

# NSF Review of ATLAS High Luminosity Upgrade Construction Progress

August 18, 2021

## Charge to the Review Panel

**WITH LINKS TO DOCUMENTATION/PRESENTATIONS (in red)**

### 1. Completion of Final Design:

a. Review FDR panel recommendations and comment to NSF on whether they have been satisfactorily addressed.

- FDR Review Committee Report - [HL-LHC-doc-967-v2: Closeout Report: NSF FDR September 2019 \(bnl.gov\)](#)
- Recommendation tracking - [HL-LHC-doc-403-v14: NSF Review Recommendations Tracking \(bnl.gov\)](#)
- Mike Tuts Overview Presentation (slides 14-16, 24) – [HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- Mark Oreglia TileCal WBS 6.5 presentation (slides 11, 14-15) – [HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- Stephanie Majewski Trigger WBS 6.8 presentation (slide 38) -- [HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)

b. Have pre-construction technical activities that were separately funded by NSF though the ATLAS operations program been satisfactorily completed?

- Pre-MREFC June monthly report - [HL-LHC-doc-361-v70: NSF Monthly Reports \(Pre-MREFC period\) \(bnl.gov\)](#)
- Mike Tuts Overview presentation (slide 17) – [HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- John Parsons LAr Calorimeter WBS 6.4 presentation (slide 35) – [HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- Mark Oreglia TileCal WBS 6.5 presentation (slide 12) – [HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- Tom Schwarz Muon WBS 6.6 presentation (slide 38) – [HL-LHC-doc-1128-v1: 6.6 Muon L2 Talk for August 2021 IPR \(bnl.gov\)](#)
- Stephanie Majewski Trigger WBS 6.8 presentation (slide 25) -- [HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)

## 2. **Project Management:** Examine and comment to NSF on:

a. Implementation of the Project Execution Plan, project controls and financial reporting, including subawardee oversight. *Examine the current version of the Project Execution Plan,*

- Project Execution Plan - [HL-LHC-doc-78-v33: NSF Project Execution Plan \(PEP\) \(bnl.gov\)](#)
- Cost Estimating plan - [HL-LHC-doc-197-v16: Cost Estimating Plan \(bnl.gov\)](#)
- Mike Tuts Overview presentation (slides 9-13, 18-22) – [HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- Gustaaf Brooijmans presentation (slides 6-11) – [HL-LHC-doc-1117-v3: PO Talk for NSF Annual Review August 2021 \(bnl.gov\)](#)
- John Parsons LAr Calorimeter WBS 6.4 presentation (slide 24-28) – [HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- Mark Oreglia TileCal WBS 6.5 presentation (slide 17) – [HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- Tom Schwarz Muon WBS 6.6 presentation (slides 25-29) – [HL-LHC-doc-1128-v1: 6.6 Muon L2 Talk for August 2021 IPR \(bnl.gov\)](#)
- Stephanie Majewski Trigger WBS 6.8 presentation (slide 21, 40) -- [HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)

*representative change control actions, and*

- MREFC Monthly reports – [HL-LHC-doc-1022-v13: NSF MREFC Monthly Report \(bnl.gov\)](#)
- BCP log - [HL-LHC-doc-627-v29: NSF BCP Contingency Log \(bnl.gov\)](#)
- Mike Tuts Overview presentation (slide 22) – [HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)

*recent Earned Value Management Reports and advise NSF on their use as effective management tools.*

- Cost Performance Reports (CPR) for April, May, June - [HL-LHC-doc-865-v5: Cost Performance Report - June 2019 \(bnl.gov\)](#)
- MREFC Monthly reports (shows June, see archived earlier versions for earlier periods) – [HL-LHC-doc-1022-v13: NSF MREFC Monthly Report \(bnl.gov\)](#)
- Mike Tuts Overview presentation (slide 34) – [HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- Gustaaf Brooijmans presentation (slides 10-14) – [HL-LHC-doc-1117-v3: PO Talk for NSF Annual Review August 2021 \(bnl.gov\)](#)

b. Financial tracking of COVID and non-COVID costs & cumulative COVID costs-to-date.

