ILC International Linear Collider

CLIC MEETING

1 - ILC – Frascati workshop

2 - Conventional Facilities & Siting

CFS Group of GDE

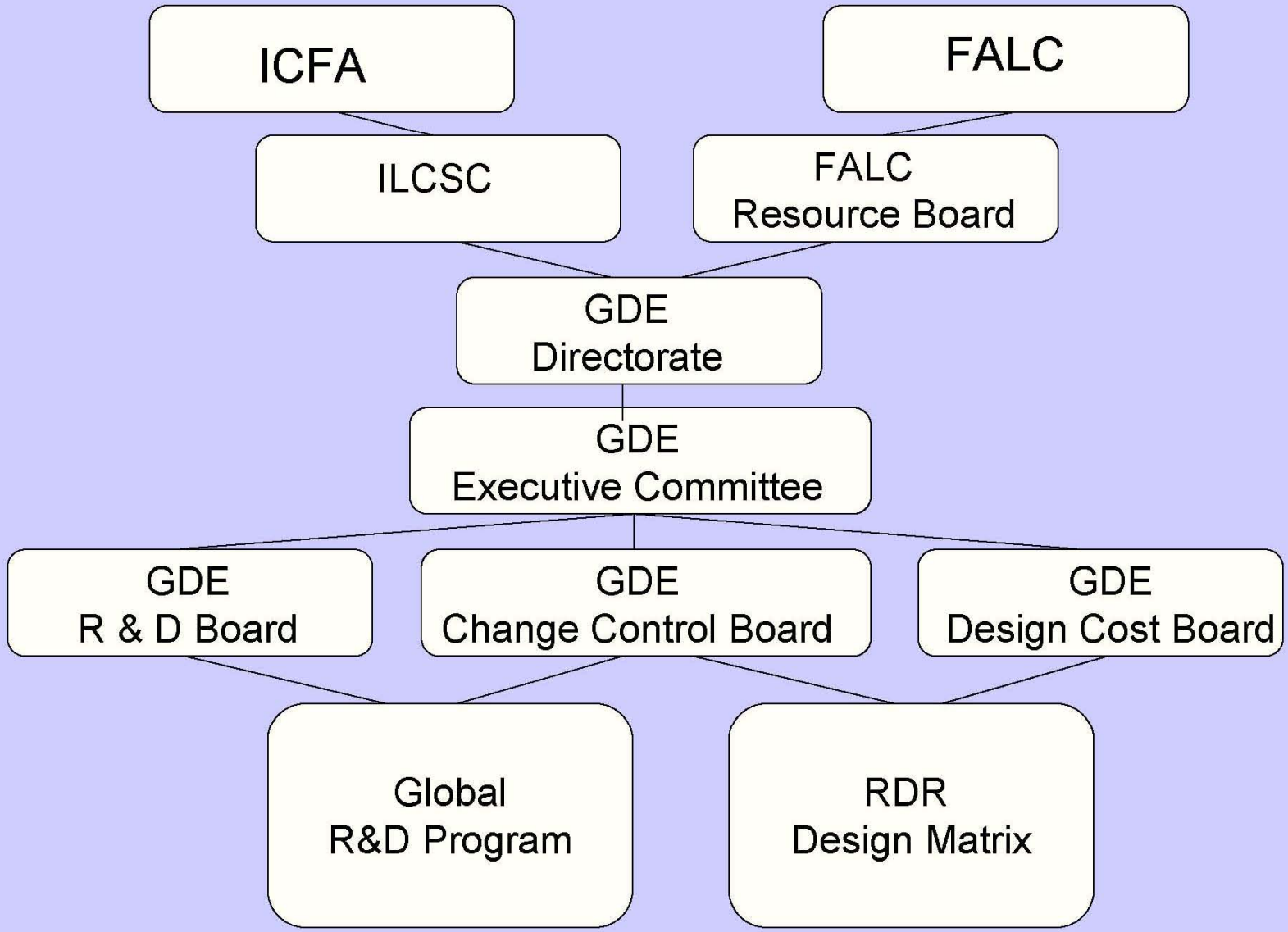
J.L. Baldy

13 January 2006

Global Design Effort

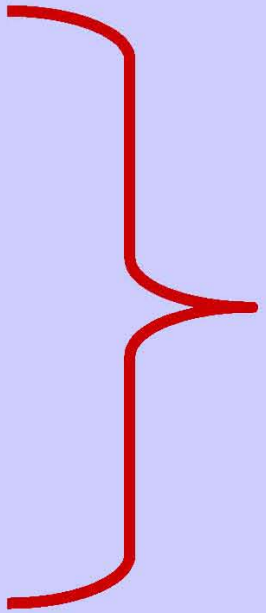
- The Mission of the GDE
  - Produce a design for the ILC that includes a detailed design concept, performance assessments, reliable international costing, an industrialization plan , siting analysis, as well as detector concepts and scope.
  - Coordinate worldwide prioritized proposal driven R & D efforts (to demonstrate and improve the performance, reduce the costs, attain the required reliability, etc.)

GDE RDR / R&D Organization



GDE Structure and Organization

- Executive Committee for Baseline Configuration
  - GDE Director
    - Barish
  - Regional Directors
    - Dugan – Americas
    - Foster – Europe
    - Takasaki – Asia
  - Accelerator Leaders
    - Yokoya - Asia
    - Raubenheimer - Americas
    - Walker - Europe



