Central Controls and Computing

WBS51 & 52

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WBS5 Work Package Manager

Agenda

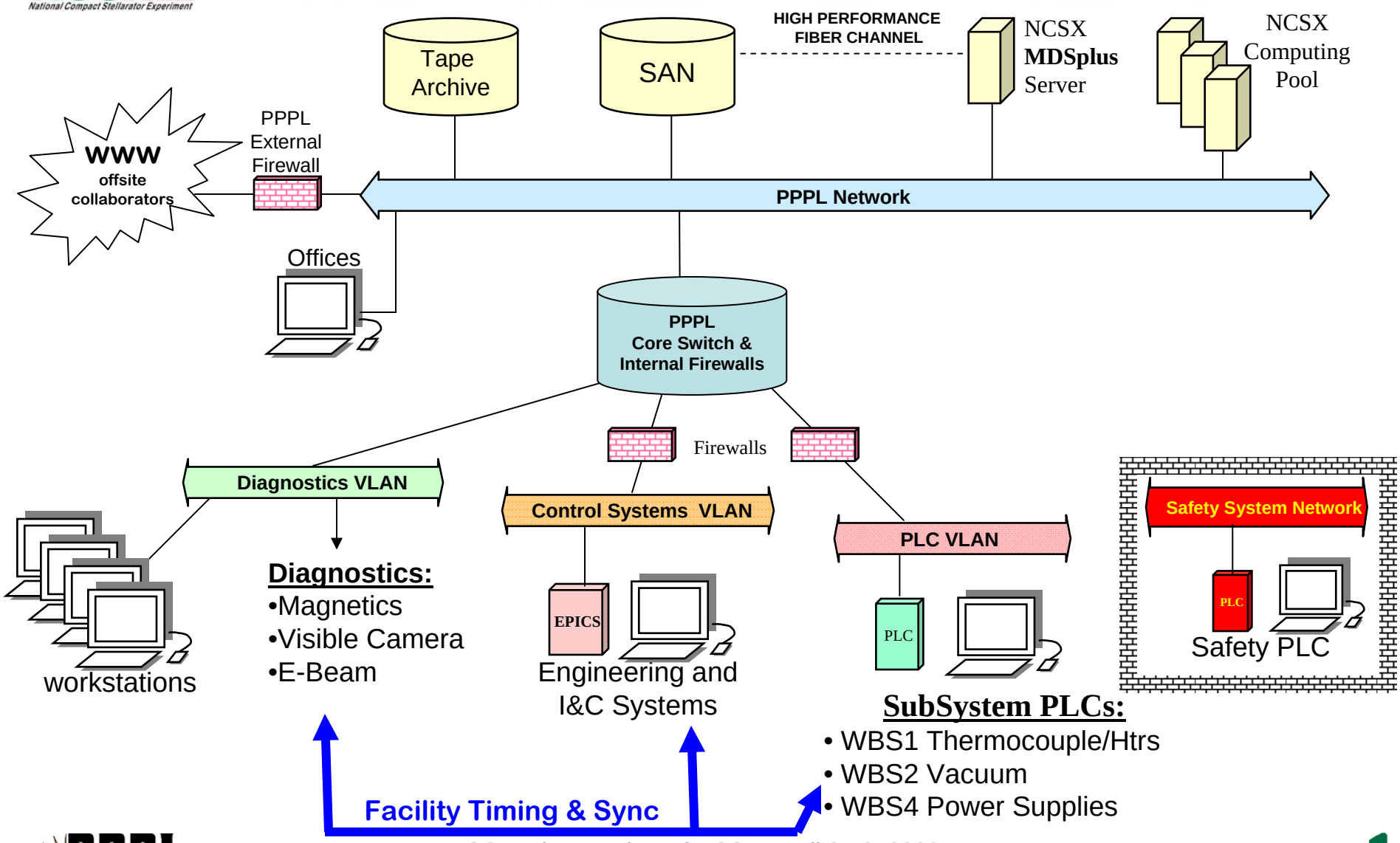
- Introduction
- Requirements and Interfaces
- Cost and schedule
- Risks and mitigation
- Responses to past review recommendations

Introduction

Central Controls and Computing will provide the equipment and services to support: 1) integrated and remote control; 2) data acquisition, analysis, and storage; 3) facility timing and synchronization; 4) central safety and interlocks.

