



BDS KOM Close-Out

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SLAC

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BDS Design Maturity

- Lattice design is probably most mature of any Accelerator System
 - **NLC legacy**
 - **Many iterations**
- Now is a good time to consolidate / review
 - **Understand ‘base design criteria’**
 - **Cost performance derivatives**
 - **Cost reduction**
- Current RDR status provides an excellent base to start from.



Understanding Cost Drivers

- Critical for EDR planning
 - “value” engineering and cost-driven design should be reflected in the WBS
 - A cost leverage should be assigned to each identified WP.
- Critical (accelerator design) items
 - How much does support of 1TeV cost?
 - HEP diagnostics requirements driving costs
 - General lattice design / requirements / functionality
- Engineering cost drivers
 - **Concrete!** (Keep It Short and Simple)
 - **Water cooling**
 - **Power**

Tightly connected and must be iterated (VALUE engineering)

AS link to CFS must be clearly defined

Integration WP



Planning and Process (General)

- Critical for cost containment
- Difference from RDR phase: we have a cost base
- Must have process for maintaining / updating / reviewing VALUE estimate throughout EDR phase
 - **Avoid last minute panic / shock**
- Change Control will provide some of this
 - **But not all. Small changes can accumulate**
- Documentation is critical!!!

- Action item for PM and Technical Area Group Leaders.
 - **FNAL meeting agenda**



CF Comments

- Design of water cooling system specific to BDS is required
 - **Current estimate is scaled from ML shaft**
 - **ΔT of 20deg (F) assumed (as in linac)**
 - **(has been clearly identified by groups in this meeting)**
- Tunnel air temperature stability
 - **Understand accelerator driven requirements**
 - **(some simple models/estimates are possible)**
 - **At what point / levels does there requirement become challenging?**
 - Cost begins to escalate
 - Might be regions of tight tolerance (as in light sources)
- Vibration criteria for magnets (critical for BDS)
 - **Review / define / iterate**



Magnets

- Part of the “critical path” for engineering design:
 - **Lattice design**
 - **Magnet specifications**
 - **Power supply and cable definitions**
 - **Water/Air cooling requirements**
 - **Underground Volume**
- Level of engineering effort must be balanced against cost leverage:
 - ~64MILCU for Magnet systems
 - ~11% of BDS cost
 - <1% TPC
 - **knock-on effects may be more critical (CFS again)**
- Consolidation of magnet families a clearly desirable (action item)
 - **Lattice design.**
- Note all magnets born equal
 - **Critical magnets requiring prototyping**
 - **(unlikely needed in ED phase given cost leverage and BDS time-scale)**
- FMEA, Radiation Hardness requirements → availability
 - **Requirements need better definition**
 - **Again, cost derivative / leverage must be understood**



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Other Systems

- Instrumentation
 - **Identify critical path for EDR**
 - **How much of these systems must be “fully engineered” by 2010**
 - We expect very few if any
 - Detail engineering can start after project approval
 - Result: mostly R&D effort, which will need to be justified to PMs during review (note large return on EoI)
- Vacuum
 - **Again, identify critical EDR path (cost-drivers)**
 - **Full 100% engineering for BDS not required by 2010**
 - **Rank list of issues presented**
 - **Review 100um alignment issue**
 - **IR vacuum (very special case) should be moved to IR & IR Integration**
- Collimation
 - **Study concept of shorter 500 GeV CM with consumable collimator solution for TeV upgrade**



IR & IR Integration

- Biggest single point cost associated with BDS
- Will require special attention during ED Phase
 - **Careful planning needed**
 - **Interface definitions critical**
 - **Base design criteria for detector groups**
- SC FD included in here
 - **Integration aspects the main challenge**
- Well defined coordination with detector groups
 - **Problem of 'design maturity' of detectors noted**
- Some concern that costs are already beginning to escalate in this area
- Cost control for this critical item must be high-priority during ED phase

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Alternative Crossing Angle Solutions

- All current designs have weaknesses and performance issues
 - **Baseline is most mature but there are still valid questions:**
 - Crab cavity (alignment specs; interaction with tuning systems)
 - Complex IR geometry: impact on tuning / stability
 - ...
- Although less mature, it remains prudent at this time to keep alternatives as back-up
- Downstream diagnostics remain a critical 'down-select' criteria
 - **But needs review also for baseline**
- WP for alternatives should be raised to L4 in WBS NJW1
 - **Consistent with other AS (e.g. e+ source)**
 - **Direct call for EoI**
 - **Support for these activities should be identified**
- Baseline remains primary engineering focus
 - **Additional resources for ACD WP will need to be found.**

Slide 9

NJW1

Andrei Seryi voiced some concerns over this proposed modification. It will be discussed.

Nicholas Walker, 10/15/2007



WP definitions (a recommendation for discussion)

- Accelerator Physics Design NJW2
- BDS Integration → *primary WP connection to CFS*
- IR & IR Integration
- Crab Cavity
- Beam Dumps
- Collimation System
- Magnets & PS
- Instrumentation
- Vacuum
- Alternative IR geometries
- Physics Options

Slide 10

NJW2

Andrei Seryi raised concerns over this proposed re-structuring. He noted that it did not take into account his organisation structure, which includes a support Integration Engineer.

He reiterated his concerns over the Alternative and Physics Options WP.

Nicholas Walker, 10/15/2007



Policy Decisions

- Require top-down policy from PM/EC/HEP community for
 - **Support of TeV upgrade**
 - **Options:**
 - G-g, fixed target,...
 - **General approach: incremental cost**
- ES&H requirements policy (in progress)
- Managing ACD



BDS R&D

- Many R&D topics covered in last two days
- S4 priorities identify (mostly) critical single-point R&D items
 - **Must understand time-scale for necessary R&D**
 - **How items impact BDS design**
 - Risk analysis
- Critical R&D milestones need to be included in schedule/WBS
 - **Identify their relationship to engineering design**
 - **Again CFS impact is critical path**



Short Term Milestones

- Complete WBS matrix
 - **Review/refine WBS (WP definitions)**
 - templates
 - **Consolidate EoI**
 - Understand resource base
- Document RDR baseline in EDMS
 - **All relevant documentation in EDMS structure**
 - **Re-establish traceability between design and cost information**
 - Specifications etc.
- Begin first iteration of accelerator design
 - **Lattice review**
 - **Aim for partial EDR freeze by Sendai**
- *Any one of these will keep BDS management 100% occupied*

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Close-Out Report

- This presentation is just the beginning
- PM will produce a draft close-out report (from template) which will contain more detail
 - **Iterate with Andrei before publication**
- All reports will hopefully be available by GDE meeting
 - **DR excluded.**



An Excellent Meeting...

- ...if not a little intense!
- Many thanks to all the presenters
 - **All comments and suggestions have been duly noted and will receive our attention.**
- Many thanks to our host (Andrei)