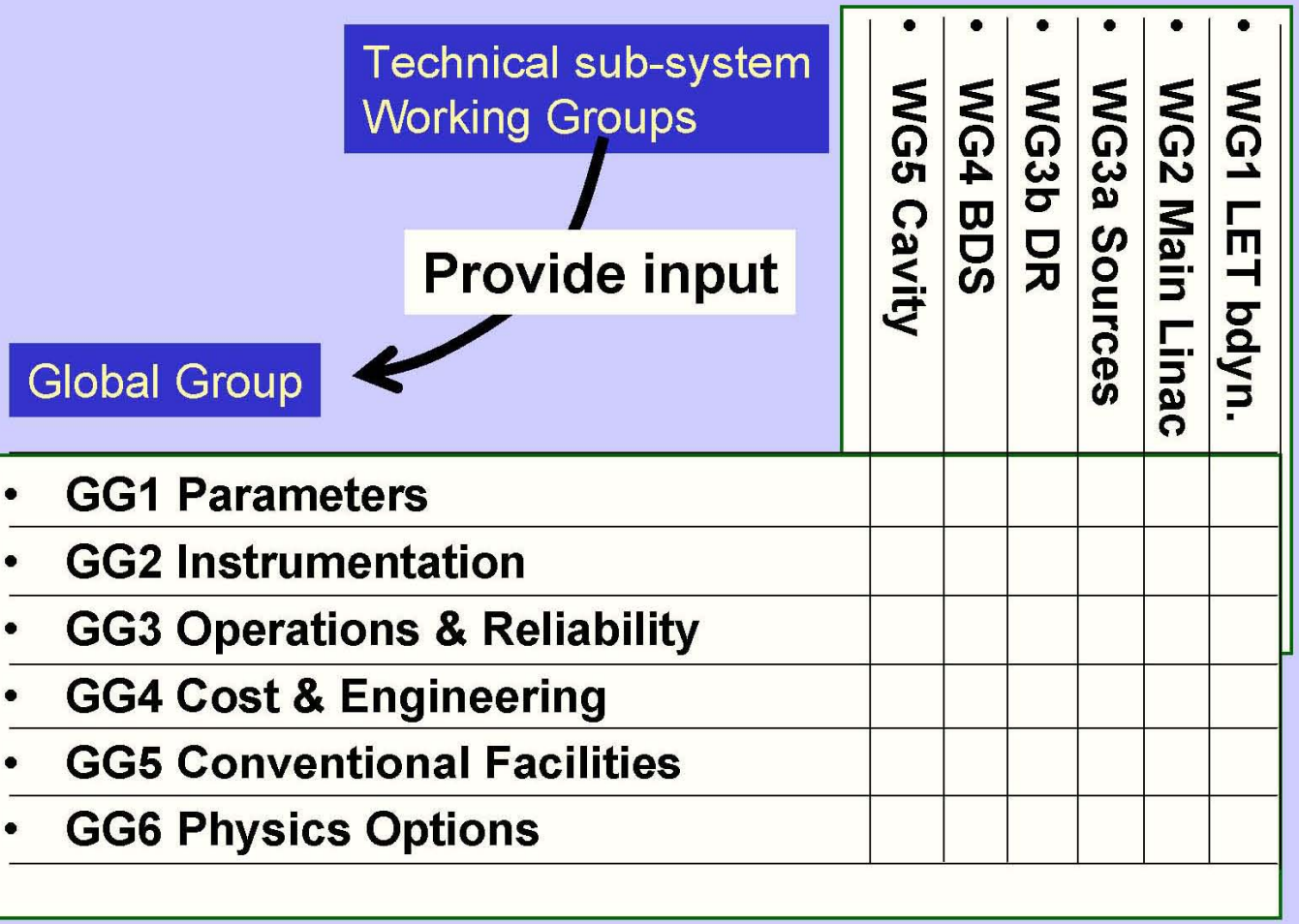
GDE Executive Committee

- Responsible for decisions and documentation for the Baseline Configuration Document (BCD)

GDE Structure and Organization

- GDE Groups
  - Design / Cost Engineers
    - Shidara – Asia
    - Bialowons – Europe
    - Garbincius – Americas
  - Siting, Civil Construction and Infrastructure
    - Baldy - Europe
    - Enomoto – Asia
    - Kuchler – Amercas
  - Physics / Detectors (WWS chairs)
    - Brau - Americas
    - Richard - Europe
    - Yamamoto - Asia
  - Accelerator Experts (44 GDE members)

GDE Organization for Snowmass



Area Systems

e- source	e+ source	Damping Rings	RTML	Main Linac	BDS
	Kuriki	Gao	E.S. Kim	Hayano	Yamamoto (MDI Ch)
???		Guiducci	PT	Lilje	Angal-Kalinin
			Adolphsen		
Brachmann	Sheppard	Wolski		Solyak	Seryi

Technical Systems			
Vacuum systems	Suetsugu	Michelato	Noonan
Magnet systems	Sugahara	BINP ??	Thompkins
Cryomodule	Ohuchi	Pagani	Carter
Cavity Package	Saito	Proch	Padamsee
RF Power	Fukuda	Saclay ??	Larsen
Instrumentation	Urakawa	Burrows	Ross
Dumps and Collimators	KEK	??	??
Accelerator Physics	Kubo	Schulte	??
Global Systems			
Commissioning, Operations & Reliability	Terunuma	Elsen	Himel
Control System	Michizono	Simrock	Carwardine
Cryogenics	Hosoyama	Tavian	Peterson
CF&S	Enomoto	Baldy	Kuchler
Installation	Shidara	Bialwons	??

ILC International Linear Collider
Office of the Global Design Effort
PO Box 500
Batavia, IL 60510
USA
630-840-8907

November 18, 2005

Dr. Gerry Dugan
Regional Director for the Americas

Dr. Brian Foster
Regional Director for Europe

Dr. Fumihiko Takasaki
Regional Director for Asia

Dear Regional Directors of the GDE

As you are well aware, the detailed technical design and implementation of the ILC will be intimately connected to the features of the site where it will be located. For that reason, it will be important to have real site information during the technical design effort in a couple years. However, at the present time, our design effort is conceptual and we have much less need for specific site information. Therefore, it would be premature to solicit actual site proposals at his time. .

More specifically, our needs during the reference design effort are to learn about the factors that are important in doing the siting and can help set site requirements. Secondly, it is important to develop an ILC reference design that is consistent with the features of real sites. For these reasons, I am requesting each regional director to produce information on one "sample" site in their region by this December 2005. Even though the final candidate sites are likely to be different sites, the information on these sample sites will help to insure that we produce a realistic reference design.

Let me assure you that the sample site information from the three regions will not be used to compare one site with another or to do any preliminary site selection, or in a way that will reveal those sites. Instead, we plan to study siting issues and to develop a reference design for a range of site conditions. We will not make public any detailed or individual site information and the chapter we produce on siting in the Reference Design Report will not discuss or compare individual sites.