- **Network and Fiber Optic Infrastructure (WBS 51)**
- **Central Instrumentation and Control (WBS 52)**
- **Data Acquisition and Facility Computing (WBS 53)**
- **Facility Timing and Synchronization (WBS 54)**
- **Real-Time Plasma and Power Supply Control (WBS 55)**
- **Central Safety and Interlock System (WBS 56)**
- **Management and Integration (WBS 58)**

NCSX Computing Overview



Requirements

- An *NCSX System Design Description* (SDD) was written in 2003, before CD-2. The primary elements of that design remain intact.
- My current estimate is derived from the SDD, ongoing technical discussions and design reviews, and recent experience with similar systems on NSTX.
- A WBS5 System Requirements Document (SRD,BSPEC) will be reviewed and approved prior to the *Preliminary Design Review* for each WBS5 element.
- Design Complexity & Maturity
  - Many of the technologies for WBS5/NCSX are currently in use on NSTX, so complexity is low for our experienced staff.
  - The *current workscope* has completed neither **Preliminary** nor **Final design**, so the maturity is medium.

CD-4 Interface List

WBS51 Network & Fiber Optic	WBS1 Thermocouple/Heater Local I&C WBS2 Vacuum/Fueling Systems WBS3 Diagnostics WBS4 Power Systems
WBS52 Central I&C	WBS1 Thermocouple/Heater Local I&C WBS2 Vacuum/Fueling Systems WBS4 Power Systems
WBS53 Data Acquisition and Management	WBS1 Thermocouple Local I&C WBS2 Vacuum/Fueling Systems WBS3 Diagnostics WBS4 Power Systems
WBS54 Timing & Synchronization	WBS3 Diagnostics WBS4 Power Systems
WBS55 Real-Time Control	WBS2 Vacuum/Fueling Systems WBS4 Power Supply Control
WBS56 Central Safety and Interlocks	**Access Control**: WBS4 Power System Areas, WBS7 Test Cell. **SubSystem Interlocks**: WBS4 Power Systems. **NCSX (Global) E-Stop**.

Basis of Estimate

- Labor:
  - referenced actual engineering hours from FY97-99 for the NSTX first plasma.
  - experience with similar activities for NSTX.
  - ‘expert’ estimates (e.g. Erik Perry).

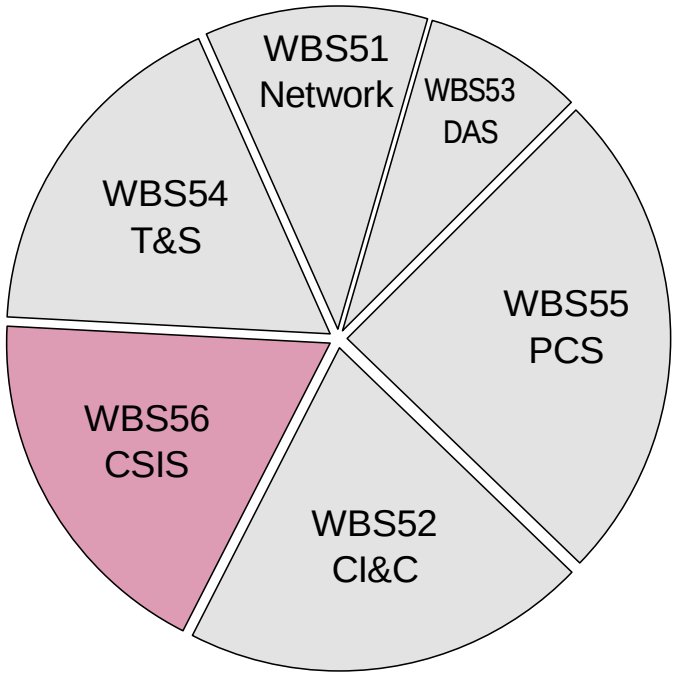
- M&S
  - recent purchase of parts for NSTX and other lab infrastructure projects.
  - catalog prices.
  - includes spares and service contracts.
  - selective use of NSTX equipment.

