



Cost and Schedule Development

Michael Dinnon

Director's Progress Review of SBN

15-17 December 2015

Schedule Development

- Engineering work was estimated by engineering support familiar with other similar projects (MicroBoone, Mu2e)
- Set of tasks as developed by the Cryogenics Manager to complete the work on the system
- Many tasks were created - From that package, a crosswalk was performed by the Installation Manager to develop the current Cryogenics Project Schedule
- Future work to integrate the ND and FD Cryogenics is anticipated

Preliminary Design

- Preliminary Design is where work package agreements are signed, initial schemes are determined, and preliminary ODH analysis is completed.
- Other tasks:
 - Finalize Requirements
 - Final Schedule Development
 - Interface Documentation
 - Updating P&ID Drawings

Final Design

- Integration
 - Documentation, Engineering Notes, Specifications
- Internal
 - Final Design of components inside the Cryostat related to the Cryogenics system
- External
 - Finalize information for smart P&ID's, Piping contract, reliefs, analyzers, etc
- Proximity
 - Filter skids, pumps instrumentation
 - Interconnecting Piping

Construction/Installation

- Procurement of hardware and services
- Bid and Procure piping by A&E
- Finalize documentation
- Installation of Hardware
- Moving Dewars on piers
- Developing Smart P&IDs and Isometric drawings for main piping

Example of Mapping

Near Detector -Schedule

ND Cryogenics Preliminary Integration

Ongoing development of the final design and fabrication work plans

Updates to preliminary requirements, interface and P&ID documents

Near Detector- Information supplied for schedule (work to be done)

Preliminary design and portions of Final Design - integration

Schedule with major FNAL costs - preliminary

Work Package Agreement (signed)

Milestone: All Work Package Agreements are signed

Milestone: All preliminary interface documents are discussed

Requirements for SBN Cryogenics - finalize

Interface document - preliminary (updated)

Determine filtration scheme

Need for additional "normal ops" filter skid(s) by testing at Microboone

Results from filter tests at CERN

Update P&ID

Resources

- Resources were determined from past experience and expert opinion
- Work was identified by Cryogenics Manager. Assignments were then made by having discussions with management regarding availability.
- Individuals will be assigned as work area expertise dictates.

Basis of Estimates

- Estimates were completed by the Cryogenics Manager
- Information based on past experience and expert opinion
- Supporting documentation was gathered
- Estimates and quotes
- BOE reports are generated by Project Controls
- Supporting information is added to each BOE report
- Schedule information can be easily updated and still archives the supporting documentation

Basis of Estimates

BOE_WBS4_40333_FD_Cryogenics_Construction.xlsx - Excel

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Basis of Estimate for Tasks under

Summary Task Name: FD Cryogenics Construction (SBN-II-CS)(FD)(CC)

Summary WBS: 40SBN/4.3.3.3

Summary Unique ID: 2384

Summary BOE Number: 40333

WBS	UID	ID	Task Name	Duration in Days	Start Date	Finish Date	Fixed Cost M&S	All Labor (With OverHd)	All Materials (With OverHd)	Project Base Est Cost
40SBN/4.3.3.3.1	2413	1209	FD Cryogenics Construction Integration (SBN-II-CS)(FD)(CC)(CC)	120	05/23/16	11/09/16	\$0	\$52,721	\$340,693	\$393,415
40SBN/4.3.3.3.1.1	2414	1210	Procurement of Controls Components (FNAL - Labor) (SBN-II-CS)(FD)(CC)(CC)	90	05/23/16	09/28/16	\$0	\$31,177	\$0	\$31,177
40SBN/4.3.3.3.1.2	2415	1211	Procurement of Controls Components (FNAL - M&S) (SBN-II-CS)(FD)(CC)(CC)	90	05/23/16	09/28/16	\$270,000	\$0	\$340,693	\$340,693
40SBN/4.3.3.3.1.3	2484	1212	Assemble Controls Cabinets (FNAL - Labor) (SBN-II-CS)(FD)(CC)(CC)	30	09/29/16	11/09/16	\$0	\$21,544	\$0	\$21,544
40SBN/4.3.3.3.1.4	2430	1213	(TS) - [Ready] - Far Detector Controls Ready for Installation (SBN-II-CS)(FD)(CC)(CC)	0	11/09/16	11/09/16	\$0	\$0	\$0	\$0
40SBN/4.3.3.3.2	2419	1214	FD Internal Cryogenics Construction (SBN-II-CS)(FD)(CC)(ID)	81	02/25/16	06/20/16	\$0	\$0	\$0	\$0
40SBN/4.3.3.3.2.1	2469	1215	(TS) - [Complete] - Procurement of Cold Shield (SBN-II-CS)(FD)(CC)(ID)	0	02/25/16	02/25/16	\$0	\$0	\$0	\$0
40SBN/4.3.3.3.2.2	2471	1216	(TS) - [Complete] - Cold Shield Delivered to CERN (SBN-II-CS)(FD)(CC)(ID)	0	05/20/16	05/20/16	\$0	\$0	\$0	\$0
40SBN/4.3.3.3.2.3	2470	1217	(TS) - [Ready] - Cold Shield Ready for Shipment to Fermilab (SBN-II-CS)(FD)(CC)(ID)	0	06/20/16	06/20/16	\$0	\$0	\$0	\$0
40SBN/4.3.3.3.3	2421	1218	FD External Cryogenics Construction (SBN-II-CS)(FD)(CC)(ED)	100	06/14/16	11/02/16	\$0	\$137,523	\$887,839	\$1,025,362
40SBN/4.3.3.3.3.1	2422	1219	Procurement of External Cryogenics (FNAL - Labor) (SBN-II-CS)(FD)(CC)(ED)	100	06/14/16	11/02/16	\$0	\$137,523	\$0	\$137,524
40SBN/4.3.3.3.3.2	2423	1220	Procurement of External Cryogenics (FNAL - M&S) (SBN-II-CS)(FD)(CC)(ED)	100	06/14/16	11/02/16	\$750,000	\$0	\$887,839	\$887,839
40SBN/4.3.3.3.3.3	2468	1221	(TS) - [Ready] - Cryogenics Components Ready for Installation (SBN-II-CS)(FD)(CC)(ED)	0	11/02/16	11/02/16	\$0	\$0	\$0	\$0
40SBN/4.3.3.3.4	2426	1222	FD Proximity Cryogenics Construction (SBN-II-CS)(FD)(CC)(PD)	180	06/07/16	02/24/17	\$0	\$0	\$0	\$0
40SBN/4.3.3.3.4.1	2427	1223	Procurement of Proximity Components (FNAL - Labor) (SBN-II-CS)(FD)(CC)(PD)	180	06/07/16	02/24/17	\$0	\$0	\$0	\$0
40SBN/4.3.3.3.4.2	2472	1224	(TS) - [Ready] - FD Proximity Cryogenics Ready for Shipment to Fermilab (FNAL - Labor) (SBN-II-CS)(FD)(CC)(PD)	0	02/24/17	02/24/17	\$0	\$0	\$0	\$0

