

NERC Compliance & PWS

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NERC Compliance Issues

- Compliance isn't new...
 - but the fines are!
 - up to \$1 million a day
- Are you compliant?
 - can you PROVE it?
- If it isn't written down it never happened!
 - the “Gold Standard” for compliance efforts

An Aside about Compliance

- Submarine Safety (SUBSAFE)
 - Created after the USS Thresher (SSN-593) was lost
 - She represented the leading edge of US Submarine technology
 - Lost 10 April 1963
 - 117 crew & 17 civilians died
- Investigation focus areas
 - Documentation, processes, design, etc
 - No compliance program was in place at the time!



Investigation Results

- Deficient **Specifications**
- Deficient **Shipbuilding and Maintenance Practices**
- Incomplete or Non-Existent **Records**
 - **Work Accomplished**
 - **Critical Materials**
 - **Critical Processes**
- Deficient **Operational Procedures**

SUBSAFE Program Success

1915 – 1963

16 submarines lost to non-combat causes

1915: USS F-4 (SS-23)
1917: USS F-4 (SS-20)
1920: USS H-1 (SS-28)
USS S-5 (SS-110)
1923: USS O-5 (SS-66)
1926: USS S-51 (SS-162)
1927: USS S-4 (SS-109)
1939: USS SQUALUS (SS-192)
1941: USS O-9 (SS-70)
1942: USS S-26 (SS-131)
USS R-19 (SS-96)
1943: USS R-12 (SS-89)
1944: USS S-28 (SS-133)
1949: USS COCHINO (SS-345)
1958: USS STICKLEBACK (SS-415)
1963: **USS THRESHER** (SSN-593)

SUBSAFE Program inception
after THRESHER was lost

1963 - Present

1 submarine lost to non-combat causes

1968: **USS SCORPION** (SSN-598)

- SCORPION was **not** SUBSAFE certified
- Loss would not have been prevented by the SUBSAFE Program
- Lost due to weapon malfunction

**NO SUBSAFE-CERTIFIED SUBMARINE
HAS EVER BEEN LOST**

Objective Quality Evidence (OQE)

- Compliance is strictly based on OQE
 - OQE is any *statement of fact* pertaining to the quality of a product or service based on observations, measurements, or tests *which can be verified*.
 - either quantitative or qualitative
 - OQE is defined from technical requirements
 - Based on the integrity & responsibility of individuals
 - OQE provides verifiable evidence that deliberate steps were taken to comply with requirements

TPL-003 & PowerWorld

- System Performance Following Loss of Two or More Bulk Electric System Elements
 - Not just common mode outages
 - In the past only double circuits were examined
 - “Be supported by a current or past study...”
 - “[provide] rationale for contingencies selected for evaluation...”
 - Studies need to be conducted annually
- OUCH!

Avista

■ Recent audit

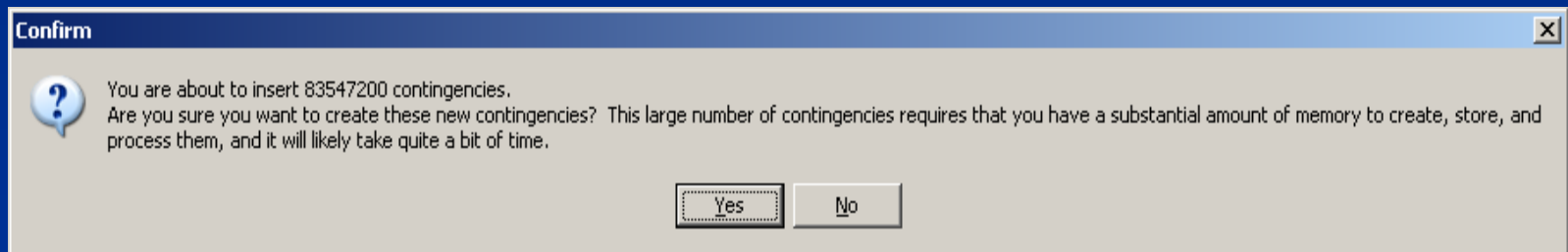
- “Dinged” on TPL-003
- Past experience deemed to be “not good enough”
 - Auditors wanted to see study plans and study reports
 - In other words, **DOCUMENTATION**
 - They were looking for N-1-1 studies
 - This included non Avista transmission outages (i.e. BPA)

■ The solution?

