



ASPEN LEAFLET

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Price Increase on February 1, 2016

We plan to increase our prices by 3% on February 1, 2016. You can renew your maintenance - up to 3 years - at the existing price by sending us a purchase order before that date.

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OneLiner and DistriView Classes

Classes for *OneLiner* and *DistriView* will be held in March-April, 2016. Both classes will be in Burlingame, California, a city near the San Francisco airport.

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Applications of ASPEN Tools for PRC Compliance

North American Electric Reliability Corp. (NERC) started issuing recommendations after the Northeast blackout of 2003, when the causes of the blackout became known. These recommendations soon turned into standards with names that begin with the letters "PRC". Currently there are a number of PRC standards that directly govern how protective relays are set and maintained. The following is a description of ASPEN tools designed for complying with these standards.

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PRC-005 - Protective System Maintenance Program

This standard requires the utilities to have an ongoing program to keep the protection systems in good working order. Among other things, this regulation requires the relays and associated equipment (communication system, battery backup, trip coils, etc.) to be tested and calibrated from time to time. In the ASPEN Relay Database C/S, we have implemented an "Activity" feature (in version 10, available since 2012) to help users schedule and keep records of the tasks required under this standard.

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New Users Since Fall, 2013

OneLiner™

- Alaska Electric and Energy Coop, Kenai, AK
- AMEC Foster Wheeler E&C Services, Minneapolis, MN
- Applied High Voltage, LLC, Frederick, MD
- Artech Smart Grid USA, Rochester, NY
- Barbados Light & Power Co., St. Michaels, Barbados
- BHMGE Engineers, Inc., Arnold, MO
- Bryan Texas Utilities, Bryan, TX
- CEPALCO, Pasig City, The Philippines
- City of Farmington, New Mexico
- City of Naperville, Illinois
- Continuum Associates, LLC, Jersey City, NJ
- COPEL, Curitiba, Parana, Brazil
- Derik Johnson PE, Mandan, ND
- DGR Engineering, Rock Rapids, IA
- E.C. Fennell P.A., W. Palm Beach, FL
- EC Source Services, LLC, Houston, TX
- Electric Power Systems, Inc., Anchorage, AK
- Emerson Network Power, Auburn, WA
- Empire District Electric Co., Joplin, MO
- EMS- PE Elektromreza Srbije, Beograd, Serbia

PRC-023 - Transmission Line Loadability

Features for PRC-023 compliance were implemented in OneLiner v10, in 2005. Figure 1 shows the load region as a shaded cone in the distance-relays window. The relay passes the test if this cone does not intersect the relay characteristics. In the overcurrent-relay window, the loadability limit is shown graphically with an annotation with a callout (Figure 2). The relay passes the test if the relay's pickup lies to the right of the callout's vertical bar. In OneLiner v10, we also added a Check | Relay Loadability command to verify the compliance of all the phase distance relays and phase overcurrent relays system wide. A utility can use both the graphical displays and the reports from the check command as evidence of compliance.

In version 14, OneLiner will have the ability to check the loadability of transformers, as required by PRC-023-3.

