

November 2, 2006

**To: Distribution**  
**From: GDE Change Control Board**  
**Subject: Response to the Change Request (September 21, 2006) for the BCD Beam Delivery Section (CCR#17)**

## **Preamble**

This is the CCB response to the proposed changes (CCR#17) to apply to the Beam Delivery section of the Sep. 2006 version of GDE ILC Baseline Configuration Document [1]. The present BDS BCD does not explicitly specify the method of underground assembly of detector facilities. However, it has been implicitly assumed in the past RDR discussion that detectors are assembled underground. This change request is to specify in the BCD that assembly of the detectors will be done on-surface, in a manner similar to the assembly of the CMS detector at CERN. According to the requesters, this is expected to reduce the construction time of the IR-related portion of the ILC, since the detector subassembly work does not have to wait for completion of the underground hall; it is also expected to reduce the construction cost.

CCB received the change request from A. Seryi, representing the Beam Delivery System (BDS) Area Group, on September 21, 2006 and CCB forwarded it to GDE the same day [2]. This Change Request was treated as Class-1. T. Markiewicz and G. Blair were assigned as the CCB reviewers. In addition to inviting comments from all within GDE and GDE-related work groups, CCB requested remarks from WWS contacts concerning the impact on the detectors. The WWS response was received on Oct.26, 2006 (Appendix A).

## **Summary**

### **Requester proposed:**

1. To specify in the BCD that assembly of the detectors will be done on-surface, in a manner similar to that for the CMS detector at CERN.

This change request, according to the requesters, will reduce the duration of ILC construction by 2-2.5 years, because, with the proposed scenario, detector assembly on the surface can start earlier than underground. The requesters also anticipate a cost saving, resulted from 40-50% reduction of the collider hall area.

### **CCB response:**

1. **CCB agrees that the cost change (in this case, reduction) expected from this change request qualifies as Class-1.**
2. **CCB accepts this change request as is, for reasons detailed below in the Discussion section.**

## **Discussion:**

### **Technical Issues (including extracts from original CCR):**

1. If the detectors are assembled underground, it will probably not be possible to meet the overall (detectors plus machine) construction goal of seven years. Faced with a similar problem of simultaneous detector and underground hall construction, CMS at CERN LHC opted for surface assembly of major (2000t) detector subcomponents which were then lowered, tested and readied for beam, into the underground beam cavern. Discussions with ATLAS and CMS, backed up by on-site visits of the MDI panel, indicated that this decision was validated by construction experience, and is considered to be a reasonable model to adopt for ILC at this point in the design lifecycle..
2. The Machine Detector Interface panel has considered on-surface assembly [4], and concluded that it is needed for scheduling reasons and that it can be made to work for all detector concepts. The MDI panel also noted that the design of the assembly as well the geometry of the experimental hall and shafts are ongoing; more work is needed to finalize the configuration [5].
3. One of positive consequences of on-surface assembly is reduction of the required volume of the hall. In comparison with the hall area assumed in the Vancouver WBS, which is  $144 \times 32 \text{ m}^2$  combined for two halls, the required hall area may be reduced to  $(100-110) \times (22-25) \text{ m}^2$  for a single collider hall housing both detectors [6]. While it is not clear how much of this reduction is due to BDS “pushing-back” on the original “blue sky” desires of the detector concept groups and how much is directly attributable to “surface assembly,” it is a welcome reduction from the cost perspective.
4. It is been presently being discussed whether the “pure CMS-like” or a “modified CMS-like” surface assembly would be adopted [5], [6]. For the latter, a smaller shaft (16m vs 20m) is needed; however the underground crane (400t) is larger and would require a taller collider hall. These are important details and the RDR group must understand that future changes may and probably will occur as the detectors to be built are better defined.

### **Implications to the Physics Programs:**

1. There may be some impacts in terms of preparation of detector subsystems and assembly scheduling. However, no significant impacts have been explicitly reported to CCB, in terms of the expected performance of the detector systems currently under development.
2. A decrease in the ILC construction period is considered welcome..

### **Feedback from WWS:**

1. A positive WWS response has been given to an inquiry from CCB, and is attached in Appendix A of this memo.

### **Cost Issues:**

1. A reduction of the collider hall area should result in cost savings; while the exact amount is open for discussion it is clear that the underground volumes required in the surface assembly model will be less than that in an underground assembly model.
2. The CCR has an impact on the CF&S configuration of the detector region; larger on-surface buildings for detector construction are also needed.

### **CCB Assessment:**

1. CCB agrees that the main impact to the ILC is a welcome reduction of up to 2.5 years in the construction schedule.
2. CCB agrees that the eventual impact to the ILC costs are likely to result in a reduction, but this involves a balance between the size of the underground halls and the need for additional surface buildings. The on-surface space tends to be much less expensive than underground space. However, it needs more detailed evaluation, and the CCB urges that some resolution be reached by the relevant parties.
3. CCB acknowledges that there will be impacts on the detectors, but these are not considered to be critical; the WWS concurs with this view.
4. CCB notes the fact that formally responsible collaborations are yet to be established for *construction of* detector facilities at ILC. Therefore, to some it might appear somewhat premature and presumptuous for the beam delivery system coordinators of GDE to specify this level of details for experimental facilities now. However, CCB concurs with the BDS Area Group leaders in considering that making an explicit assumption on the detector assembly, as proposed, is a valuable part of the exercise in which GDE attempts to optimize the project from all standpoints of scientific research, performance and cost, and through which make the outcome part of the community asset. All parties concerned have done due diligence to study, inform and discuss the issues with all relevant parties. Even if this layout model were to change with time as the detector collaborations mold their concepts into a design to be built or as the number of years required for tunneling is better known, this exercise has opened many useful threads that will certainly become a part of the detailed detector design process.