- Gustaaf Brooijmans presentation (slides 27-29) – [HL-LHC-doc-1117-v3: PO Talk for NSF Annual Review August 2021 \(bnl.gov\)](#)
- John Parsons LAr Calorimeter WBS 6.4 presentation (slide 30) – [HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- Mark Oreglia TileCal WBS 6.5 presentation (slides 18-20) – [HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- Tom Schwarz Muon WBS 6.6 presentation (slides 31-32) – [HL-LHC-doc-1128-v1: 6.6 Muon L2 Talk for August 2021 IPR \(bnl.gov\)](#)
- Stephanie Majewski Trigger WBS 6.8 presentation (slide 29) -- [HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)

c. Risk management process, including completeness of current projections of risk and potential mitigation costs and the adequacy of the contingency budget and schedule to mitigate future non-COVID risks. *Advise NSF on the completeness of the risk register in identifying currently foreseen non-COVID related threats and opportunities with appropriate probabilities and estimated cost and schedule.*

- Risk Register - [HL-LHC-doc-196-v59: Risk Register \(bnl.gov\)](#)
- Risk Management Plan - [HL-LHC-doc-4-v18: Risk Management Plan \(bnl.gov\)](#)
- Mike Tuts Overview presentation (slides 26, 35) – [HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- Gustaaf Brooijmans presentation (slides 16-24) – [HL-LHC-doc-1117-v3: PO Talk for NSF Annual Review August 2021 \(bnl.gov\)](#)
- John Parsons LAr Calorimeter WBS 6.4 presentation (slide 33) – [HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- Mark Oreglia TileCal WBS 6.5 presentation (slide 22) – [HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- Tom Schwarz Muon WBS 6.6 presentation (slide 35) – [HL-LHC-doc-1128-v1: 6.6 Muon L2 Talk for August 2021 IPR \(bnl.gov\)](#)
- Stephanie Majewski Trigger WBS 6.8 presentation (slide 28) -- [HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)

d. Adherence to the QA/QC processes presented at FDR. *Advise NSF on whether it is being implemented as intended.*

- Mike Tuts Overview presentation (slides 24-25) – [HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- John Parsons LAr Calorimeter WBS 6.4 presentation (slide 38) – [HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- QA/QC WBS 6.4.1 FEE documentation - [HL-LHC-doc-640-v6: WBS 6.4.1.1 and 6.4.1.2 QA/QC Documents \(bnl.gov\)](#)
- QA/QC WBS 6.4.2 FEB2 documentation - [HL-LHC-doc-861-v2: QA/QC document for LAr FEB2 \(WBS 6.4.2\) \(bnl.gov\)](#)
- QA/QC WBS 6.4.3 BEE documentation - [HL-LHC-doc-862-v2: QA/QC document for LAr sRTM \(WBS 6.4.3\) \(bnl.gov\)](#)
- Mark Oreglia TileCal WBS 6.5 presentation (slide 25) – [HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- WBS 6.5.1 Main Board - [HL-LHC-doc-680-v3: QA/QC for Tile Main Boards WBS 6.5.1 \(bnl.gov\)](#)
- WBS 6.5.3 ELMB MB - [HL-LHC-doc-853-v2: QA/QC for 6.05.03 ELMB2 motherboard \(bnl.gov\)](#)
- WBS 6.5.4 LVPS - [HL-LHC-doc-857-v8: QA/QC for Tile LVPS WBS 6.5.4 \(bnl.gov\)](#)
- Tom Schwarz Muon WBS 6.6 presentation (slide 39) – [HL-LHC-doc-1128-v1: 6.6 Muon L2 Talk for August 2021 IPR \(bnl.gov\)](#)
- WBS 6.6.1 sMDT - [HL-LHC-doc-848-v2: QA/QC for WBS 6.6.1 sMDT \(bnl.gov\)](#)
- WBS 6.6.3 TDC - [HL-LHC-doc-630-v6: QA/QC for TDC \(bnl.gov\)](#)
- WBS 6.6.4 CSM - [HL-LHC-doc-846-v4: QA/QC for WBS 6.6.4 CSM \(bnl.gov\)](#)
- WBS 6.6.5 LOMDT - [HL-LHC-doc-847-v4: QA/QC for WBS 6.6.5 LOMDT \(bnl.gov\)](#)
- Stephanie Majewski Trigger WBS 6.8 presentation (slide 31, 43) -- [HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)
- WBS 6.8.1 L0Calo - [HL-LHC-doc-852-v1: 6.8.1 L0 Calo QA/QC Document \(bnl.gov\)](#)
- WBS 6.8.2 HTT - [HL-LHC-doc-849-v1: 6.8.2 HTT QA/QC documents \(bnl.gov\)](#)
- WBS 6.8.3 GEP - [HL-LHC-doc-851-v2: 6.8.3 Global Event Processor Firmware QA/QC \(bnl.gov\)](#)

### 3. Plans for FY 2022

- a. Examine and comment to NSF on COVID impact modelling and assessment by the project of forecast COVID-related cost and schedule impacts. Advise NSF on the realism of assumptions and the credibility of the models used, and the completeness (based on current understanding) of additional schedule and budget needs. Advise NSF on the timing for when additional NSF funds to offset pandemic impacts are likely to be needed within the project.