Sincerely,

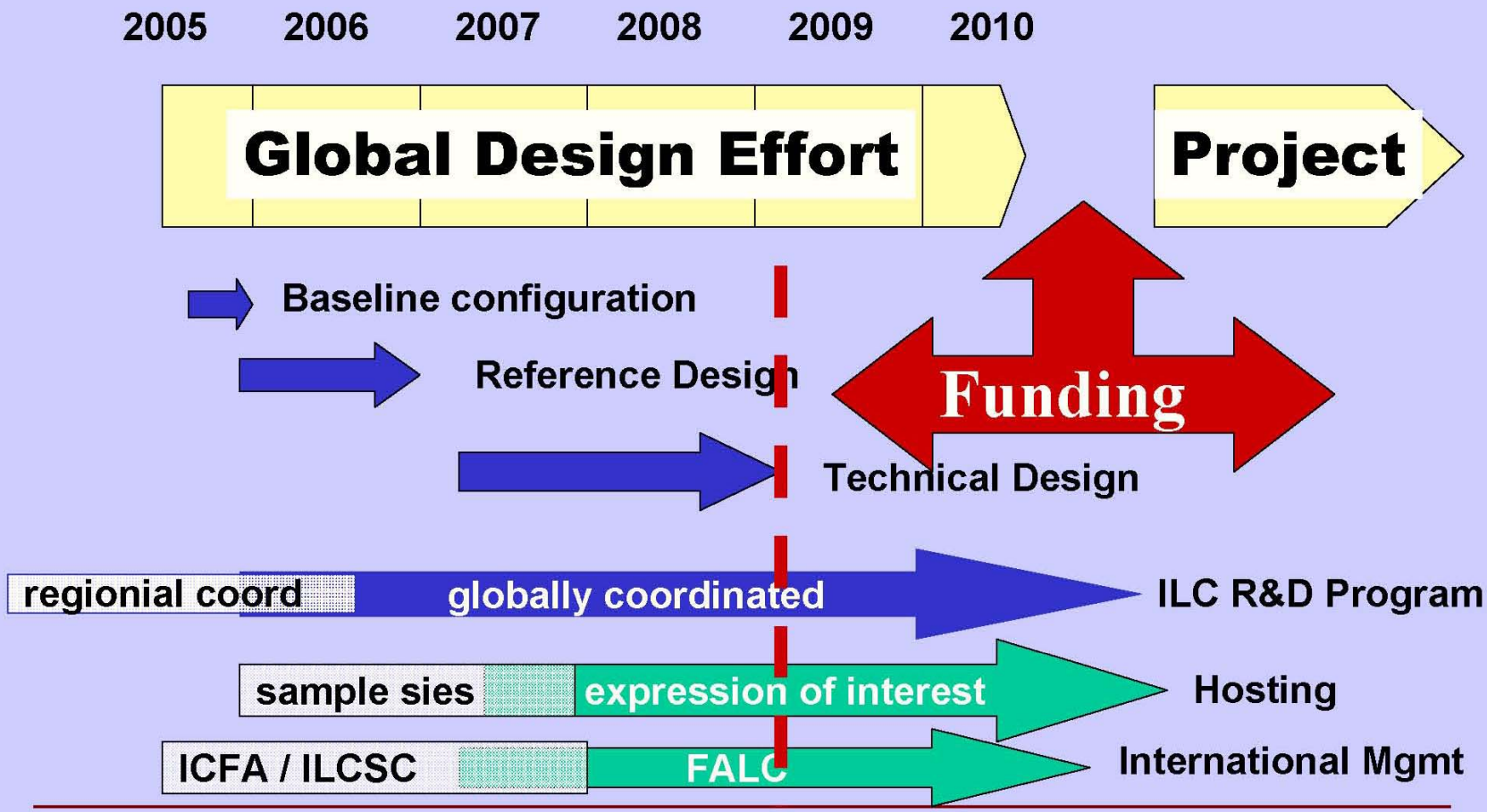
Barry C. Barish

Barry C. Barish
Director, ILC Global Design Effort

Request for Sample Site Information

To be used to study siting issues, in advance of a call for "expressions of interest" to host the ILC

