Beyond the RDR
- some ideas

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After Beijing

- Period after Beijing and “release” of the preliminary RDR and costing will be dominated by politics, outreach, reviews etc, probably for at least 6 months.
- Essential that momentum in the project maintained during this period.
- Requires that clear ideas on shape of post-RDR GDE has been widely discussed and agreed both internally and with external stake-holders.
- Our aim is clear - to produce a engineering design which specifies the project in sufficient detail by 2010 to allow approval to construct by participating governments. How do we get between here and there?

3 main aims

3 main threads that must be satisfied by the GDE in the future:

1) we must produce the technical information required and agreed by the contracting governments as necessary to proceed to approval of the projects;
2) we must ensure that the internal momentum of the GDE continues to grow and that the tasks the GDE sets itself allow scope for the enthusiasm and commitment of the international ILC community to continue to grow;
3) we must ensure that the world-wide R&D programme is coordinated to give the optimum return on the investment of the contracting governments.

Requirements to start construction

- We need dialogue with governments, which presumably must proceed via FALC
- Clear that FALC is some way away from being ready to act in this way
- In order not to loose momentum, need to make assumptions ourselves what level of detail will be necessary to get construction approval
- Do so by looking at “similar” projects - the two most similar that we can find are ITER and XFEL
- ITER fully international project that has approval from all 3 regions
- XFEL predominantly European project about to get full approval - technology very similar to ILC…
- Other projects, ALMA, FAIR, could also be examined in future

Lessons from ITER, XFEL

- There are numerous differences between the two projects.

- Technical requirements for ITER approval difficult to discover because the approval processes was almost entirely political. Nevertheless, we can work out the technical documentation available at time of approval - ~720 pages + 80 page summary - ~same as RDR + CDR. However, level of detail much greater - average of 1 tech. drawing or table/page.

- XFEL has about same number of pages but much less technical detail - lots of CAD - the technical details of course exist but are not in document. Almost half of document about science case and instruments, so amount of text less than our RDR - but project much more mature.

Lessons from ITER, XFEL

- We surely will need more detail than in XFEL to get “approval”. Since ITER was such a political project, we will probably need at least as much documentation as them and probably a bit more; not least because we will have a specific site. But question is, what is “approval” - even ITER level is not enough for standard DoE approval. We must assume that we can get “approval” from governments on a document which would not allow us to break ground immediately - this will only happen maybe one or two years later - so EDR is an intermediate step before the documentation required to break ground - at which stage we should have enough to satisfy even DoE approvals.

Lessons from ITER, XFEL

- How much effort does this imply?
- For ITER this is almost a meaningless question - the design was changed several times and work was duplicated in all three regions.
- For XFEL the extra effort required above & beyond R&D to produce the TDR was ~ 160 FTEs. Assume that this work will be the main task of the post-RDR GDE, which is about 30 FTEs working for 3 years - so a factor of 2 increase in core GDE would get us to a EDR document level between ITER and XFEL. enough for “approval”?

R&D effort

- What increase in effort will be required to produce the R&D necessary to have a design that we are confident we can build?

- Another very difficult question! Milestones from S task forces are roughly compatible with 2010 milestone without enormous increases in effort from current. But also lots of real engineering design & specification needed as well as R&D. Assume that factor of two increase will do the job - this needs further investigation and is probably an underestimate - but note A. Wolski's S3 talk earlier, which was ~ factor 2.

- It does not seem likely that such an increase can proceed under the current paradigm of ad hoc assignment from major laboratories and relatively uncoordinated involvement across a broad range of R&D activities.

Maintaining momentum

- Another very important consideration for the post-RDR period is the increase in effort required to maintain and accelerate the internal momentum of the project.
- What does this imply? What is the increase in FTEs working on the ILC since the start of the GDE? Difficult to estimate this but at least for some countries it seems at least 50% increase.
- Maintaining momentum would therefore imply about a factor 2 increase on the timescale of the EDR; coincidently, presumably, in agreement with what seems necessary to do the job in hand.

How to deliver

- Generally speaking, many aspects of the GDE management seem (at least to us) to be working well.
- Delivery of the EDR can therefore proceed by a process of evolution of the current structures, rather than revolution.
- There must be a reform of GDE personnel to reflect the evolution in the course of the project - EDR GDE should concentrate on central functions, project management, coordination etc. Many people outside GDE are doing vital work in this area; some inside the GDE have changed emphasis and level of activity. This needs to be recognised by a rationalisation of GDE membership.
- An area which does require significant change is RDR Management Group. While this worked well for RDR, it would not be able to cope with the EDR. We need to evolve a professional Project Management Team under a full-time Project Manager who would report to the Director and EC.

How to deliver

- Growing the RDR teams by a large factor seems difficult - problems of coordination, integration and management grow strongly to the extent that many teams are spread geographically. In addition, certainly in Europe, the possibility of a large increase in numbers dedicated to the project and donated from the laboratories seems unlikely.

- Many of these problems can be ameliorated by dividing the tasks into work packages which can be bid for by consortia, which would be encouraged, or by individual labs or countries. This reduces the problems of coordination and avoids duplication in R&D. It also greatly eases the problem of increasing FTEs since people available for only small fractions of their time but with vital expertise can be efficiently utilised within the consortia and having succeeded in being allocated a work package, labs and other organisations will feel obliged to deliver, even at the expense of allocating more FTEs than they might originally have intended.

How to deliver

- However, work packages have their drawbacks. It will be very difficult, having allocated the work-packages, to reallocate them at a later stage in the project, so that an allocation early in the EDR stage will tend to freeze responsibility for ever. This needs to be avoided - we need to be able to integrate new groups joining the project and give them appropriate responsibility.

- How do we allocated the workpackages? Who does it? On what basis? It must be some process involving estimation of expertise, believability of overall cost/FTE estimate, spreading the work across the regions etc. It will be delicate and must be done very carefully!

- Are there other ideas on how we can do the necessary R&D and engineering specification which could maintain the good points of workpackages but avoid some of these weaknesses?

Mechanisms

- One suggestion to secure the R&D deliverables and the sections of the EDR report would be to have signed MoU with the GDE, which would detail the site selection procedure, draft proposals for the management of the GDE successor organisation, how work would be funded and a model for operating the ILC. A possible model is the MoU for the XFEL.
- There would clearly be significant advantages in having the new supervision structure to replace the ILCSC in operation asap - closer connection with funding authorities would make allocation of work packages easier. However, current body language of FALC does not make that seem very likely.

Summary

- **Estimates from comparable projects imply that an increase in the global ILC effort of >~ 2 should be sufficient both to produce a technical design of sufficient 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 that would report to the EC.**

- **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 adjudication of bids 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 that would also replace the current ILCSC supervision as soon as practicable.**