Power Conversion
Solutions for Challenging Problems

AIP 67-2901/02 Review

LINAC SECTORS 22 AND 23
QE MAGNET POWER SYSTEM UPGRADE

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December 6, 2007

RESTATED SCOPE AND MOTIVATIONS

Scope on October 31, 2007

- Upgrade “QE” magnet power supplies and controllers in LINAC Sectors 22 and 23
- “Two” new bulk power supplies and sixteen new boost supplies
- New Ethernet power supply controllers, new zero flux current transductors, new PPS chassis
- Ten (10) weeks to do work

Motivations

- Equipment more than 20 years old and at end of useful life. Unreliable, lack of available parts will affect future LINAC operations
- Better short and long-term current stability
- Interface with new EPICS-based control system for better diagnostics
- Lower line harmonics, noise, power consumption

CHANGES SINCE 07/10/31 REVIEW

Review Topics

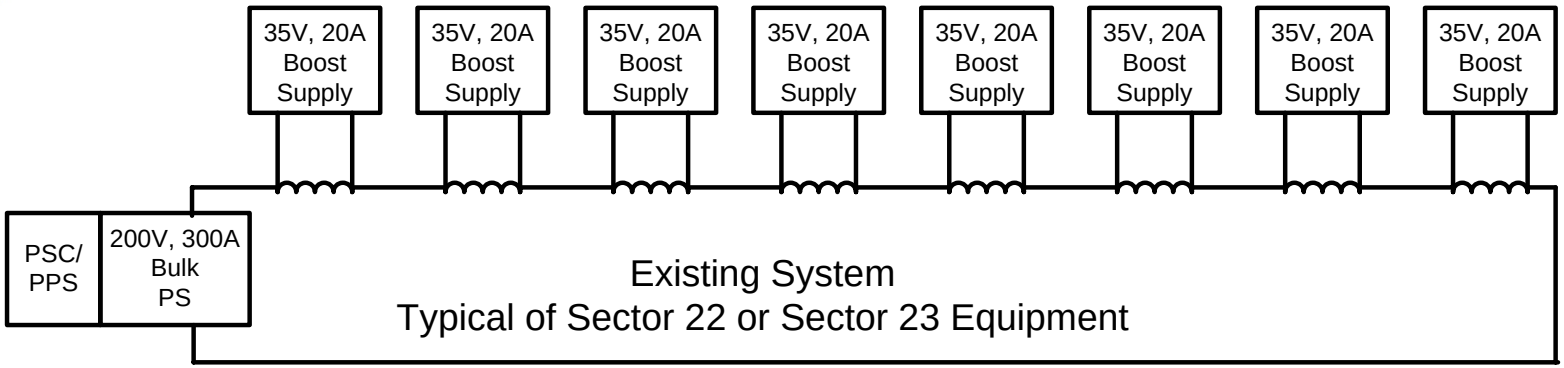
1. Downtime length
2. Two to three bulk power supplies per sector
3. Possible purchase of one single bay rack per sector
4. PPS elimination – use magnet covers
5. Commitment of Controls Department to support this effort