WBS5 Aggregate Cost

Reference *WAF*s for labor and M&S detail for WBS51-58.
http://ncsx.pppl.gov/Rebaseline/Rebaseline_index.htm

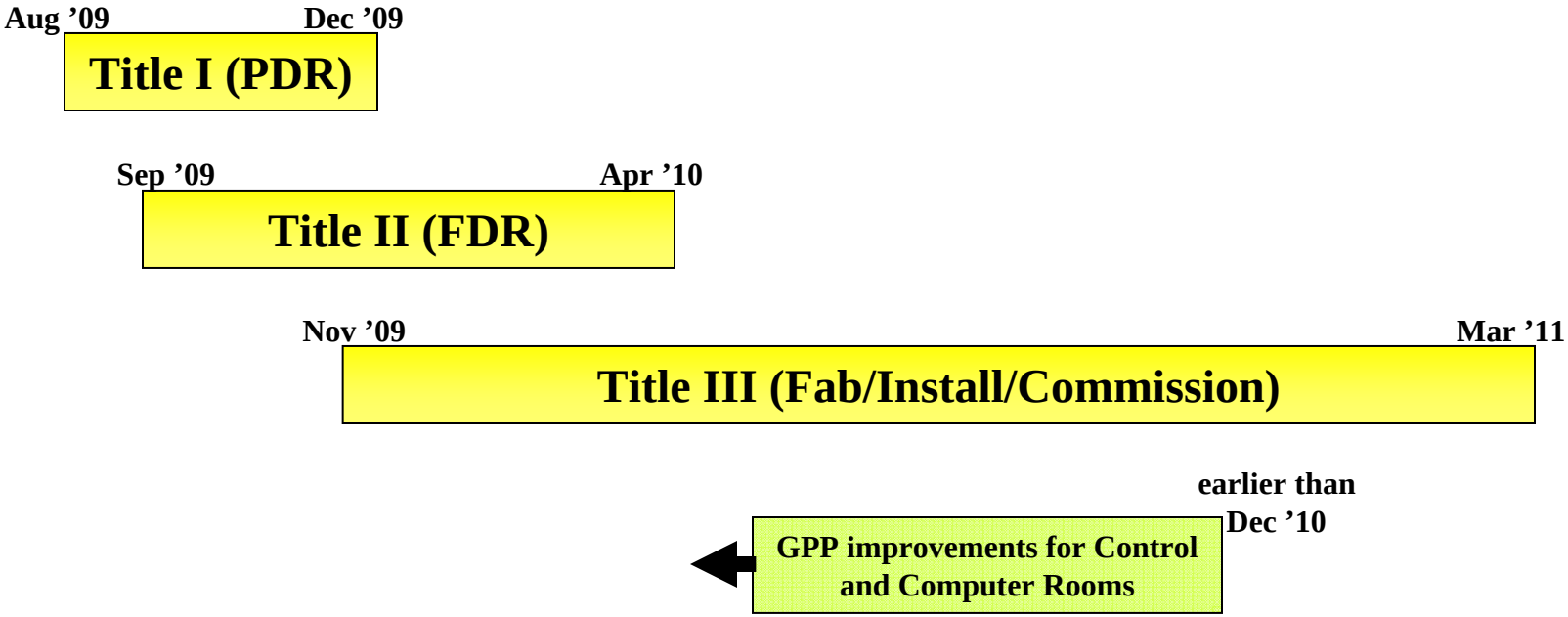
WBS5 ETC = $ **2.1** M

Softwr/Elec Engineering: **3.6 years**
Elec/Mech/Draft Tech: **3.1 years**
'Materials & Services': $ **432 K**