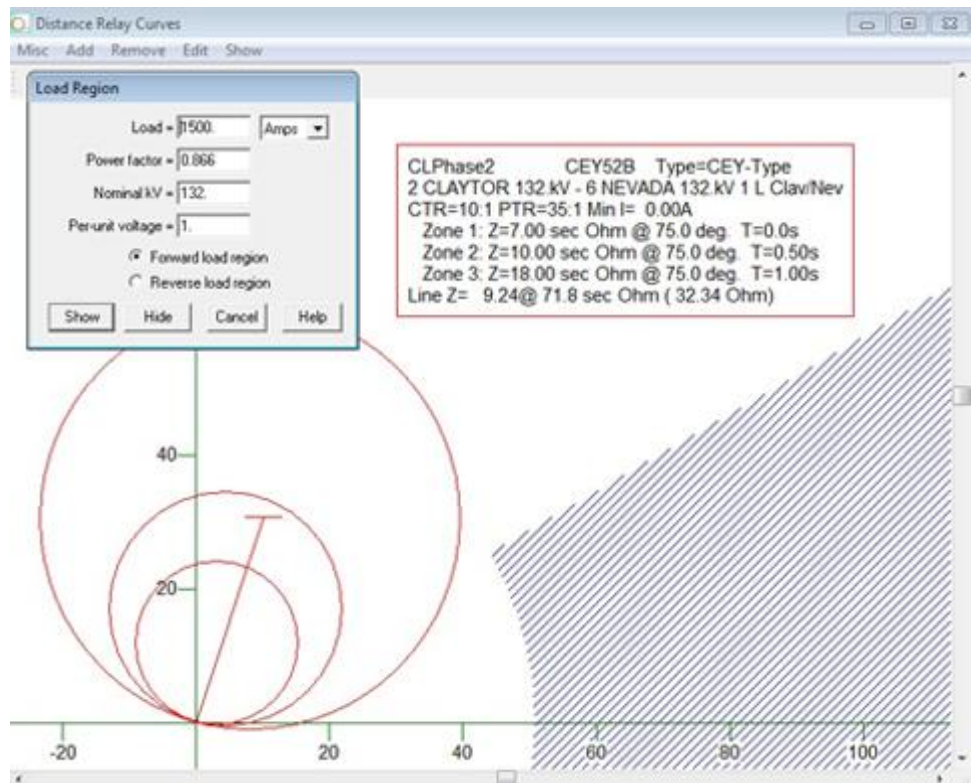


Fig. 1: Distance relay characteristics with a load region.

- Energy Initiatives Group, LLC., Marloborough, MA
- ESC Engineering, Inc., Fort Collins, CO
- Finley Engineering Company, Inc., Lamar, MO
- Freeport McMoRan Chino Mines, Vanadium, NM
- Garcia Consultoria & Engenharia Ltda., Florianopolis, Brazil
- Gas Natural Fenosa, Miguel Hidalgo, Mexico
- Ghana Grid Company Limited, Tema, Ghana
- Gilberto Abdo Rocha, Belo Horizonte, MG, Brazil
- Hetch Hetchy Water & Power, Moccasin, CA
- HV Engineering, LLC, Houston, TX
- Iberdrola Central Dulces Nombres, Pesqueria, N.L. CP, Mexico
- Innovative Energy Alliance, LLC, New England, ND
- JBT Electric, LLC, Hockley, TX
- JL Utilities Consulting Engineers, Altamonte Springs, FL
- JYG Ingenieria, Leon, Guanajuato, Mexico
- Kleinfelder, Inc., Denver, CO
- Leidos Engineering, LLC, Hendersonville, TN
- Liberty Utilities, Tahoe Vista, CA
- Long Island Electric Utility Servco, LLC, Garden City, NY
- MESA Associates, Inc., Knoxville, TN