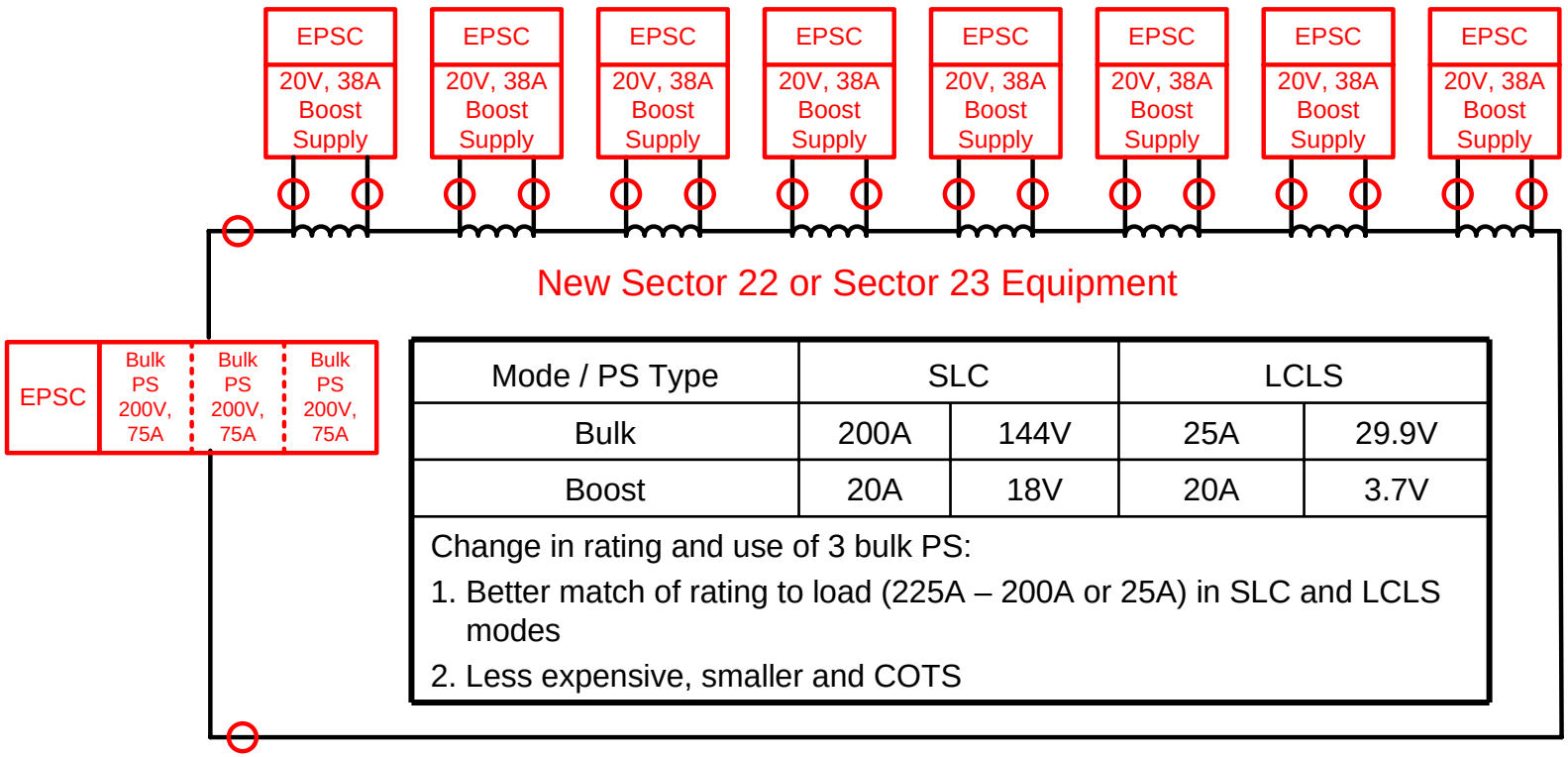
1. DOWNTIME LENGTH

Original and Present Understandings and Plan

Issue	October 31, 2007 Plan	December 6, 2007 Plan
Downtime	10 weeks – 10/1 through 12/15/08	4 weeks – 10/1 through 10/31/08
Build plan	Refurbish racks and assemble/test in field	Purchase new racks and assemble / test in B15

2. TWO TO THREE BULK POWER SUPPLIES





Mode / PS Type	SLC		LCLS	
Bulk	200A	144V	25A	29.9V
Boost	20A	18V	20A	3.7V

Change in rating and use of 3 bulk PS:

1. Better match of rating to load (225A – 200A or 25A) in SLC and LCLS modes
2. Less expensive, smaller and COTS

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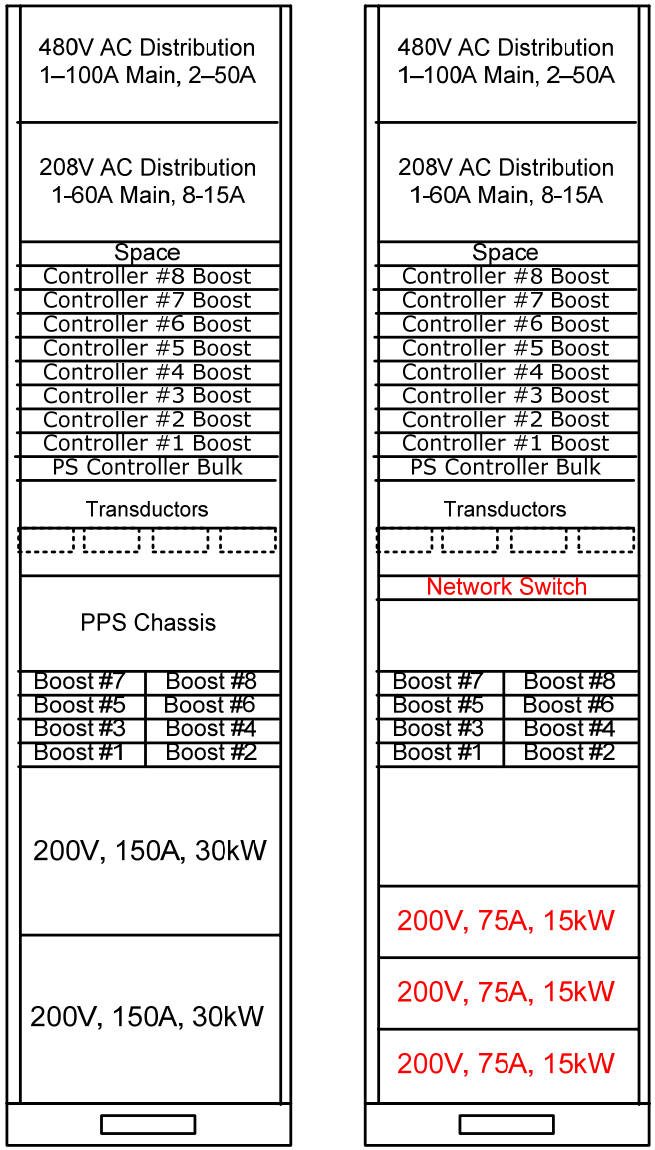
THE EXISTING

