

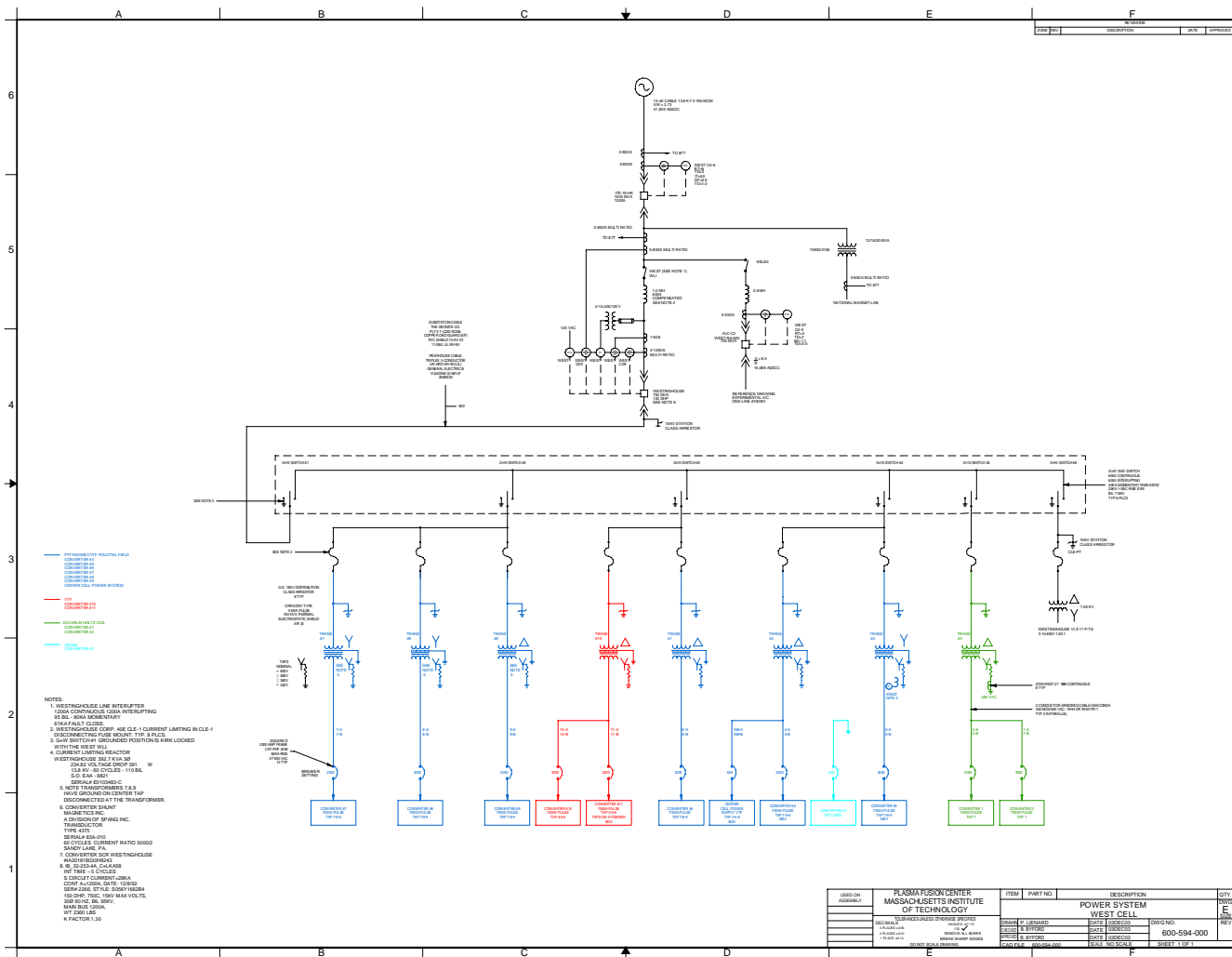
PSFC West Cell Power Convertors

Presented by: Phil Michael
at the
Mercury Target Collaboration Meeting
MIT-PSFC
17 Oct. 2005

System overview

- 3-phase 13.8 kV power feed to West Cell penthouse
- Distributed to several pulsed power transformers
- 6-pulse rectification for each convertor
- Six convertors connected via interphase transformer to create 12-pulse supply
- Various transformer tap settings to select maximum dc output voltage