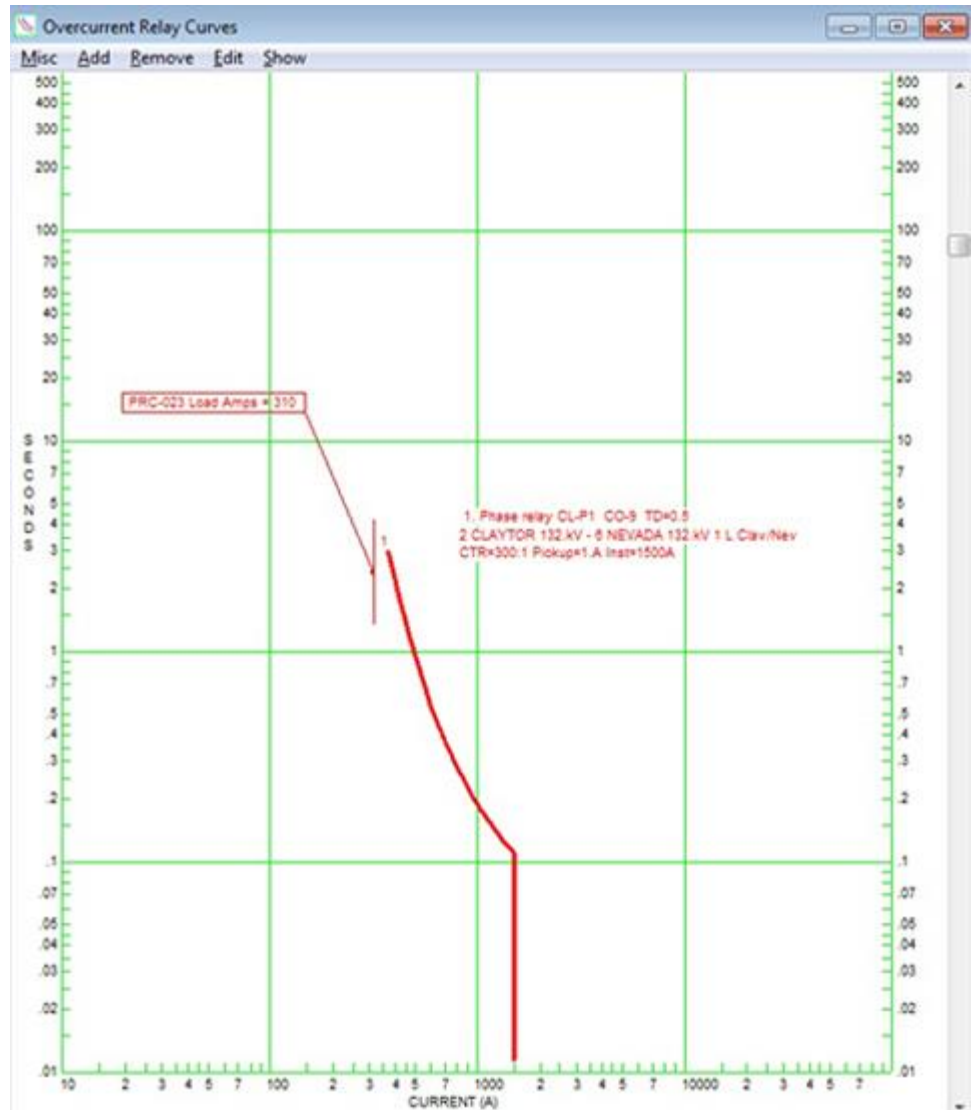


Fig. 2: Overcurrent relay curve with an annotation.

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PRC-025 - Generator Loadability

In the events leading to the 2003 blackout, a number of the generators tripped when the voltage in the transmission network dropped to 0.85 per-unit. A detailed analysis revealed that, prior to the trip, the generators were generating near their MW limit, while supplying VARs as high as 1.5 times the numerical value of the rated MW because of a controlled response call "field-forcing." This condition apparently confused some phase relays to conclude that the generators were feeding into a fault. PRC-025 provides guidelines for setting relays at and near generators to prevent a recurrence.

- Mesquite Solar 1, LLC, Tonopah, AZ
- metaGRA engineering ltd., Delta, BC, Canada
- Nalcor Energy, St. John's NL, Canada
- Oman Electricity Transmission Co., Muscat, Oman
- Orcas Power & Light Cooperative, Eastsound, WA
- Palmer Engineering & Forensics, North Salt Lake, UT
- Power Grid Engineering, LLC, Birmingham, AL
- Power Systems Consultants, Inc., Westborough, MA
- Pterra, LLC, Albany, NY
- RealTime Utility Engineers, Inc., Marlborough, MA
- Sega, Inc., Overland Park, KS
- Sentry Technical Service, Inc., Calgary, AB, Canada
- Soudi Consultants, San Ramon, CA
- Tri Sage Consulting, Reno, NV
- Utilicast, LLC, Carmel, IN
- Wind Energy Transmission Texas, Austin, TX
- ZGlobal, Inc., Folsom, CA

OneLiner v14 (to be release near the end of 2015) has tools to comply with PRC-025-1 for distance and overcurrent relays:

- At the generator side of a step-up transformer (GSU) that connects the generating unit(s) to the network.
- At the plant side of a GSU that connects a wind or solar plant to the network.
- On a line that is used exclusively to connect the GSU to the network.

For a distance relay, the PRC-025 limit is shown as a slanted dotted line (Figure 3). The relay complies if its characteristics do not intersect the dotted line. For an overcurrent phase relay, the limit is shown using an annotation similar to that of Figure 2. Checking logic is also available to overcurrent relays that are voltage-restrained or -controlled. In all cases, the calculations, including all the intermediate steps, are shown in text in the TTY Window.

