EDR Planning

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3 main aims – (Brian Foster, EC)

In order to achieve our goals we must:

1) 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;

2) produce the *technical information* required and agreed by the contracting governments as necessary to proceed to approval of the project →
implement design, preparation for procurement

3) coordinate the *world-wide R&D programme* to give the optimum return on the investment of the contracting governments.

Introduction

- Engineering Design Report – to be delivered in 2010
- Supported by ‘Engineering Design Activity’ – which includes the above 3 aims
- ILC Executive committee EDR plan (03/07):
  - **A work package structure generally based on ‘Area Systems’ alignment**
    - Which is led by a ‘project manager’
    - Who is supported by ‘project management office’
  - **An ‘EDR task force’**
  - **A time line for transition from RDR management to EDR**
    - Summer ILCSC and FALC meetings

EDR task force

- Members:
  - **Hitoshi Hayano, Nobu Toge, Katsunobu Oide**
  - **Bob Kephart, Ewan Paterson, Marc Ross (chair)**
  - **Andy Wolski, Lutz Lilje**
  - **+ *ILC Executive Committee***

- Deliver an interim report 30.05.2007 (this plenary)
- Complete 08.2007 Korea ILCSC meeting

EDR Task Force CHARGE

- To study two or more possible technical project structures (WBS) for the EDR phase of the ILC. (n.b. really focus on one)
- The WBS models should be oriented around a central project management structure, lead by a single project manager.
- The WBS should break down into individual Work Packages, suitable for distribution to interested parties, who would then take on responsibility for the deliverables of that Work Package.
- The WBS models must have clear lines of responsibility and reporting, up to the top-level management.
- The WBS should naturally support (and drive) the ILC R&D program, which must be an integral part of the project.

COMMENTS on the charge - considerations of particular importance

- (from the authors)
- global nature of the project
  - **how well does the WBS/WP structure map onto a geographically distributed project, and**
  - **how will it function .**
- existing programs,
  - **funding,**
  - **regional/institutional stated interests,**
  - ***not necessarily be constrained by them*.**
- solicit and take input from the current RDR leaders (Area, Technical and Global System leaders)
  - **R&D (and other) boards**
- find flexible solutions,
  - **allow natural evolution**
  - **support (and encourage) new groups to join later**

EDR Task Force:

- in parallel:
  - **1) define the EDR effort and goals,**
  - **2) collect input from institutions, RDR teams, GDE boards and the community at large**
    - Requests mailed to RDR AS/TS/GS leaders and boards 02.05.2007
    - To date, visits to: Daresbury, SLAC, KEK, Fermilab, Saclay/Orsay, …
    - more to come, CERN, DESY etc
  - **3) begin to define work packages, their inter connection (WBS) and an organizational plan.**
- Task Force ←→ WG joint meetings next 2 days

EDR definition

Goal: The primary goal of GDE activities will be to advance

(i) the technology,

(ii) the design and

(iii) the construction plans for ILC, so that

approval for construction can be sought in ~2010.

EDR will

(i) explain the capabilities of the technology at that time,

(ii) will detail the design of the machine and the construction plans, and

(iii) will present an updated value estimate.

The purpose of the EDR will be to facilitate:

- formal international negotiations at government level on
  - **(a) siting,**
  - **(b) funding,**
  - **(c) organization and**
  - **(d) execution of the ILC project;**
- With timescale consistent with the start of construction in ~2012.
- Preparations for
  - **the production of final engineering designs of critical components,**
  - **procurement,**
  - **site preparation.**
- The *primary technical output* of EDR will be an integrated engineering design of the accelerator.
  - **must satisfy the energy, luminosity, and availability**

Engineering Design phase will include:

1. ***Basic R&D*** **to demonstrate that all components *can be engineered***
2. **R&D into *alternative* solutions to mitigate remaining risk.**
3. **An *overall design* to allow machine construction to *start within 3 years*,**
4. **selection between *high tech* options must be made to allow *industrialization* efforts.**
5. **A comprehensive *value-engineering* exercise must be conducted.**
6. **A complete *value cost estimate* for the machine must be provided, including a funding profile consistent with the project schedule.**
7. **A *project execution plan* must be produced, including a realistic schedule.**
8. **Designs for facilities shared between different “area systems”, and for site-specific infrastructure. The designs must include the level of detail needed for regions to estimate the cost to host**
9. **All necessary information must be provided to regions to evaluate project technical and financial risks in support of a bid to host.**

RDR and RD – 2006/7

- RDR Area, Global and Technical Systems
  - **Developed design, plan and costs**
  - **Assessed technical and cost risk**
  - ***The above gives much EDA guidance!***
- (Not a project organization;
  - **Communication / reporting channels need definition)**

- RD Board with associated task forces
  - **'top level' RD: quantifying, advising and (in one case) coordinating global RD**
    - Much ongoing RD not part of the task force process
  - **Strong S# task force / Area System Leader overlap**

- Collect proposed EDR deliverables from the above
  - **Devise more tightly linked organization intended to accomplish these**
  - **(DESY LCWS)**

How Good is the RDR Concept?

