question & Answer

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