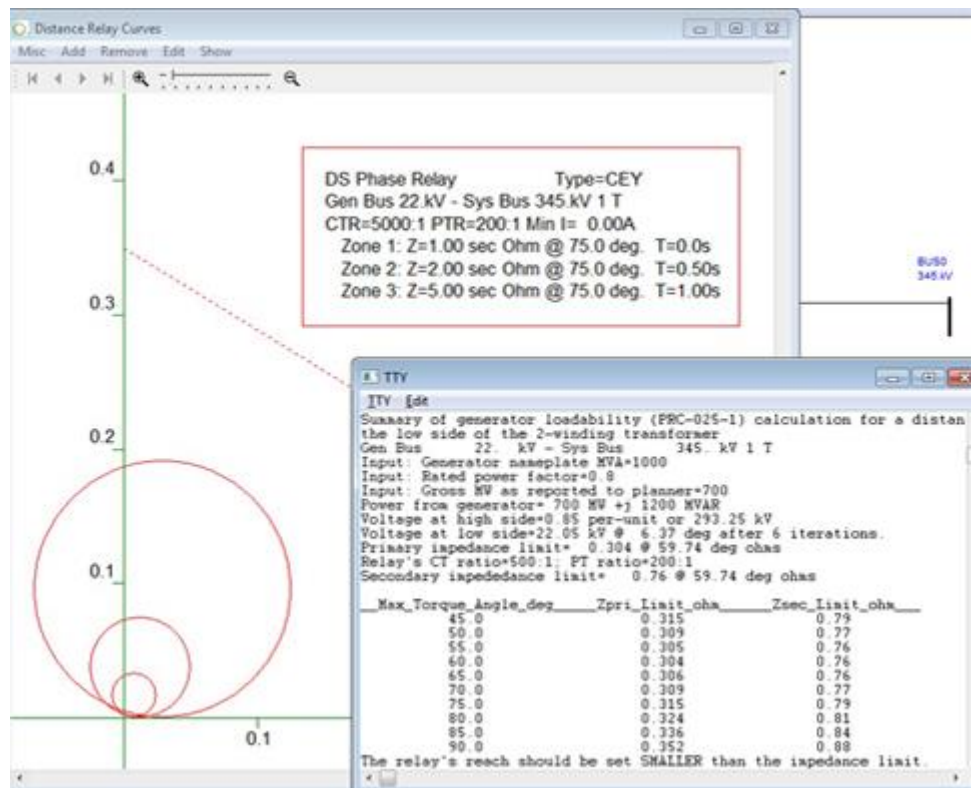


Fig. 3: Distance relay characteristics with a generator loadability limit.

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ASPEN Power Flow™

- A2V Partners, LLC, Springfield, MO

- CEPALCO, Pasig City, The Philippines
- City Water and Light, Jonesboro, Jonesboro, AR
- DGR Engineering, Rock Rapids, IA
- E.C. Fennell P.A., W. Palm Beach, FL
- El Paso Electric Co., El Paso, TX
- Electric Power Systems, Inc., Maryland Heights, MO
- EMS- PE Elektromreza Srbije, Beograd, Serbia
- Ghana Grid Company Limited, Tema, Ghana
- Innovative Energy Alliance, LLC, New England, ND
- Laramore, Douglass & Popham, Inc., Chesterfield, MO
- Orcas Power & Light Cooperative, Eastsound, WA
- PG and E, San Francisco, CA
- Pike Enterprises, Inc., Mount Airy, NC
- Toth & Associates, Inc., Springfield, MO

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ASPEN Distview™

- ALDACOR Engineering, Inc., Idaho Falls, ID
- City of Lompoc, CA
- ControlPoint Technologies, Rockland, MA
- EMS- PE Elektromreza Srbije, Beograd, Serbia
- Hestco Engineering LLC, Baton Rouge, LA

PRC-026 - Relay Performance during Stable Power Swings

This standard seeks to improve reliability by preventing relays from tripping unnecessarily due to stable power swings.

For a distance phase relay, the calculation for the unstable power-swing region is quite involved. Among other things, the entire network has to be reduced to a 2-bus equivalent that comprises of the end buses of the relay branch in question. Then the region is formed as the intersection of a lower loss-of-synchronism circle, an upper loss-of-synchronism circle, and a lens that connects the end points of the total system impedance. The end result is a pair of wing-shaped curves, shown dotted in Figure 4. A relay complies with PRC-026 must have its characteristics lie within the area embraced by these two dotted curves. The calculations and the coordinates of the dotted curves are documented in text in the TTY Window. For an overcurrent phase relay, the limit is shown using an annotation similar to that of Figure 2.