- The design has been carried out by Area Systems that have been built up into an overall design.
  - **We have advanced in integrating that design and even in being able to evaluate proposed changes that cross several area systems (e.g. central injector – E Paterson)**
  - **A more integrated design approach is envisioned for the engineering design stage.**
- Technical system designs still immature, resulting in lack of detailed specifications, requirements and value engineering has been deferred

Prioritization for EDR

- Based on:
  - **Technical risk mitigation**
  - **Cost risk mitigation**
  - **Cost reduction**
  - **Preparation**

RDR risk assessment

- Not in the above order:
  - **Quantitative evaluation possible based on RDR Value estimate and plan**
- Mechanism?
  - **Gather proposed WP's,**
  - **Build WBS**
  - **Secure institutional/funding agency consensus**

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	EDR			Approval		Construction							Commiss.
Constraints				LHC physics	total length frozen		tunnel & optics layout frozen		optics details frozen		tunnels ready for install-n		
Beam dumps	beam dump conceptual design and critical tests			pre approval		beam dump final engineering			b.dump design frozen	beam dump construction		beam dump installed	
crab cavity	design, build & test of conceptual phase control system; cavity fabrication; conceptual cryostat design; LLRF develop and test with single cells			design of cryostat; cavity integration; beam test of one cavity		beam tests of two cavities		final engineering		production		installed	
ATF2	ATF2 construction and installation. Start of commissioning		Commissioning	Beam size and optics results	Beam stability results	2nd phase, e.g. SC FD; smaller emittance & beam size		Instrumentation developments and tests at beamline					
Final Doublet	Engineering design; full length prototype; stability design study and initial stability tests			Stability tests & design optimization		final design		production		lab tests	installation and pre-commissioning		
Detectors	Conceptual design; selection of two concepts; continue design			Design optimization		final design and start of production		Construct, assemble and pre-commission on surface				Lower	
IR integrated	Conceptual eng. design of IR vaccum chambers; supports; pacman and moving shielding; cryogenic; service platform; detector moving system; cranes; etc.			Detailed eng. design of integrated IR with finalized choice of two detectors for final design		final design and start of production		product					
Magnets	Optimization of number of styles; conceptual design of most magnets; definition of interfaces; Detailed design of low field and other special magnets; Vibration -wise design			Design and cost optimization; layouts with real space allocation, and detailed interfaces.		final design & needed prototypes		production			installation and pre-commissioning		
Collimation	Tests of collimation wakefields and beam damage tests; conceptual eng. design			Detailed eng. design; optimization & integration into beamline		final design & pre-production prototypes							
Instrumentation	Develop laser wires; test feedback BPMs with secondary beam; conceptual eng. design			Detailed eng. design; optimization & integration into beamline		final design & pre-production prototypes		production					
Vacuum systen	Physics and conceptual eng. design. Detailed design of IR vacuum chamber.			Detailed eng. design; optimization & integration of beamlines		final design		production			installation		

Example: Beam Delivery EDR + 'Deliverables'

Overall tentative schedule to get general idea. Detailed (and more accurate) tables for several systems will be shown

Present status:

- Demonstration of Internationally Driven RD / Design
  - **Extremely impressive / motivating / encouraging**
  - **RDB ‘advising’ funding US/UK/J FY07, EU FY08.**
- Must retain momentum
- RDR experience is valuable
  - **What worked / what did not**
  - **No one has done this before**
- Strong scientific leadership in place
  - **Need support, guidance, tools, resources…**

- *Ideal starting point for ED Activities*

Global Organization to do EDA

- Devised along functional lines
  - (instead of institutional or regional…)
  - Many WP's will have strong institutional center
  - **With strong internationally balanced leadership**
    - Experienced
  - **Alignment with funding will not be practical (at first)**
- Relationship between Project and Institute through a series of 'Memoranda'
- Defines a Work Package for a given Institution

- *we must be extremely careful to develop and maintain inter-regional consensus/balance*

ILC Project Management

- **Global focus**
- **Role of the project managers in relation to the regional directors, and regional efforts needs definition:**