## **References**

- [1] [http://www.linearcollider.org/wiki/doku.php?id=bcd:bcd\\_home](http://www.linearcollider.org/wiki/doku.php?id=bcd:bcd_home) .
- [2] <http://lcdev.kek.jp/ML/PubCCB/msg00079.html>
- [3] Martin Gastal, "[Construction schedule for CFS](#)", 19/07/2006; Andrei Seryi, "[BDS and Detector schedules, for discussion at MDI meeting](#)" 15/08/2006; Martin Gastal, "[Construction schedule for CFS, Updated according to Vancouver workshop](#)", 28/08/2006.
- [4] [Materials presented at MDI panel meeting](#) on 15/08/2006.
- [5] "[Minutes of the MDI panel meeting](#)", 15/08/2006.
- [6] Discussion of GLD hall requirements for on-surface assembly, Yasuhiro Sugimoto, "[\[lcdds 240\] GLD Experimental hall](#)", "[Hall layout](#)", 21/08/2006; Andrei Seryi, "[\[lcdds 260\] Modified assembly scheme for GLD](#)", "[Hall layout](#)", 06/09/2006; Yasuhiro Sugimoto, "[\[lcdds 264\] Re: modified assembly scheme for GLD](#)", "[Hall layout](#)", 12/09/2006; Jean-Luc Baldy, "[\[lcdds 267\] FW: layouts questions](#)", 13/09/2006.

## Appendix A

Subject: Surface assembly  
From: Hitoshi Yamamoto  
To: CCB  
Date: Thu, 26 Oct 2006 00:04:28 +0900

Dear CCB,

We WWS understand that the surface assembly is required to meet the time schedule of ILC that it should start commissioning at  $t_0 + 7$  years where  $t_0$  is the completion of the ILC TDR. After examining the assembly procedurs of detector, we conclude that surface assembly is possible for existing detector concepts acknowledged by WWS. Normally, we think such detail of detector assembly procedure should lie outside of accelerator design. However, we endorse the CCR since it is mandatory for realizing the stated time schedule of the ILC project.

Best regards

WWS co-chairs  
representing WWSOC

The communication above is a response from WWS to the inquiry from CCB which is reproduced below:

Subject: [Ext-GDE-67] GDE BCD Change Request from BDS (Surface Assembly of Detectors)  
From: N.Toge  
To: J.Brau, F.Richard and H.Yamamoto  
cc: D.Angal-Kalinin, A.Seryi, GDE  
Date: Sat, 23 Sep 2006 06:36:30 +0900 (JST)

Dear Jim, Francois, Hitoshi,

Nobu Toge from CCB/ILC-GDE here.

I am writing to ask your comments and remarks as Co-chairpersons of WWS, concerning the BDS change configuration request that was submitted on Sep. 21, 2006. The description for this CCR can be found at

<http://lcdev.kek.jp/ML/PubCCB/msg00079.html>

or as item #17 at

[http://www.linearcollider.org/wiki/doku.php?id=bcd:bcd\\_history](http://www.linearcollider.org/wiki/doku.php?id=bcd:bcd_history) .

This change request relates to an attempt at clarifying the assembly procedure for ILC detectors.

While the present BDS BCD does not explicitly specify the method of underground assembly, it has been implicitly assumed in the BCD that detectors are assembled underground. Now, the change request is to specify in BCD that assembly of detector will be done on-surface, in a manner similar to what was done for CMS detector at CERN. According to the requesters, this is expected to reduce the construction time of the IR-related portion of ILC, since the detector subassembly work does not have to wait for completion of the underground hall, and is also expected to reduce the construction cost.

The information of primary interest from you is your comments, reactions and assessment on anticipated impacts concerning the detector concept, its construction, operation and maintenance in conjunction with physics research potential that this configuration change might incur. We are interested in hearing both your expert insights as well as opinions (average, distributions, etc) of the WWS members and their friends that you have access to.

We note that the MDI has had opportunities to discuss on this matter in the past month (August 15, 2006) with its minutes having been sent to WWS, which is available as

[http://www-project.slac.stanford.edu/ilc/acceldev/beamdelivery/rdr/docs/CCR\\_surface/Revised%20MDI%20meeting%20minutes%20\(81506\).txt](http://www-project.slac.stanford.edu/ilc/acceldev/beamdelivery/rdr/docs/CCR_surface/Revised%20MDI%20meeting%20minutes%20(81506).txt) .

Therefore, I believe this particular topic is not too new to you. However, we feel that it is prudent to ask for opinions of the bigger WWS body, and to incorporate them as inputs to evaluate this change request for CCB. And if the minutes above already represents the consensus opinion of WWS, with a good approximation, CCB should learn it explicitly from you, too.

We would greatly appreciate if you could respond as soon as possible.

Sincerely,

- Nobu Toge (KEK, Accelerator Lab)