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Accelerator Safety Workshop

Safety Interlocks Breakout Session

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Safety Interlocks Breakout Session

■ Contributors

- Steve Butala
- Laren Weber
- Kamran Vaziri
- Paul Rossi
- John Anderson
- Bob Casey
- Asher Etkin
- DeVaughn Nelson
- Jim Sturrock
- Mark Gully
- Paul Wright
- Don Gregory
- Jonathan Reich

■ Contributors

- Jannifer Kozak
- Ian Evans
- Gary Clifton
- Quentin Hasse
- Ron Mlekodaj
- Isidoro Campisi
- Kelly Mahoney
- Nick Friedman
- John Forrestal
- Marty Knott
- Bob Mueller
- Paul Neeson

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■ Definition of Critical Component (Bob Casey Talk)

- System that will save your life (APS)
- 2 Shutters (APS)
- 1 Shutter and PSS at others
- Config Control could be a problem
- 1 Dipole AC and DC interlocked (SNS)
 - *RSO Locks used*
- Must perform an analysis to determine what is safe
- Real estate is an issue that may restrict second shutter
- Both methods are in use now at different labs
- SUMMARY
 - *There is no standard!*
 - *But safer to have 2 devices*
 - *Risk Analysis.....bottom line*

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■ LOTO using Control Systems (Paul Wright)

- Multiple devices LOTO'd with a control system
- Voltage decay relay in system
- Individual Locks may not be needed?
- Variance required from DOE and OSHA
- Power the systems to single breaker
- Kirk Keys used at APS
- Big question??? How do you test the system
 - *May have to test before each use*
- SUMMARY
 - *More info on volt decay relay*
 - *Legal aspect.... credit for LOTO??*

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■ Recommendations for Guidance on Design

- Safety PLC's is an option
 - *Redundancy built-in*
 - *Still need redundant field devices*
- Redundant systems still allowed
- Specification is very important
- Testability
 - *Diode injection (APS Gen 3 PSS)*
 - *Built –in testability at the design stage*
 - *Size of facility a factor*
 - *Test Programs used (should minimize)*
 - *Fatigue a factor*
- Modularity

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■ Recommendations for Guidance on Design (cont.)

- Cross trip
 - *Harder to test*
 - *More hardware / less reliable*
 - *More reliable by virtue of redundant trip*

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■ Recommendations for Guidance on Maintenance

- It's a good idea
- 6 month validation cycle
- 12 month validation cycle
- Hardware Revision/Series issues
 - *Inventory control very important*
- Revalidate after replacement
 - *Only I/O on card tested*
- Any change to code
 - *Full revalidation*
 - *Graded approach*
 - *“Compare” programs available*

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■ Recommendations for Guidance on Maintenance (cont.)

- Relay based systems
 - *One for One replacement*
 - *Full validation of sub system required after tool required replacement*
 - *Less for plug-in type*
- Full end to end testing required

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■ Recommendations for Guidance on Testing

- Test as appropriate to get desired risk reduction
- Over-testing can be a problem
 - *Dumping Power supplies*
 - *Exercising contactors, relays, etc*
 - *End to end test should be performed last (procedure dependant)*
- Humans are the weak link
- Engineered systems are preferred
- Configuration Control is important
 - *Labeling*
- Forces
 - *Not recommended during testing*
- Testing required after off-normal operation of equipment

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■ Recommendations for Guidance on Records Keeping

- What should be retained
 - *Executed Validations*
 - *Repairs*
 - *System descriptions*
- Store in project archives (electronically)
 - *Procedures*
 - *Executed Procedures.....NO*
- Keep for 75 Years?

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- **Other Discussions**
- Robotics
 - What are the interlock requirements?
 - Risk level set by ANSI R15.06 (1999)
- 2 of 3 voting to increase reliability
 - Some are using this