- Project Managers are responsible for
  - **Leading the world-wide technical development effort**
    - efficiently and effectively
  - **Setting technical direction and executing the project toward realization of the ILC**
- Regional Directors are responsible for
  - **Promoting, funding and authorizing the international cooperative program.**

ILC Project Management

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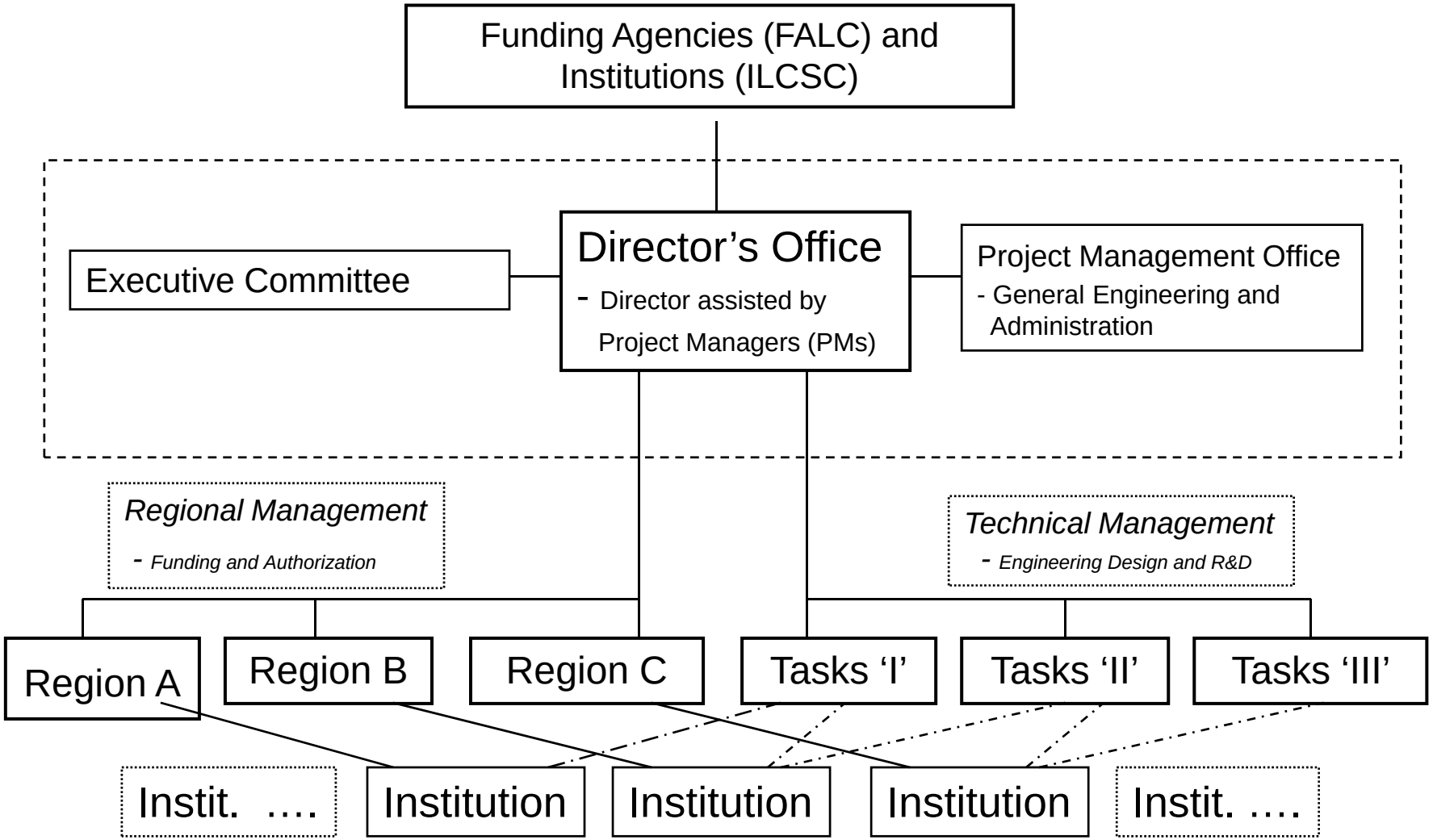

Responsibilities and Authority of EDR Project Management

- "work should be *coordinated* through a more traditional project management structure"
  - **What was missing in RDR organization? Clear communication paths?**
- Key Tool: *Formal Partnership 'Memoranda'* between ILC Project and WP Institute (s)
- What content must be included:
  - (starting from the most important)
  - **Statement of work,**
    - What is to be done, agreed upon in advance through discussion with project management
  - **Milestones**
    - The schedule for doing it, and strategy
  - **Reporting**
    - Information 'flow', both directions, third parties?

