NLC Damping Rings & Transport Lines
DC Magnet Power Systems

Proposal For Implementing The Personnel Protection System (PPS)
Summary

1. 2,400 magnets will need terminal covers - expensive
   OR

2. 2,100 power supplies will have to be PPS interlocked
   - expensive, complex and perhaps not certifiable.
   OR

3. Proposal - PPS interlock upstream AC distribution
   system to reduce the number of PPS interface
   points.

4. PPS interface responsibility and cost transferred
   from PCD to PE.
NLC Damping Rings/Transport Lines - DC Magnet Power Systems
PPS Proposal

Outline & Scope
Typical Power Supply Rack Layouts
NLC Damping Rings/Transport Lines - DC Magnet Power Systems

PPS Proposal

Typical Feed For 208V Power Supplies

Motor Control Center (MCC) or Panelboard

208V, 600A, 216kVA

8 Racks * 6 PS/Rack = 48 Power Supplies = 48 PPS Interfaces
**Typical Feed For 480V Power Supplies**

- **Motor Control Center (MCC) or Panelboard**
  - 480V, 600A, 500kVA
  - PPS interface (typ)
  - 51A

- **480V Source**
- **1 PS**
  - 50kW rated
  - 40kW run
  - 50kVA total

- **4 PS**
  - 10kW rated
  - 8.5kW run
  - 34kW total
  - 42kVA total

- **7 Racks * 4 PS/Rack = 28 Power Supplies + 3 = 31 Power Supplies = 31 PPS Interfaces**

**PPS Proposal**

---

*Paul Bellomo - PCD*  
*October 12, 1998*
PPS Requirements

1. Two (2) power breaks between source and load.
2. Power break components controlled by 2 independent PPS permits
3. The status of the power breaks monitored by 2 different means.
4. Physical separation or a barrier between the power breaks.
1. Two Power Breaks - Contactors Added To MCC

2 independent electromechanical contactors provide 2 circuit breaks, an interface to the PPS and MCC remote turnon/turnoff capability.

PPS Interface

480V or 208V Source

Motor Control Center (MCC)
2. Two PPS Permits

3. Two Readbacks, 2 Ways

PPS Permit = \( A_p \times B_p \)

Safe = \( A_1 \times A_2 \times B_1 \times B_2 \)

MCC Bus

To several power supply racks
4. Physical Separation Between Contactors
More Than 1 MCC On A PPS Interface
PPS Interface Reduction

30/50 power supplies were illustrated for 480V/208 - 600A systems

40 power supplies per 600A system (one MCC) is a reasonable “first cut” assumption.

\[
2,100 \text{ PS} \times 1 \text{ MCC/40PS} = 53 \text{ MCCs (PPS interfaces)}
\]

Note possibility of even more power supplies on an MCC as 1200A bus and contactors are available.

Costs

\[
2,100\text{PS} \times 1\text{MCC/40PS} \times 2 \text{ contactors/MCC} \times $5,000/\text{contactor} = $525,000
\]

On a per power supply or per magnet basis:

\[
$525,000/2,100 \text{ PS} = $250/\text{PS}
\]

\[
$525,000/2,400 \text{ magnets} = $220/\text{magnet}
\]
Wrap-up

1. Technical (safety) requirements have been met.
2. Number of PPS interface reduced.
3. Cost is reasonable.
4. PPS interface responsibility and cost has shifted from PCD to PE