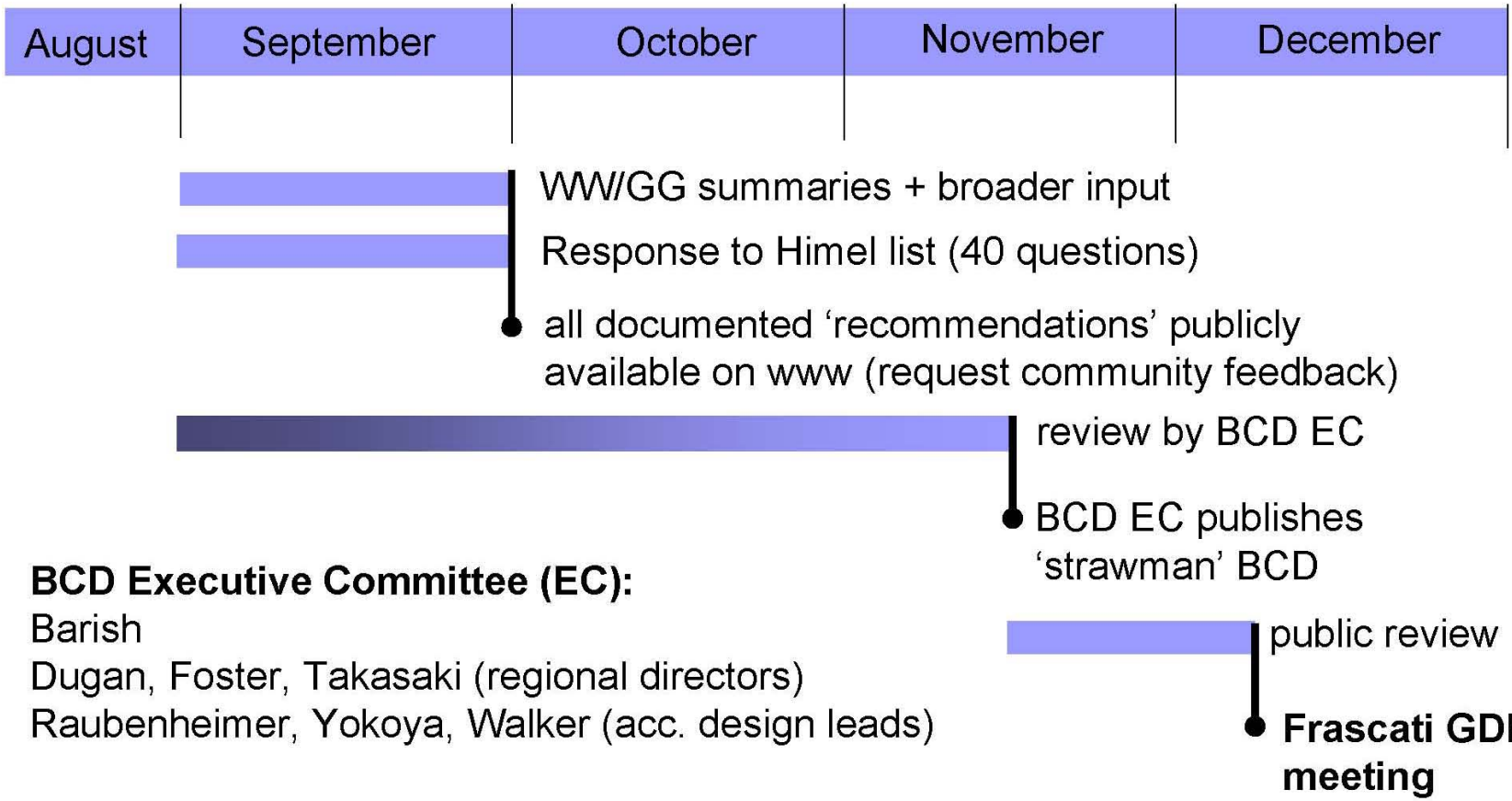
The GDE Plan and Schedule



Baseline Configuration Document

- Our 'Deliverable' by the end of 2005
- A structured electronic document
  - Documentation (reports, drawings etc)
  - Technical specs.
  - Parameter tables
  - …
- A 'printable / readable' summary document (~100 pages) ---- (available in January)

Arriving at the BCD (cont)