System schematic



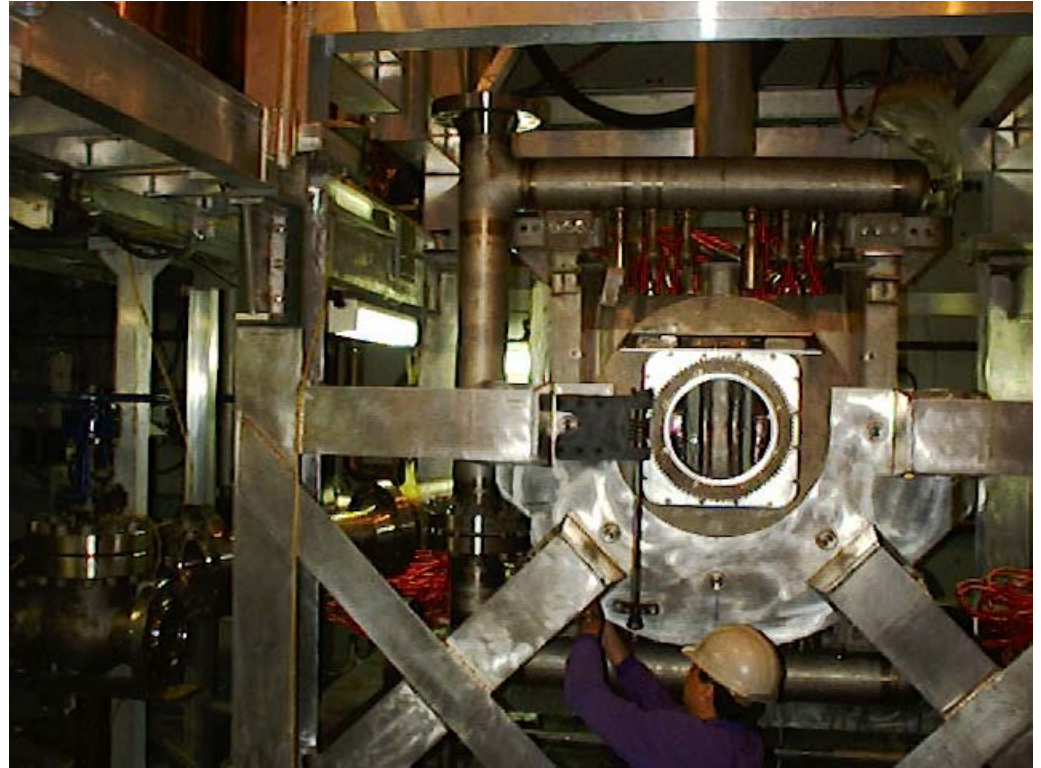
- NOTES:
- WESTINGHOUSE LINE INTERRUPTER
1200A CONTINUOUS RATED INTERRUPTING
81.5% I_{FL} (100% I_{FL})
 - WESTINGHOUSE DISJ. SEE CLE-1 CURRENT LIMITING IN CLE-1
 - DISCONNECTING FUSE MOUNT-TYP. 4 P.F.C. 2000A
 - LINE SWITCHER-GROUNDING POSITION IS LOCKED
 - CURRENT LIMITING REACTOR
WESTINGHOUSE 250 P.F.C. 2000A
2500V VOLTAGE DROP 200 W
C.S. 50% 100% 110% 120%
C.S. 100% 110% 120%
SERIAL A 570045C
WINDING GROUND/CENTER TAP
DISCONNECT AT THE TRANSFORMER
 - CONVERTER SCR
3000V 100A 1000V MAX VOLTAGE
300 50 Hz 50% 100%
WINDING RATIO
4 FACTOR 1.5
 - CONVERTER SCRs WESTINGHOUSE
MOSBY-ROSS
SERIAL A 570045C
WINDING RATIO
WINDING TAP - 5 CHOICES
CIRCUIT CURRENT 100A
CONV. A.P. 200A, DATE 10/20/88
SERIAL A.P. 200A, DATE 10/20/88
100 AMP. 1000V MAX VOLTAGE
300 50 Hz 50% 100%
WINDING RATIO
4 FACTOR 1.5