- [Gustaaf Brooijmans presentation \(slides 26-35\) – HL-LHC-doc-1117-v3: PO Talk for NSF Annual Review August 2021 \(bnl.gov\)](#)
- [Mike Tuts Overview presentation \(slide 23\) – HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- [John Parsons LAr Calorimeter WBS 6.4 presentation \(slides 29-30,36\) – HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- [Mark Oreglia TileCal WBS 6.5 presentation \(slide 24\) – HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- [Tom Schwarz Muon WBS 6.6 presentation \(slides 30-32, 38\) – HL-LHC-doc-1128-v1: 6.6 Muon L2 Talk for August 2021 IPR \(bnl.gov\)](#)

- b. Examine and comment to NSF on the realism of plans for the coming project year (10/1/21 – 9/30/22) based on current understanding of COVID pandemic impacts and mitigation strategies, and lessons learned from the first year of construction.

- [Gustaaf Brooijmans presentation \(slides 26-35\) – HL-LHC-doc-1117-v3: PO Talk for NSF Annual Review August 2021 \(bnl.gov\)](#)
- [Mike Tuts Overview presentation \(slide 29\) – HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- [John Parsons LAr Calorimeter WBS 6.4 presentation \(slides 40-41\) – HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- [Mark Oreglia TileCal WBS 6.5 presentation \(slides 24,27\) – HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- [Stephanie Majewski Trigger WBS 6.8 presentation \(slides 33-35\) -- HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)

c. Examine the forecast risk-adjusted expenditure and obligation profile (including pandemic-related risks) for the coming fiscal year and advise NSF on the adequacy of its substantiation. Make recommendations for modification, if appropriate.

- Gustaaf Brooijmans presentation (slides 26-35) – [HL-LHC-doc-1117-v3: PO Talk for NSF Annual Review August 2021 \(bnl.gov\)](#)
- Mike Tuts Overview presentation (slides 26, 29) – [HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- John Parsons LAr Calorimeter WBS 6.4 presentation (slide 34) – [HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- Mark Oreglia TileCal WBS 6.5 presentation (slide 21) – [HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- Tom Schwarz Muon WBS 6.6 presentation (slide 36) – [HL-LHC-doc-1128-v1: 6.6 Muon L2 Talk for August 2021 IPR \(bnl.gov\)](#)

d. Do the materials presented by the project provide adequate substantiation for re-baselining within the next 6-12 months? If not, what criteria must be satisfied as a precondition for conducting a re-baselining review that would confidently bound estimates for additional schedule and budget based on current understanding?

- Gustaaf Brooijmans presentation (slides 36) – [HL-LHC-doc-1117-v3: PO Talk for NSF Annual Review August 2021 \(bnl.gov\)](#)

## 4. Technical Progress

- a. Comment on the adequacy of progress and planning across all Level 3 Work Breakdown Structure (WBS) elements, considering COVID-19 uncertainties. Identify non-COVID-related impediments to technical progress and comment on the adequacy of plans and efforts exerted by ATLAS to mitigate their impacts.

- [Mike Tuts Overview presentation \(slides 3-6\) – HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)
- [John Parsons LAr Calorimeter WBS 6.4 presentation \(slides 15-22\) – HL-LHC-doc-1127-v1: L2 LAr Presentation at 2021 NSF Annual Review \(bnl.gov\)](#)
- [Mark Oreglia TileCal WBS 6.5 presentation \(slides 12-15\) – HL-LHC-doc-1120-v3: L2 6.5 Tile talk for 2021 NSF review \(bnl.gov\)](#)
- [Tom Schwarz Muon WBS 6.6 presentation \(slides 17-23\) – HL-LHC-doc-1128-v1: 6.6 Muon L2 Talk for August 2021 IPR \(bnl.gov\)](#)
- [Stephanie Majewski Trigger WBS 6.8 presentation \(slides 14-19, 22, 25\) -- HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)

- b. Comment on the level of engineering and scientific labor that is being applied to support Level 0 Trigger development, as evidenced by satisfactory technical progress in firmware development.

- [Stephanie Majewski Trigger WBS 6.8 presentation \(slide 26\) -- HL-LHC-doc-1125-v2: 6.8 Trigger L2 Talk for August 2021 Annual Review \(bnl.gov\)](#)

*Note: Because the EPO plans presented at FDR described how ATLAS would leverage the high luminosity upgrade activities within the context of its existing EPO and Diversity programs, NSF will review the current status of those plans as part of the ATLAS 5-year operations proposal review (July 20-21, 2021).*

- [Mike Tuts Overview presentation \(slide 16\) – HL-LHC-doc-1126-v2: 2021-08-18 Tuts Overview presentation for NSF review \(bnl.gov\)](#)