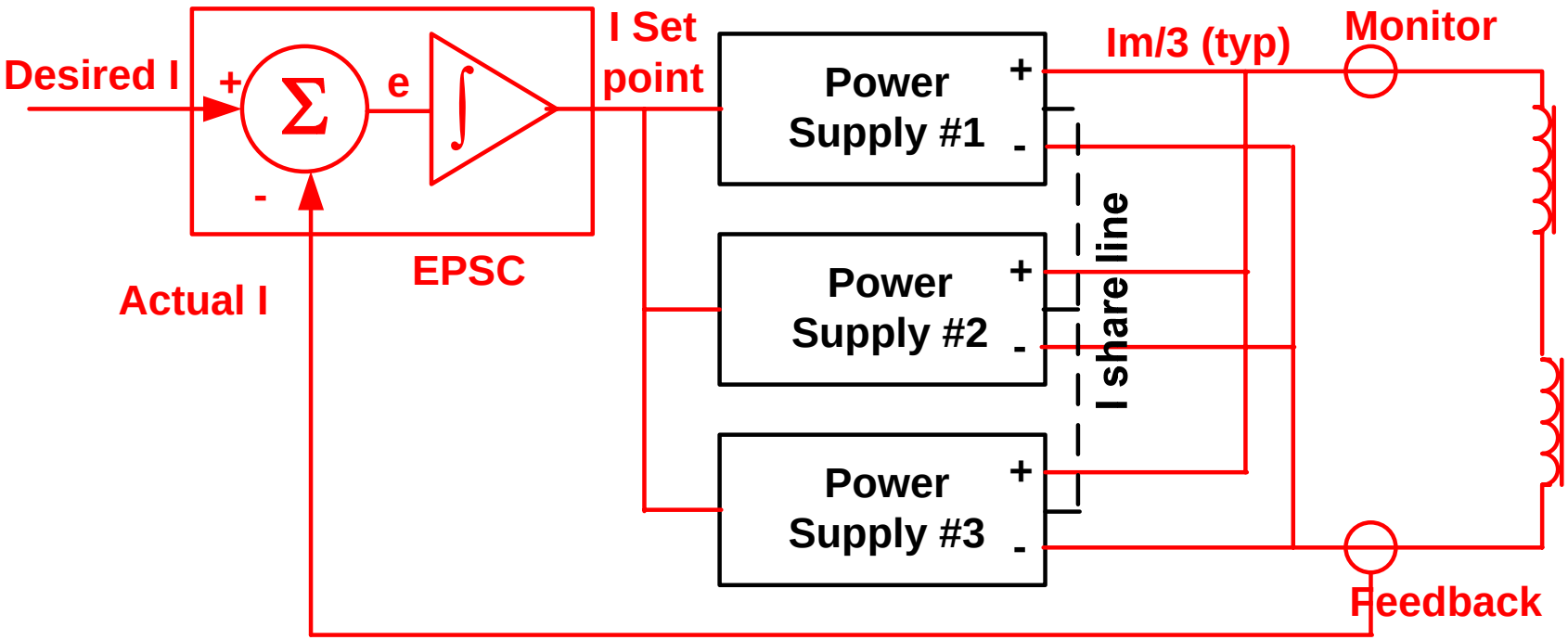
THE REVISED BULK PS TOPOLOGY



October 31, 2007 December 6, 2007

Bulk power supplies were identified as the critical path item if custom designed – COTS desired

CONTROL OF 3 PS DIAGRAM



Black items are provided by power supply manufacturer\

Red items are provided by SLAC

3. POSSIBLE NEW RACK PURCHASE

The issue is time! A 4 week downtime will not allow for field rack refurbishment, system assembly, and test

Refurbish Existing Racks	Two New Racks
EDI: None – field work is done on an ad hoc basis	EDI: Very little, purchase commercial rack
M & S: 2 racks * $250 / rack = **$0.5k**	M & S: $4k*2 = **$8.0k**
Assembly/Install: 2tech*9 days/rack *2 racks *1mon/20days * $8.5k/mon = **$15.3k**	Assembly/Install: Set and bolt new racks = 0.5day/rack *2techs *2 racks*1mon/20days*$8.5k/mon = **$0.85k** **Shorten boost cables = 2days/set*2sets*2persons*1mon/20 days*$8.5k/mon= $3.4k**
Total cost: **$15.8k**	Total cost: **$12.3k**

Note: Costs are unburdened and are for comparison purposes only

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4. PPS ELIMINATION - USE MAGNET COVERS

PPS System	Magnet Covers
EDI: 1engr*0.5mon*$15.1k/mon + 1coord*0.5mon*$10.5k/mon + 1 tech * 0.5day/chassis * 4 chassis* 1mon/20days * $8.5k/mon = **$13.7k**	EDI: Previously completed
M & S: 4 chassis * $5k/chassis = **$20k**	M & S: $300*16 = **$4.8k**
Assembly/Install: 1tech*3 days/chassis *4 chassis *1mon/20days * $8.5k/mon = **$4.8k**	Assembly/Install: 16manhours/cover *16 covers $77.50/hour = **$19.8k**
Total cost: **$38.5k**	Total cost: **$24.6k**

Notes: 1. Costs are unburdened and are shown for comparison purposes

2. Magnet covers are consistent with Sector 20, 21 and 24 approach

5. CONTROLS COMMITMENT – LAST SLIDE

- Soft IOCs exist
- Programming support to recognize new systems (operating programs, displays, etc) already written
- Network switch purchase needed