

# **The ILC Engineering Design Phase**

## **– general principles and some outline proposals**

GDE Executive Committee  
4/2/07

### **1. Executive Summary**

This document addresses the structures necessary to take the GDE into the post-RDR period.

**Estimates from comparable projects imply that an increase in the global ILC effort of around a factor two should be sufficient to produce a technical design of enough detail to allow approval by the interested governments. Such an increase would also maintain the internal momentum of the ILC project.**

**The management structure of the GDE should be capable of adaption to the new era, with the establishment of a strong project-management board and a project manager who would report to the Director.**

**The expansion of the R&D and development of the engineering design should be carried out through a work-package structure with appropriate mechanisms for workpackage selection and to encourage the formation of optimal consortia.**

**The structure of the post-RDR phase should be defined by a Memorandum of Understanding between the interested parties.**

### **2. Introduction**

1. It is expected that the period following the release of the RDR will be dominated by reviews and political discussion, which may well take of the order of six months. It is essential that during this period, which will inevitably be characterised by a necessity to recuperate and take stock, momentum should not be lost and that the shape of subsequent work of the GDE should have been widely discussed and agreed with all stake holders, both internal and external. The purpose of this document is to set out some general principles on which to base the EDR phase and then to go on to make some specific proposals for implementation.
2. Initial ideas were presented to the GDE during the Valencia Workshop in November 2006 and refined by the EC in subsequent meetings. These further ideas were presented to the MAC with the ILCSC in attendance in January 2007. It is intended that the current document form the basis for further development and will be the

starting point for discussion at the Beijing workshop in February 2007, at which substantial time has been scheduled for this discussion both in plenary and parallel sessions. This document therefore represents a snapshot of the GDE thinking on the EDR phase and will certainly evolve over the next few months, and specifically over the next few days, following the Beijing discussions.

### 3. General Principles

3. The general charge on which all of our planning is based is that the GDE is required to deliver an ILC engineering design with sufficient technical detail to be submitted to governments for approval in 2010. We must be confident that this engineering design can be built within the specified budget and deliver the required performance.
4. There are three main objectives that the GDE must accomplish to discharge this task:
  - a) ensure that the internal momentum of the GDE is maintained and that the tasks the GDE sets itself allow scope for the enthusiasm and commitment of the international ILC community to continue to grow;
  - b) produce the technical information required and agreed by the contracting governments as necessary to proceed to approval of the project;
  - c) ensure that the world-wide R&D programme is coordinated to give the optimum return on the investment of the contracting governments, and that the critical top-priority R&D is successfully completed on the required timescale.
5. The delivery of these three objectives requires a robust management, an organization fit for purpose and with the required resources to accomplish its aims. In the absence of any detailed information from FALC it is necessary to try to estimate the resources required. We have looked at two international projects, each with similarities and differences to the ILC, in order to try to estimate the FTE years necessary to produce their equivalent of the RDR phase. These projects were ITER, an international project approved in all three regions, and XFEL, a predominantly but not exclusively European project on the verge of approval. A fairly exact estimate of the effort required to produce a TDR was possible for the XFEL; it is more difficult to produce such a directly comparable figure from ITER. However, this information, together with estimates already made by some GDE area systems, leads to a similar conclusion, *viz.* that a factor of approximately two in the global ILC effort is required to complete the EDR on the required timescale.
6. We have examined the GDE itself and concluded that substantial reform is required to its membership and structure. The current GDE is a relatively small body. We propose to expand the GDE to include all those working on approved GDE & ILC project with at least 50% FTE.

7. The top-level management of the GDE will remain an Executive Committee similar to the current one, consisting of the Director, three Regional Directors and Three Accelerator Directors.
8. The RDR Management Board will be replaced by a Project Manager (PM) and a Project Management Team (PMT) containing all support, e.g. secretarial, web, Excel, etc., necessary to ensure strong coordination of the project. The PM will report directly to, and work closely with, the Director.
9. The EDR itself will be organised in workpackages. In general the workpackages will be formulated around area systems; this does not preclude a workpackage formed around a technical system where this has clear advantages. The formation of consortia of all types to deliver the workpackages will be encouraged by the GDE. Close consultation will take place with laboratory directors and other senior figures to ensure that the workpackages are optimally defined. The major task of the PMT will be to monitor the progress of the workpackages, ensure that technical developments with implications across other workpackages and best practice are distributed throughout the GDE. Flexibility and responsiveness will be necessary from the PMT as the EDR progresses. In particular it is necessary to ensure as far as possible that partners joining the project at whatever stage can be assigned responsibilities appropriate to their resources, competences and aspirations.
10. The engineering for the ILC design, and the R&D program, will need to be closely integrated in the workpackage structure. Clear milestones and technology choices will need to be defined to meet the EDR schedule. Because of the schedule pressure, there will be a number of cases where the project will need to adopt proven technologies even though promising alternates may be under development. These alternates should continued to be supported and managed by the ILC PM, assuming that useful results could potentially be delivered on a timescale commensurate with the ILC.
11. The involvement of consortia in the workpackages and GDE in general will be governed by Memoranda of Understanding between the GDE and the consortia and/or laboratories.
12. The role and composition of the RDB, CCB and DCB will be reviewed in the light of the workpackage structure once this has been completely specified and the PMT is in place.
13. The process to solicit and then if necessary select a site should begin within a year to eighteen months. This will be closely coordinated with FALC, ILCSC and other interested parties.