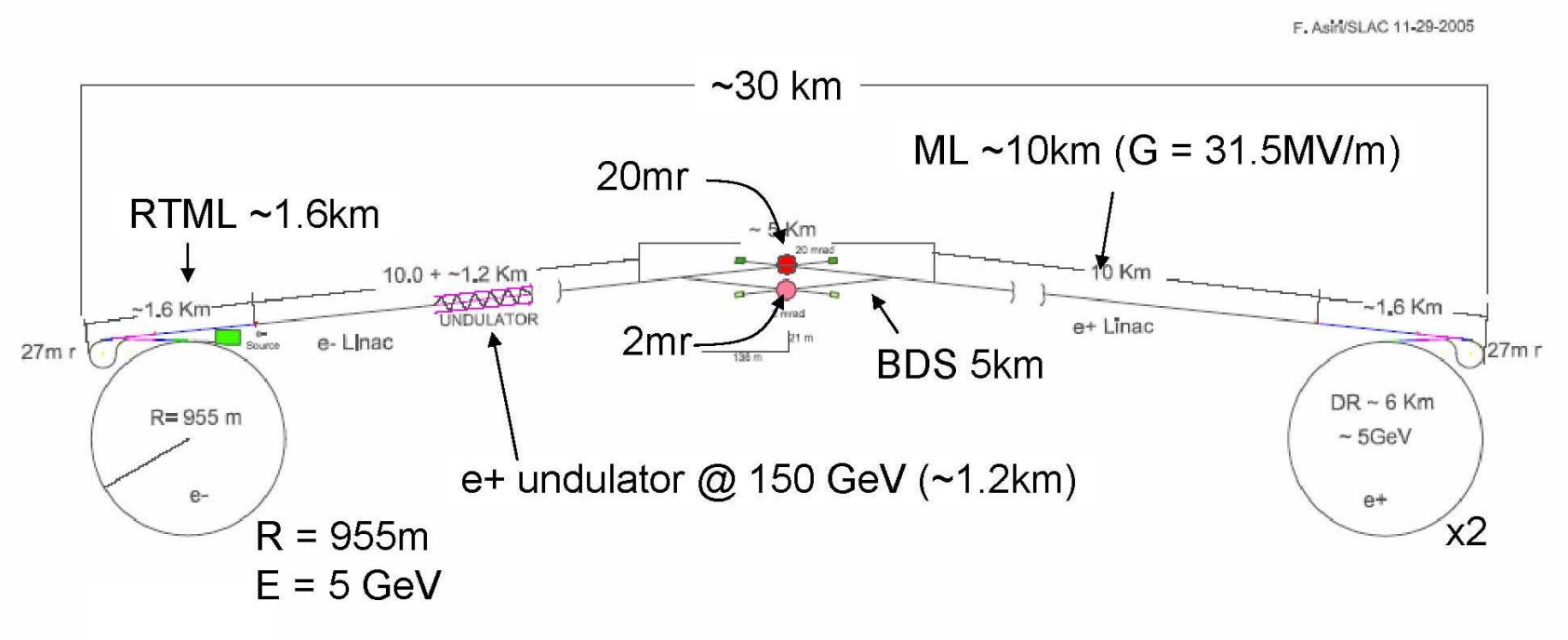


BCD Executive Committee (EC):
Barish
Dugan, Foster, Takasaki (regional directors)
Raubenheimer, Yokoya, Walker (acc. design leads)

White Papers

- Energy upgrade
  - Lijle, Raubenheimer, Toge
- IP configuration
  - Bialowons, Markiewicz, Yamamoto
- Number of tunnels
  - Delahaye, Hayano, Phinney
- Location of positron source
  - Himel, Walker, Yokoya
- Tunnel topology
  - Funk, Schulte, Shidara

The Baseline Machine (500GeV)



not to scale

BCD Formal Acceptance

- The Role of Change Control
  - today is not the final word!
  - requests for modifications will now be formalised via the CCB
  - *many* questions and decisions on details still remain (not currently in the BCD document)
  - CCB will probably be more of an '*Acquire Control Board*' in the first few months.

Discussion Session: Problems

- New GDE Organization for RDR
  - We need systems integration
  - We need a single point of contact for each area, technical system and global group
  - We need infrastructure / Tools – EDMS, management tools, etc
  - We need the technical manpower to carry out the work of the area groups, technical systems, etc
- Problem -- Communications within and between board, area groups, EC, etc. GDE websites – please post minutes, technical notes, meetings, etc (Max will help)

ILC
EDMS Selection Committee
Progress Report

Tom Markiewicz
SLAC
7 December 2005
Frascati GDE Meeting

International Linear Collider at Stanford Linear Accelerator Center

Committee Members

John Ferguson – CERN

Lars Hagge - DESY

Tom Markiewicz - SLAC (Chair)

Richard Stanek - FNAL

Nobu Toge - KEK

Harry Weerts - Argonne

International Linear Collider at Stanford Linear Accelerator Center

Charge to the Committee

The committee should recommend a specific web based software solution, which may mean an integrated collection of distinct software packages that will allow ILC collaborators worldwide to store, search for and retrieve various kinds of documents.