Responsibilities and Authority of EDR Project Management(2)

- ‘Memoranda’ contents (cont):
  - **Management**
    - How are decisions made?
      - Especially selection between alternates, a kind of change control
      - Advisory role of review / evaluation boards
      - Responsibility of project (line) management
    - What if there are problems? → technical strategy
  - **Commitment**
    - Institutional signature
  - **Communication mechanics**
    - Specification of communication channels
    - → top ‘lesson learned’ from RDR management

Management section of WBS

- Project Management Office →
- To include roles and tasks:
  - **Advisory Boards**
    - Reviews
    - Test Facility planning and usage
  - **Cost Engineering/Planning / Scheduling**
    - Earned value estimation
  - **Configuration Management**
  - **Standards / Integration**
  - **e Documentation Management**

Getting Started on the EDR:

- *Re-organize* ourselves toward the EDR
  - **Project management-based structure,**
  - **Definition and scope – (DESY WGs – work packages and work breakdown structure)**
- *Examine RDR* → a starting point
  - **Technical reviews will be implemented**
  - **Internally controlled process**

- Design work and technical R&D
  - **Technologies to be chosen and to be further established to reach EDR by 2010.**

RDR Technical Reviews

- Review charge:
  - **performance requirements and specifications**
  - **comprehensive technical**
  - **implementation plan**
  - **Cost estimate (all aspects),**
    - Focus on containment/reduction
  - **issues**
  - **interface and integration**
  - **proposed EDR WP's,**
  - **institutional and funding support**

Technical Review Schematic:

Area, Global,
Technical System
Leader + team

Review oversight

eDocuments

Project Manager,

EC, Inst.,

Workshop Plenaries,

community

Review closeout presentation and write-up

WP/WBS development

- *Primary goal* → parallel sessions this workshop

- Alternates were included in 2005 ‘Snowmass’ configuration (BCD / ACD)
- → in general alternates to be directly included in WBS, with implied selection process and schedule
  - **Other ‘alternates’ may emerge**
  - **Example ML WG discussion: Linac cryomodule →**
    - Global discussion, institutional impact

Key CM questions for EDR phase (1)

Example WG Questions: *Kephart*

- Is the goal to build IDENTICAL CM all regions ?
  - **All parts built to the identical spec ?**
  - **Global parts vendors (e.g. couplers, feed thrus, etc ?)**
  - **Can this fly politically ?**
- Are CM that are “plug compatible” good enough ?
  - **What does that even mean for an object this complex ?**
  - **Dramatically increases the testing and validation effort.**
- Should we consider RF units, or even whole sections of the linac as deliverables from a region?
  - **What does this do to the “risk” of the machine**
  - **Will we require “global review and approval” of designs ?**
  - **Who has to approve the design? (in-kind contributions)**

Key CM questions for EDR phase (2)

Example WG Questions: *Kephart*

- What are the “time scales” for changes?
  - **(Are changes needed at all??? – XFEL/TTF?)**
  - **How will XFEL experience feed into the design ?**
  - **Does the “final” design have to validated in test areas AND produced in industry before the start of the project ?**
    - If no, then what must be done ?
  - **When must a cavity shape decision be made?**
  - **When do we pick the coupler, the tuner, etc.**
  - **Do we have time for a “clean piece of paper” approach to cryomodule design aimed at cost reduction ?**
  - **What is the date of the “latest major change” relative to project start (t=0)?**

Key CM questions for EDR phase (3)

Example WG Questions: *Kephart*

- How do we manage industrialization ?
  - **Do we ask industry to guarantee "performance" or just build to "print and process"**
  - **If vertical test and CM test is done at labs, how to we handle the "hand offs" with industry**
  - **How do we encourage industry to improve CM AND at the same time manage intellectual property rights?**
  - **How does region A interact with industry in region B ?**
  - **What is the shipping criterion for a CM**
    - Eg Ship in parts, assemble at site ? Or ship full CM…
    - Horizontal installation vs tipping on end (ILC shaft size)
- We must address many of these questions as we make the EDR plan !
  - **(Process of how to answer these questions will be discussed in ML parallel session)**

2007 – timeline for starting EDR:

- March
  - **EDR draft organization plan, EDR Task Force**
- May – DESY meeting
  - **definition of EDR, collection of input at LCWS and community at large**
- July
  - **presentation to FALC**
- August
  - **presentation to ILCSC, completion of EDR Task Force**
- September
  - **RDR Technical Reviews**
- October – Fermilab meeting
  - **New organization in place.**