- PowerWorld contingency and sensitivity tools
 - Mitigation plan...

Get Smart—Document!

- Review all possible WECC N-2 contingencies?
 - How?
 - Contingency Analysis tool
 - Using 07HS2a WECC operating case
 - 15,032 buses
 - 17,434 lines
 - Auto insert N-2 (lines only...)



- NO WAY!

Document!

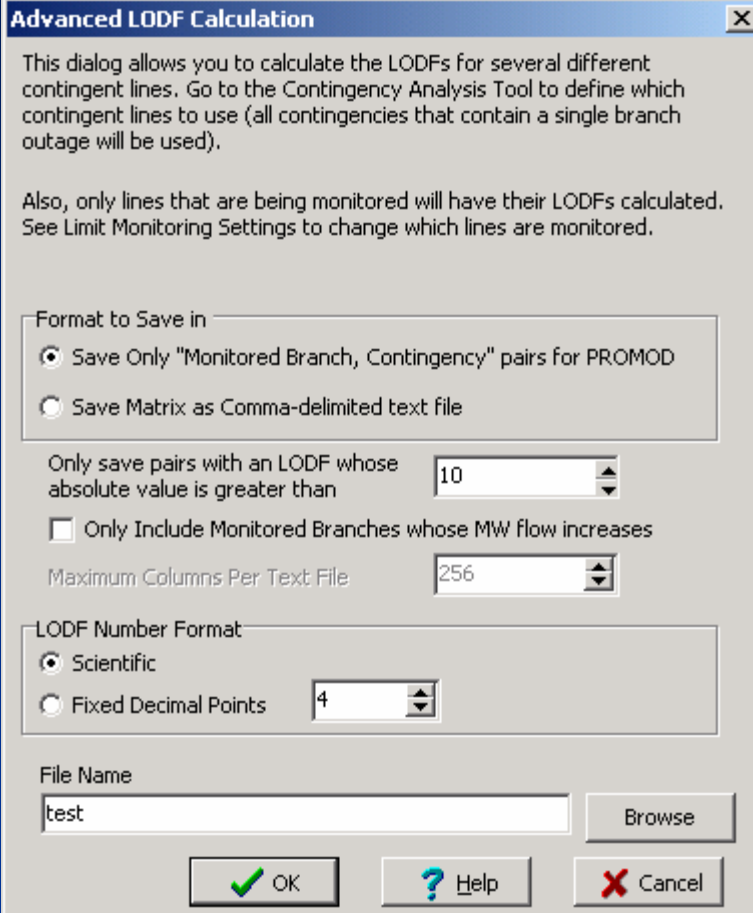
- Ok, our first run at this is nuts, but...
 - Write it down!
 - You did write or are writing a study plan, correct?
 - Step 1: Examine all possible N-2 ctgs
 - Reject this because 83,547,200 ctgs will take:
 - 1.23 years using DC load flow
 - 3.87 years using AC load flow
 - Step 2: Be smart, use filters and sensitivity tools
 - Look at just AVA N-2
 - Still reject at 38,266 ctgs...
 - Bound the problem

Sensitivity Tools

- Line Outage Distribution Factors
- High voltages affect lower
 - Usually anyway
- Power Transfer Distribution Factors
- Flow and Voltage Sensitivity Tools
- Geography Matters
 - Usually—electrically close is the true measure
 - Overbuilt 500 kV is BPA's stuff...