At least three basic kinds of documents must be handled:

1. meeting/conference/seminar related files
2. publications/white papers/notes and
3. engineering documents:
   - CAD drawings, cost estimates, vendor quotes, and QC documents.

International Linear Collider
at Stanford Linear Accelerator Center

Products Considered

CERN Suite

- **InDiCo (Meetings&Conferences-CERN written)**
- **CDS-CERN Document Server (CERN written)**
  - Not yet reviewed
- **CERN EDMS, as used for LHC (Commercial)**
  - Axalant
  - Datastream7i
  - User Databases

DESY/FNAL UGS Team Center EDMS (Commercial)

- **UGS Team Center Enterprise (DESY)**
- **UGS Team Center Engineering (FNAL)**

Hybrids of these elements (for example)

- **InDiCo + CDS + CERN EDMS**
- **InDiCo + CDS + TeamCenter**
- **InDiCo + TeamCenter**

Each lab has invested many man years in customizing the underlying databases and tailoring the web user interface

International Linear Collider at Stanford Linear Accelerator Center

Committee's Current Consensus (NB: Not yet a recommendation)

Use InDiCo for Meeting Management

- Back fill CERN or TC EDMS with InDiCo pointers & files
- Begin an ILC specific instance of InDiCo

Decide among TeamCenter, CDS & CERN EDMS for document & engineering control by applying Benchmark Functionality Tests that are being written into the Requirements Document

- Certain committee members already have an opinion
- Ideally we would construct a "light" ILC implementation of each product as part of selection process, but ….
  - Requires more time and resources than committee has
  - "Light" exercise unlikely to have adequate breadth & depth to discriminate

SUMMARY

- *Organization overview / Activity of the CFS Group since Snowmass*
- *Requirements and general parameters*
- *American Sample Site*
- *Asian Sample Site*
- *European Sample Site (CERN and DESY Sample Site)*
- *Conventional facilities :*
  - *Facilities Design (Main tunnel, Access, Detector, surface building)*
  - *Power Distribution*
  - *Ventilation & Air-conditioning System*
  - *Cooling Water System*
  - *Handling Equipment*
  - *Safety and Fire Fighting System*
  - *Survey and Alignment*
- *Conclusion / Next Year Activities*

ILC International Linear Collider

Conventional Facilities and Siting Requirements and General Parameters

1. *Accelerator energy: 0.5 TeV cm Initial, upgradeable to 1 TeV cm*
2. *Accelerator gradient: 31.5 MV/m Initial (500 GeV CM), 36 MV/m Final, each w/75% fill factor*
3. *Accelerator length: ~26 km Initial, including BC1, BC2, undulator, diagnostics, etc.*
4. *Crossing angles: 20mrad & 2mrad, length of BDS between wyes 3.84km*
5. *Damping ring length: 3 @ 6 km circumference each (1 line for electrons, two stacked lines for positrons)*
6. *Linac elevation; continuously curved to follow earth's curvature (horizontal)*
7. *Beam line alignment: Follow earth's curvature, laser straight Beam Delivery*
8. *Number of tunnels: 2, with periodic surface buildings*
9. *Number of interaction regions: 2 Final. One IR hall will be fully costed initially.*
10. *Overall Length of the Tunnel : ~30 km initial ; the site should accommodate ~50 km.*
11. *Vibration requirements*

ILC International Linear Collider

Methodology for sample site selection : Assessment Matrix

1. ***Site Impacts on Critical Science Parameters,***
2. ***Scientific /Institutional Support Base,***
3. ***Land Acquisition,***
4. ***Environmental Impacts,***
5. ***Construction Cost Impacts,***
6. ***Operational Cost Impacts,***
7. ***Environmental, Safety and Health Issues,***
8. ***Regional Infrastructure Support, and***
9. ***Risk Factors***

Americas Sample Site

Situation :

In solid rock, close to existing institute, close to the city of Chicago and international airport, close to railway and highway networks.