Summary M&S Labor Reference for Basis of Estimate MicroBoone Estimate Reference Controls EQUIP Control Labor Reference Mapping ...



Basis of Estimates

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Basis of Estimate for Tasks under

Summary Task Name: FD Cryogenics Construction (SBN-II-CS)(FD)(CC)

Summary WBS: 40SBN/4.3.3.3

Summary Unique ID: 2384

Summary BOE Number: 40333

WBS	UID	ID	Task Name	Duration in Days	Start Date	Finish Date	Resource Name	Contingency % M&S	Fixed Cost M&S	All Materials (With OverHd)
40SBN/4.3.3.3.1.2	2415	1211	Procurement of Controls Components (FNAL - M&S) (SBN-II-CS)(FD)(CC)(CC)	90	05/23/16	09/28/16	FN_MS_STND_FY15	0%	\$270,000	\$340,693
40SBN/4.3.3.3.3.2	2423	1220	Procurement of External Cryogenics (FNAL - M&S) (SBN-II-CS)(FD)(CC)(ED)	100	06/14/16	11/02/16	FN_MS_STND_FY15	0%	\$750,000	\$887,839

Summary M&S Labor Reference for Basis of Estimate MicroBoone Estimate Reference Controls EQUIP Control Labor Reference Mapping ...

READY



Basis of Estimates

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References for Basis of Estimate for M&S (based on data from MicroBooNE and Mu2e estimates)

Controls:

1. Cryogenic controls (not including installation) - \$255K
 - \$125K –controls hardware
 - \$35K – HMI Interface (Full SCADA – 2, PCs – 2, iHistoriam)
 - \$70K – instrumentation
 - \$25K - Infrastructure (cables, connectors, racks, etc.)
2. ODH hardware (not including installation) – \$13K-\$15K
3. Misc. controls (i.e. UPS) - \$12K-\$14K

Equipment:

4. Gas analyzers – \$125K
5. Gas analyzer panel (outsourced constructions)– \$30K
6. Ar/H2 trailer - \$50K (\$30K to recertify + \$10K panel + \$10K to fill)
7. Main Ar reliefs - \$103K

Piping and piping parts:

Summary M&S Labor Reference for Basis of Estimate MicroBoone Estimate Reference Controls EQUIP Control Labor Reference Mapping ...

READY 100%

Basis of Estimates

- Complete Basis Of Estimate (BOE) forms can be found in the SBN docdb per the table below:

SBN Docdb 740-v2	BOE ND Cryogenics Installation
SBN Docdb 739-v2	BOE ND Cryogenics Construction
SBN Docdb 738-v2	BOE ND Cryogenics Final Design
SBN Docdb 737-v2	BOE ND Cryogenics Preliminary Integration
SBN Docdb 736-v2	BOE FD Cryogenics Preliminary Integration
SBN Docdb 735-v2	BOE FD Cryogenics Installation
SBN Docdb 724-v3	BOE FD Cryogenics Construction
SBN Docdb 725-v3	BOE FD Cryogenics Final Design

In Conclusion

The Cryogenics team has been actively engaged in developing the cost and schedule for the Cryogenics portion of the SBN program. We will continue to iterate and work with the other sub projects to ensure task links are correct and we have the most up to date information.

Thank You!