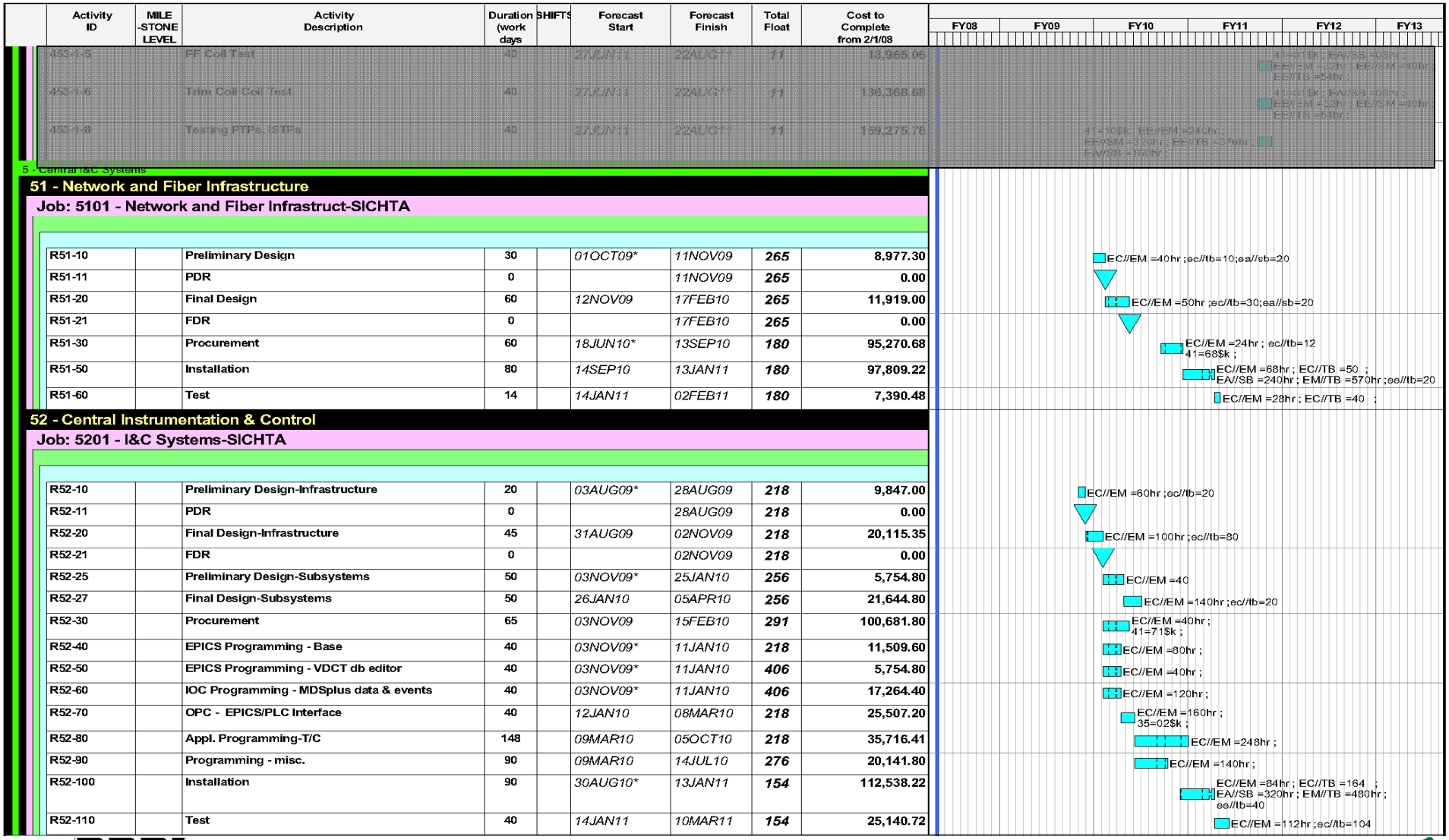


WBS51–WBS56 Aggregate Schedule

Reference *Resource Loaded Schedule* pages 53-56
for schedule detail for WBS51 – WBS58.
http://ncsx.pppl.gov//Reviews/FY08/BCP_2008/Docs/NCSX_RLS0403.pdf



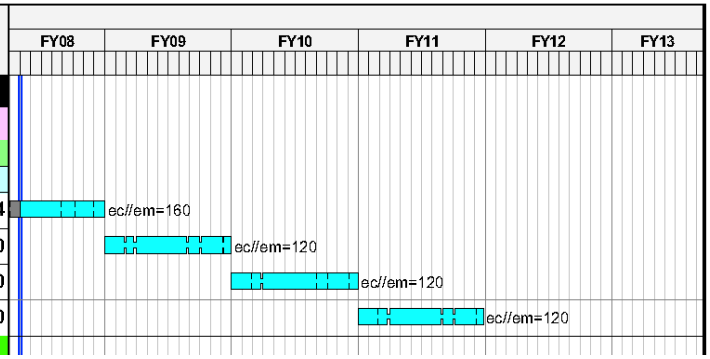
Schedule (51,52)