ISSUED FOR	PLASMA FUSION CENTER	ITEM	PART NO.	DESCRIPTION	QTY.
ASSEMBLY	MASSACHUSETTS INSTITUTE OF TECHNOLOGY			POWER SYSTEM WEST CELL	
DESIGNED BY	J. W. BAKER	DATE	10/20/88	DWG. NO.	
CHECKED BY	J. W. BAKER	DATE	10/20/88	600-594-000	
SCALE	AS SHOWN	SHEET NO.	600-594-000	SHEET 1 OF 1	

Power convertor utilization

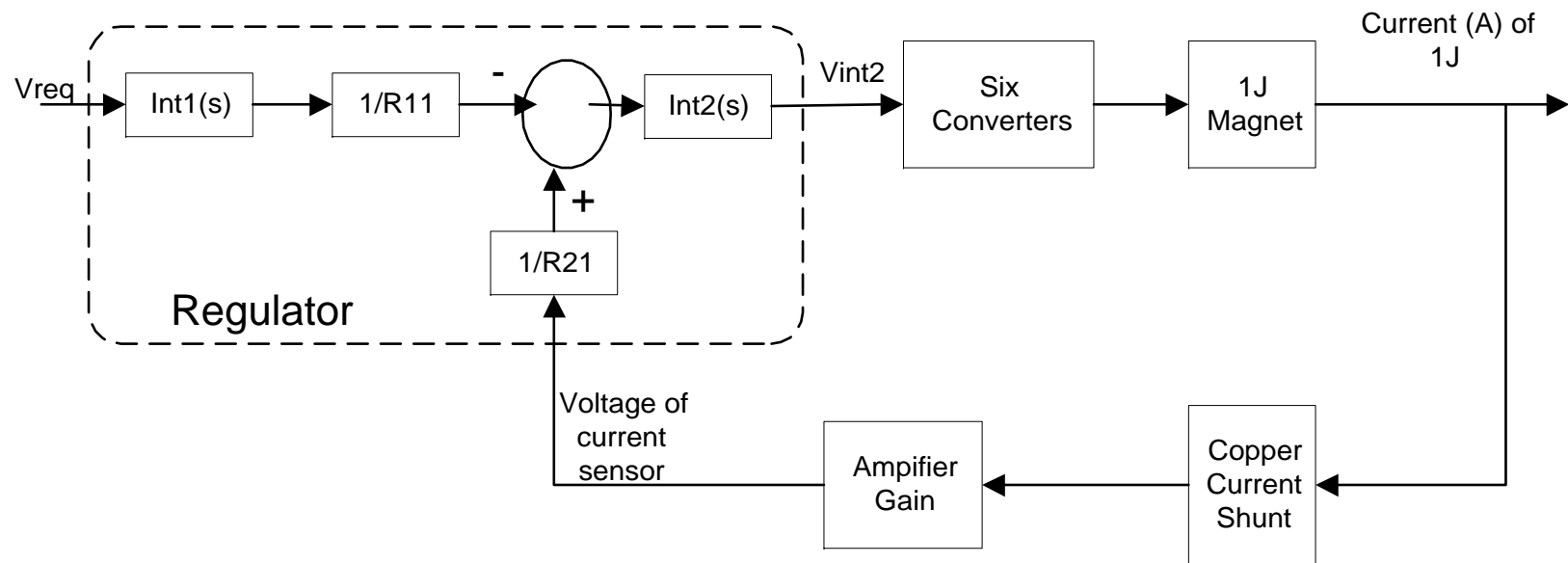
- Reassembled for Pulsed Test Facility to provide up to 8 MW for up to 45 s duration
- Loaned to Versatile Test Facility for magnetic reconnection experiments
- Upgraded for pulse coil testing