Use Advanced LODF Tool

- Setup contingencies
 - All BPA 500 kV
- Monitor only AVA
- Run Advanced LODF
- Get Results



Advanced LODF Calculation

This dialog allows you to calculate the LODFs for several different contingent lines. Go to the Contingency Analysis Tool to define which contingent lines to use (all contingencies that contain a single branch outage will be used).

Also, only lines that are being monitored will have their LODFs calculated. See Limit Monitoring Settings to change which lines are monitored.

Format to Save in

- Save Only "Monitored Branch, Contingency" pairs for PROMOD
- Save Matrix as Comma-delimited text file

Only save pairs with an LODF whose absolute value is greater than

Only Include Monitored Branches whose MW flow increases

Maximum Columns Per Text File

LODF Number Format

- Scientific
- Fixed Decimal Points

File Name

Down to nine BPA 500 kV

- MONITORED BRANCH 48025 40090 5 ! FLOW = -241.8753 MW LODF = 13.0443 "BEACON N-BELL S3"
- MONITORED BRANCH 48031 40092 4 ! FLOW = -245.8484 MW LODF = 15.3067 "BEACON S-BELL S4"
- MONITORED BRANCH 48463 41275 1 ! FLOW = -126.5984 MW LODF = 13.2479 "WEST-WESTBPA1"
- MONITORED BRANCH 48463 41276 1 ! FLOW = -17.2859 MW LODF = -14.1433 "WEST-WESTBPA2"
- MONITORED BRANCH 48524 48031 1 ! FLOW = -212.7717 MW LODF = 18.7463 "BOULDER-BEACON S"
- MONITORED BRANCH 48524 48037 1 ! FLOW = 185.0494 MW LODF = -19.1694 "BOULDER-BENEWAH"
- CONTINGENCY
- 40091 40092 1 ! Flow = -324.3445 MW "BELL BPA-BELL S4"
- END
- !
- MONITORED BRANCH 48463 41276 1 ! FLOW = -17.2859 MW LODF = 11.3221 "WEST-WESTBPA2"
- CONTINGENCY
- 40091 40287 6 ! Flow = 114.9703 MW "BELL BPA-COULEE"
- END
- !
- MONITORED BRANCH 48025 40090 5 ! FLOW = -241.8753 MW LODF = -10.6887 "BEACON N-BELL S3"
- MONITORED BRANCH 48031 40092 4 ! FLOW = -245.8484 MW LODF = -12.0318 "BEACON S-BELL S4"
- MONITORED BRANCH 48524 48031 1 ! FLOW = -212.7717 MW LODF = -16.0771 "BOULDER-BEACON S"
- MONITORED BRANCH 48524 48037 1 ! FLOW = 185.0494 MW LODF = 15.5627 "BOULDER-BENEWAH"
- CONTINGENCY
- 40091 41060 1 ! Flow = 209.3742 MW "BELL BPA-BELTAF11"
- etc

Document, Document, Document...

- Use PWS to generate numbers
- Explain the process
 - Evaluated ALL N-2's—rejected these
 - 83,547,200 possible contingencies (noncompliant due to time required to study!)
 - Used sensitivity tools to get down to 9 foreign lines that need to be accounted for
 - Still a chunk of studies, but it is tractable enough
- Write this **DOWN**. Write a study plan and a study report.