Activity ID	MILE -STONE LEVEL	Activity Description	Duration (work days	SHIFTS	Forecast Start	Forecast Finish	Total Float	Cost to Complete from 2/1/08
453-1-5		PF Coil Test	40		27JUN11	22AUG11	11	13,965.06
453-1-6		Trim Coil Coil Test	40		27JUN11	22AUG11	11	136,368.68
453-1-8		Testing PTPs, ISTFs	40		27JUN11	22AUG11	11	159,275.76
5 - Central I&C Systems								
51 - Network and Fiber Infrastructure								
Job: 5101 - Network and Fiber Infrastruct-SICHTA								
R51-10		Preliminary Design	30		01OCT09*	11NOV09	265	8,977.30
R51-11		PDR	0			11NOV09	265	0.00
R51-20		Final Design	60		12NOV09	17FEB10	265	11,919.00
R51-21		FDR	0			17FEB10	265	0.00
R51-30		Procurement	60		18JUN10*	13SEP10	180	95,270.68
R51-50		Installation	80		14SEP10	13JAN11	180	97,809.22
R51-60		Test	14		14JAN11	02FEB11	180	7,390.48
52 - Central Instrumentation & Control								
Job: 5201 - I&C Systems-SICHTA								
R52-10		Preliminary Design-Infrastructure	20		03AUG09*	28AUG09	218	9,847.00
R52-11		PDR	0			28AUG09	218	0.00
R52-20		Final Design-Infrastructure	45		31AUG09	02NOV09	218	20,115.35
R52-21		FDR	0			02NOV09	218	0.00
R52-25		Preliminary Design-Subsystems	50		03NOV09*	25JAN10	256	5,754.80
R52-27		Final Design-Subsystems	50		26JAN10	05APR10	256	21,644.80
R52-30		Procurement	65		03NOV09	15FEB10	291	100,681.80
R52-40		EPICS Programming - Base	40		03NOV09*	11JAN10	218	11,509.60
R52-50		EPICS Programming - VDCT db editor	40		03NOV09*	11JAN10	406	5,754.80
R52-60		IOC Programming - MDSplus data & events	40		03NOV09*	11JAN10	406	17,264.40
R52-70		OPC - EPICS/PLC Interface	40		12JAN10	08MAR10	218	25,507.20
R52-80		Appl. Programming-T/C	148		09MAR10	05OCT10	218	35,716.41
R52-90		Programming - misc.	90		09MAR10	14JUL10	276	20,141.80
R52-100		Installation	90		30AUG10*	13JAN11	154	112,538.22
R52-110		Test	40		14JAN11	10MAR11	154	25,140.72

Schedule (58)

Activity ID	MILE -STONE LEVEL	Activity Description	Duration (work days	SHIFTS	Forecast Start	Forecast Finish	Total Float	Cost to Complete from 2/1/08
58 - Central I&C management and Integration								
Job: 5801 - Central I&C Integr& Oversight-SICHTA								
R58-20		WBS58 -FY08 Management & Integration LOE	250*		01OCT07A	30SEP08	1,521	14,454.84
R58-30		WBS58 -FY09 Management & Integration LOE	249		01OCT08*	30SEP09	1,272	16,773.60
R58-40		WBS58 -FY10 Management & Integration LOE	248		01OCT09*	30SEP10	1,024	17,264.40
R58-50		WBS58 -FY10 Management & Integration LOE	248		01OCT10*	28SEP11	776	18,139.20
6 - Facility Systems								



Risks and Mitigation

Reference *NCSX Risk Register* (page 2, item 'e') for WBS5 risks.

http://ncsx.pppl.gov//Reviews/FY08/BCP_2008/Docs/RR_Rev28a.pdf

Risk Description	Mitigation Plan	Likelihood	Consequence	Risk Ranking
Loss of staff with experience in specialized software will delay availability of Central I&C system.	Staff have recently been brought on board in anticipation of growing NCSX I&C needs. The planned shutdown of NSTX after FY10 will increase the availability of similar resources for NCSX.	VU	Marginal	Low

Response to Past Review Findings

1. **Work with ES&H on Safety System Requirements and design basis.**
   - PPPL's *ES&H Directives Manual, section 2-5* "Personnel and Safety Interlock Systems" is in the process of being updated.
2. **Document Basis of Estimate**
   - A WBS5 notebook has been prepared to compile the design basis.
     - Copies of recent requisitions for similar equipment.
     - Catalog cut-sheets with prices.
     - Actual NSTX engineering-hours (labor) tabulation for first plasma.

Conclusion

The NCSX central controls and computing are similar in both function and scale to NSTX. The availability of a technically diverse and experienced staff provides confidence that the WBS5 work elements will effectively support the NCSX project's CD-4 objectives.