## **4. Some details of implementation**

### ***Project Management***

14. The appointment of the PM is a vital one and should take place as rapidly as possible. The EC, which will form the search committee, has begun this process already by soliciting possible names from a wide variety of sources. It is hoped that an appointment can be made by the time of the DESY LCWS meeting in June 2007.
15. The model for the PM's home base will be similar to that currently in operation for B. Barish, viz administrative support is concentrated at the GDE home base, currently Fermilab, but the PM will have a local office at his/her current home base, or wherever (s)he considers most appropriate to the task. It is clear that in any case the PM will have to make substantial trips to the three regions as one of the major parts of the task of coordinating the workpackages and supervising the preparation of the EDR.
16. There will need to be a PM secretariat, which should also be based at the GDE home base, and can be developed from the current GDE office at Fermilab. The team will need to have support for the web, Excel, EDM, database, registry of technical drawings etc.
17. The desirability of a regional element for the project management, and the interaction with the Regional Directors, some of whom have responsibilities for programme management and R&D, needs to be further examined once the PM has been appointed. The question of the possible rotation of the GDE home base or some fraction of it to other regions during the EDR period needs to be considered further.

### ***Workpackages***

18. A first cut at defining workpackages will be set in train immediately by appointing a task force that will be formed at the Beijing meeting. This should report back as soon as possible, preferable before April 1.
19. The final definition of workpackages should build on the output of this task force and take place once the Project Manager is appointed. It should be decided by a "WPD committee" (WPDC), consisting of the PM team and members drawn substantially from the R&D board and other GDE members. It should be chaired by the PM and take account of discussions with the laboratory directors and others holding substantial resources in order to ensure that it affords the opportunity for the optimum exploitation of the available resources. Its conclusions will be presented to the EC, who will take soundings, on the basis of which may subsequently refer some workpackage definitions back to the WPDC for reconsideration.

20. Workpackages will be assigned to consortia by the EC on the basis of recommendations from a “WPA committee” (WPAC) consisting of the PM team and members drawn from elsewhere in the GDE, as well as experts not working on ILC projects to ensure that possible conflicts of interest can be dealt with. All consortia bidding for a particular workpackage will be ranked by the WPAC if they are adjudged to pass a threshold of credibility and technical competence. The recommendations of the WPAC should be based purely on the technical merits and the competence of the consortium and the availability of necessary resources based on a realistic estimate of requirements. The EC will not be bound by the recommendations of the committee and will be the body that brings considerations other than technical, for example regional balance, into play. It may iterate with the committee. There should be some overlap with the WPDC, but the majority of members should not be on both committees. The chair of the R&D board should be on both committees.

## ***R&D***

21. In principle, in the longer term, each workpackage will necessarily have the responsibility for carrying out and optimising the R&D required to produce their deliverables. In the interim, a transition between the current R&D programme and its management and the workpackage regime will need to be carefully engineered. There are clear regional differences and requirements that need to be respected in this process. In the long term it will be the responsibility of the PMT to ensure that the necessary project-wide R&D is being carried out and held to milestones. Once the PM is appointed, (s)he will work with the EC to ensure that this transition is achieved in the optimum way.

## ***MOU***

22. The deliverables for the post-RDR phase should be secured by means of a Memorandum of Understanding that could be based upon that used for the X-FEL. The MoU would be based on “best efforts” and would not be a legal document. It would contain proposals for how to solicit and adjudicate site proposals. It would also contain draft proposals for the management structure of the organisation, how the work would be funded and a model for operating the facility. The MoU would also specify provision of the appropriate section of the EDR as a deliverable.

## **5. Summary**

23. This document suggests possible ways in which the post-RDR phase of the ILC can be shaped. It seems plausible that both the work required to produce a document that can be the basis for construction approval and the internal dynamic dictated by the necessity to continue and build on the momentum established within the GDE

requires a significant increase in the currently available personnel. An increase of about a factor of two seems likely to fulfil both of these criteria. The current management structure of the GDE seems adaptable to the post-RDR task. A robust and professional project management team needs to be installed to supersede the RDR Management Team, headed by a project manager. The EDR work will be based around work-packages carried out by labs or entities in all regions. The deliverables will be secured by means of MoU's between the GDE and the workpackages and/or laboratories.