

Memorandum

22-Jan-2016

To: Mike Lindgren, Chief Project Officer
From: Nigel Lockyer, Director
Subject: Director's Progress Review of the US-CMS HL-LHC Upgrade Project

Please organize and conduct a Director's Review on February 2-4, 2016 to assess the US-CMS HL-LHC (a.k.a. Phase II) Upgrade Project. Upgrades to the CMS detector at the LHC will be needed for the future High Luminosity LHC running period, scheduled to start in 2026 and last about 10 years. These upgrades will be installed during Long Shutdown 3, which is scheduled to last for 30 months, starting in January 2024. The DOE has provided a preliminary budget profile scenario and the project anticipates receiving Critical Decision 0 (CD-0) approval in early 2016. NSF has scheduled a Conceptual Design Review (CDR) in March 2016 in anticipation of eventual construction funding through the Major Research Equipment and Facilities Construction (MREFC) account.

This Director's review is to inform the laboratory about the state of the overall planning and readiness for presentation of the project plans to the DOE and NSF. The focus of this review is cost, schedule, management, ES&H, and technical readiness for meeting funding agency expectations for a project at this stage. The review committee should respond to the following questions:

1. **Design and Scope.** Have the project's performance requirements been sufficiently defined and do they flow down from the overall CMS plan? Are the conceptual designs sound and likely to meet the performance requirements? Do the designs capture the entire scope and are they adequately defined to support the cost and schedule estimates? Is there an adequate plan for design reviews? Is the R&D plan appropriate to mitigate technical risk on the project's timescale?
2. **Cost and Schedule.** Are the cost and schedule estimates credible and realistic? Do the estimates meet the funding agency targets? Are the estimating methodologies clearly defined and appropriate? Has adequate cost, scope and schedule contingency been identified to account for risk? Are assumptions used in the estimates, such as support from the core research program, realistic?
3. **Management.** Is the project appropriately staffed and being effectively managed at this stage? Are the roles, responsibilities, and contributions of DOE, NSF, and International CMS defined and appropriate? Have management plan documents been developed? Do the NSF CDR and NSF Project Execution Plan fulfill the NSF's expectations for conceptual design? Is there a credible plan for systems engineering functions such as requirements management, interface control, and QA? Are the projected resources sufficient to complete design, construction, and installation and are these resources likely to be available when needed? Are critical procurements sufficiently understood and coordinated across the organizations involved? Is the risk management system in place and appropriate? Have risks been adequately identified?
4. **Environment, Safety, and Health.** Is ES&H being appropriately addressed for this stage of the project?

The committee is asked to present a draft of their report at the review closeout and to issue the final report within two weeks of the review's conclusion.



Nigel Lockyer
Director
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