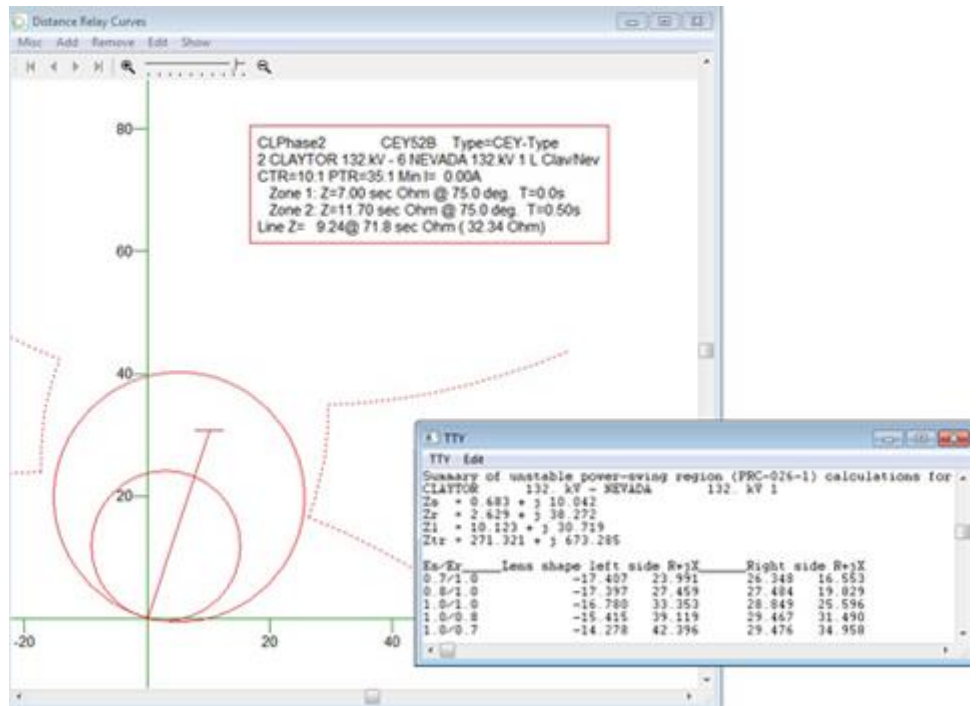


Fig. 4: Relay characteristics and the unstable power swing region.

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PRC-027 - Coordination for Performance during Fault

The stated purpose of this standard is "to maintain the coordination of Protection Systems installed for the purpose of detecting faults on Bulk-Electric-System Element and isolate those faults, such that the Protection Systems operate in the intended sequence during fault."

- Idaho Falls Power, Idaho Falls, ID
- Leidos Engineering, LLC, Hendersonville, TN
- PwrSolutions, Inc., Dallas, TX
- Quanta Technology, Raleigh, NC
- RRC Power & Energy, LLC, Tualatin, OR
- Sistemas Y Servicios En Control Electric, Apodaca Nuevo Leon, Mexico
- Soudi Consultants, San Ramon, CA
- TRC Solutions, Augusta, ME

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ASPEN Relay Database™

- ACEPALCO, Pasig City, The Philippines
- COPEL, Curitiba, Parana, Brazil
- Empire District Electric Co., Joplin, MO
- Gas Natural Fenosa, Miguel Hidalgo, Mexico
- Long Island Electric Utility Servco, LLC, Garden City, NY
- Orcas Power & Light Cooperative, Eastsound, WA

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We will provide two different tools in OneLiner v14 to assist users to comply with this standard.

First, in OneLiner v14, there will be an updated Fault All Buses command to help users identify buses where the 3-phase or single-line-to-ground fault current has changed 15% or more since the last established baseline. It works as follows. The user first runs the Bus Fault Summary command as usual for the entire system or for a selected list of buses. The text output of this command serves as the baseline. At a later time (no more than 6 years, according to the standard), the user can run the same Bus Fault Summary command, but this time with a new option to fault "buses in an existing bus fault summary report". The output will show the fault currents for the same buses as the baseline. In addition, it will list all the buses whose fault currents have change 15% or more.

Second, the standard requires the user to perform a protection system coordination study at these buses. OneLiner already has a number of tools for coordination checks, including the Check | OC Minimum Pick, Check | OC Instantaneous Setting, and Check | Primary/Backup Coordination. We intend to add a new checking command to OneLiner v14 (available in a maintenance release in the first half of 2016) that utilizes stepped-event simulations as the basis for checking relay coordination.

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ASPEN Relay Database C/S™

- EMS- PE Elektromreza
Srbije, Beograd, Serbia
- Freeport McMoRan
Chino Mines,
Vanadium, NM
- Otter Tail Power,
Fergus Falls, MN
- US Bureau of
Reclamation,
Sacramento, CA
- Western Farmers
Electric Coop.,
Anadarko, OK

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ASPEN Line Database™

- Grand River Dam
Authority, Tulsa, OK
- NEI Electric Power
Engineering, Inc.,
Wheat Ridge, CO
- Valley Electric
Association, Inc.,
Pahrump, NV

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ASPEN Line Database Enterprise™

- AECl, Springfield, MO
- Colorado Springs
Utilities, Colorado
Springs, CO
- Empire District Electric
Co., Joplin, MO
- EMS- PE Elektromreza
Srbije, Beograd, Serbia
- Entergy Corp., New
Orleans, LA

- Long Island Electric Utility Servco, LLC, Garden City, NY
- WAPA, Lakewood, CO

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