Write to the Standard

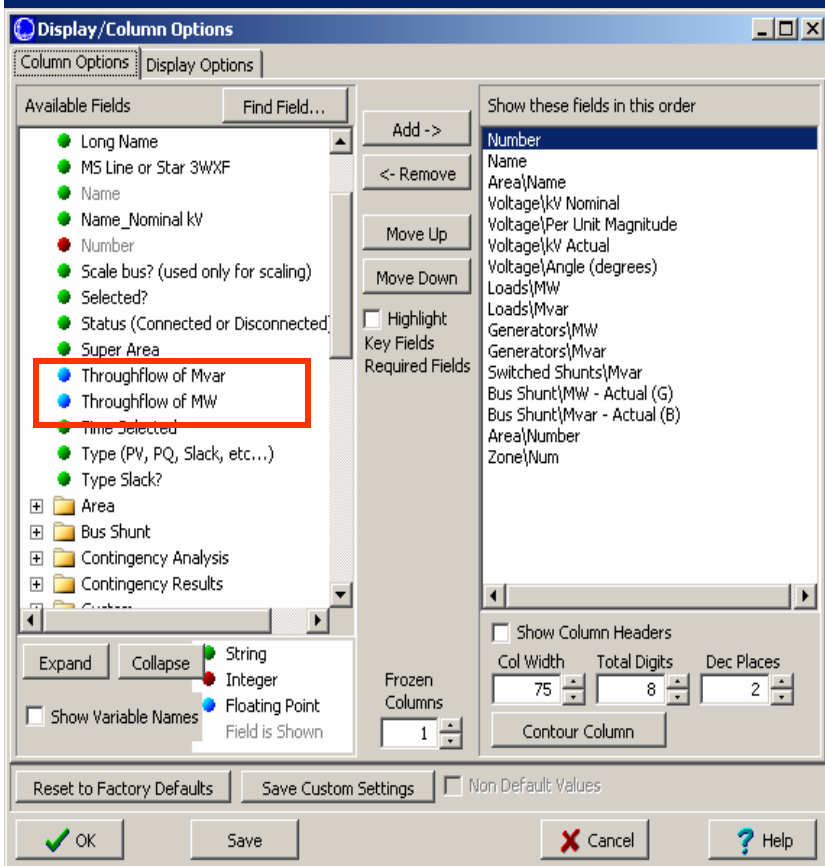
- Name your studies using the Standards
 - Make it *EASY* to audit!
- Example Report Titles
 - System Performance Under Normal Conditions
 - System Performance Following Loss of a Single BES Element
 - System Performance Following Loss of a Two or More BES Elements
 - System Performance Following Extreme BES Events

CIP-002 Critical Cyber Asset

- Critical “Cyber(?)” Assets
 - Ha! There is nothing cyber about critical assets...
- CIP-002, R1
 - Critical Asset Identification Method — The Responsible Entity shall identify and document a risk-based assessment methodology to use to identify its Critical Assets.
 - What are you using?
 - Probably voltage, size, and a panel of expert staff...
 - Not easily quantified is it?

Use PWS to ID Critical Assets

- Not to pick on our host...



Bus Records				
Number	Name	Area	Nom kV	MW Throughflow
98537	6WATFRD	EES	230	2008.81672
99486	8ANO 50	EES	500	1899.19586
99340	8WH BLF	EES	500	1656.12831
98606	69MILE	EES	230	1350.48656
98954	GGULF	EES	21	1322.00003
98952	8G.GULF	EES	500	1321.99831
99742	8DELL 5	EES	500	1213.96589
98235	8MCKNT	EES	500	1210.65931
98538	WAT U3	EES	25	1197.00012
99027	8FRKLIN	EES	500	1124.6314

Critical Facilities for Entergy?

■ Facilities

- 6WATRFRD—Waterford 
- 8ANO 50—Arkansas Nuclear One 
- 8WH BLF—White Bluff (fossil)
- 69MILE—Nine Mile Point (fossil)
- 8G.GULF—Grand Gulf 
- 8DELL 5—Dell
- 8MCKNT—McKnight
- 8FRKLIN—Franklin

Conclusions

- Compliance means documentation
- Documentation is good!
 - Aids in training
 - Corporate memory
 - Brings rigor and review to study processes
 - Feeds the compliance “monster”
 - This monster is a most unique form of herbivore
 - Lives on paper or its digital equivalent
- PWS *WILL* help feed the monster...

Questions

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