Power convertor photo



Regulator dynamic model

G. Dekow



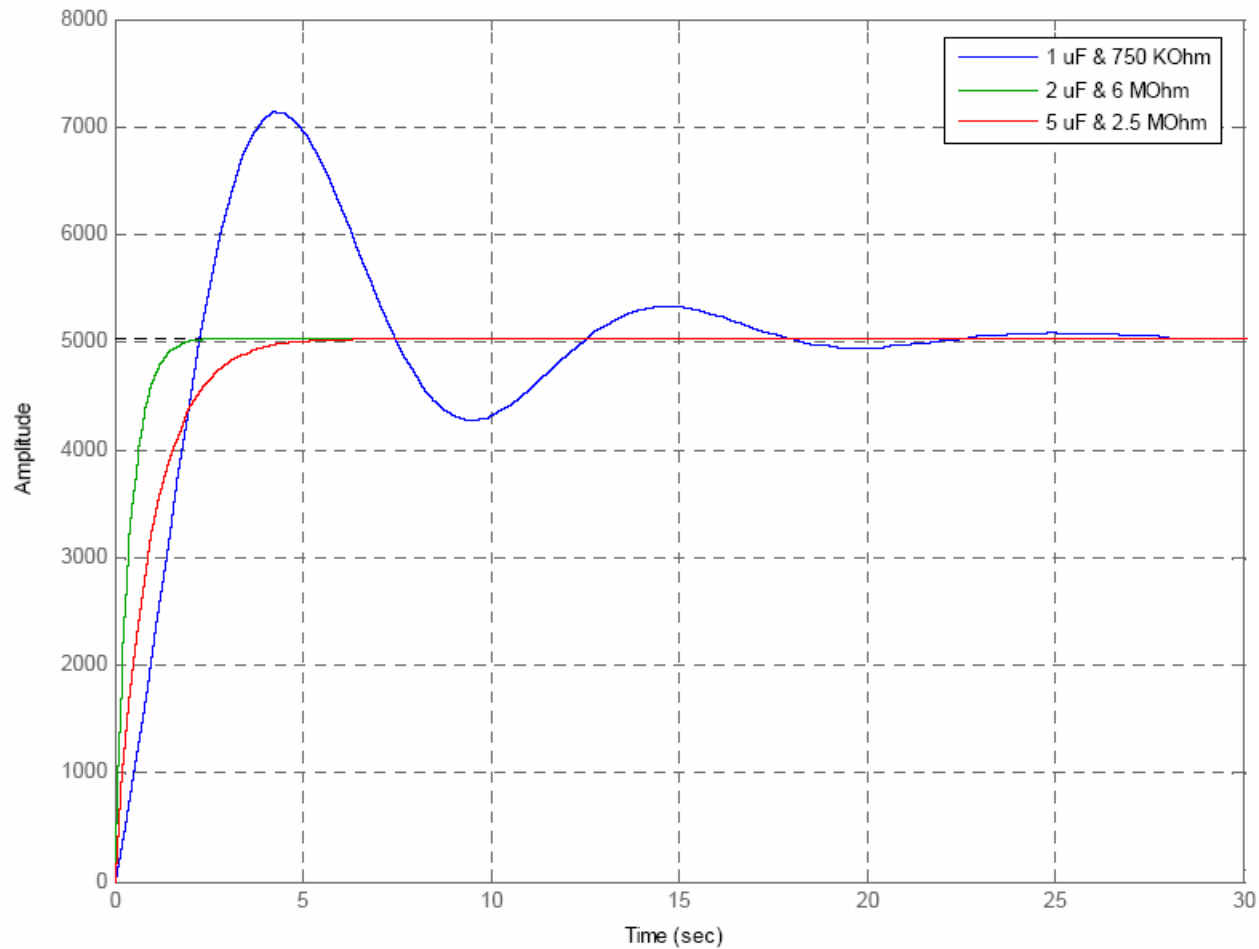
Detailed Block Diagram of Power Converter System Feedback Circuit

Regulator dynamic response

- Regulator presently tuned for 10.6 mH, 11.6 mOhm load
- The Mercury Target Pulse Coil provides a nominal load of 484 mH and 40 mOhm
- The feedback regulator needs to be retuned during start of test program

Simulation results

Step Response Varying C4 and R4 on the Regulator



Blue trace shows MT coil response with present regulator tuning

Operation voltage

- For the past 10 years the convertor transformers has been set to 385 Vac
- Testing of the MT pulse coil will require resetting the taps to roughly 590 Vac
- The fault protection circuitry in the convertors is ~20 yr old
- Several fault protection components are being upgraded for higher us voltage

Preparation activities

- Modifications can start during APS fall meeting - Oct. 24~28, 2005
- Completion of present VTF test program
- Installation of over voltage protection components
- Retest of system using PTF coil as reference
- Completion of bus work to pulse coil
- Tuning of regulator
- Implementation of test program