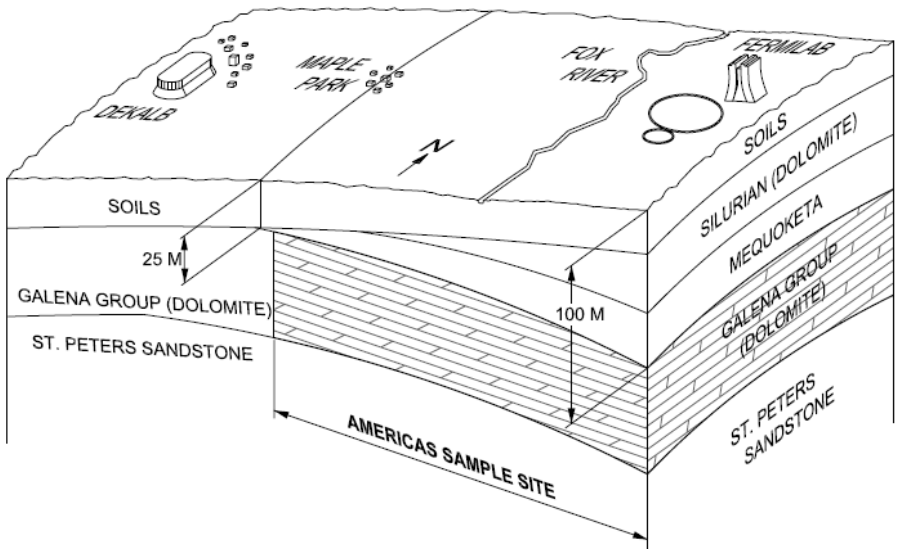
Geology :

Glacially derived deposits overlaying Bedrock. The concerned rock layers are from top to bottom the Silurian dolomite, Maquoketa dolomitic shale, and the Galena-Platteville dolomites.

Depth :

Average ~ 135 m

Americas Sample Plan / Section



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European Sample Site - CERN

Situation :

Proximity of CERN existing site and the city of Geneva with its international airport. Possibility of connection with the SPS tunnel. Close to railway and highway network connections.

Geology :

Solid an stable bedrock called “molasse” (sandstone), which stretches between Jura mountains and Lake of Geneva.

Depth :

Average ~ 120 m

European Sample Site - DESY

Situation :

Closed to DESY existing site and the city of Hamburg with its international airport and seaport. The ILC layout will follow closely The TESLA layout on the first 32.8 km and then be extended to 50 km in the same specific direction. Possibility of connection with the HERA tunnel. Close to railway and highway network connections.

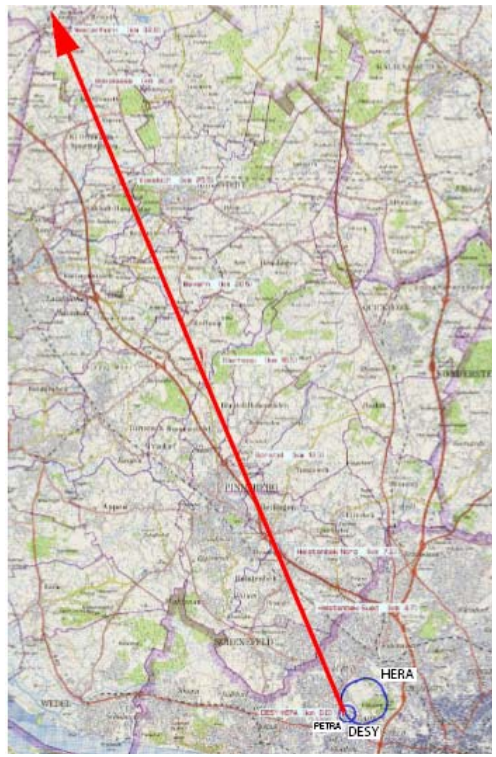
Geology :

Quaternary sand and smaller part in marl. Tunnel situated below the ground water table over nearly entire length.

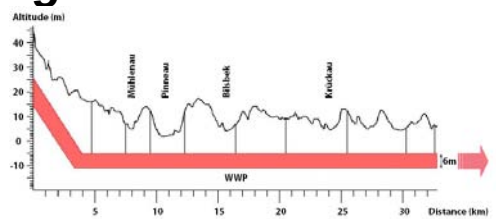
Depth:

Shallow position, average ~ 20 m

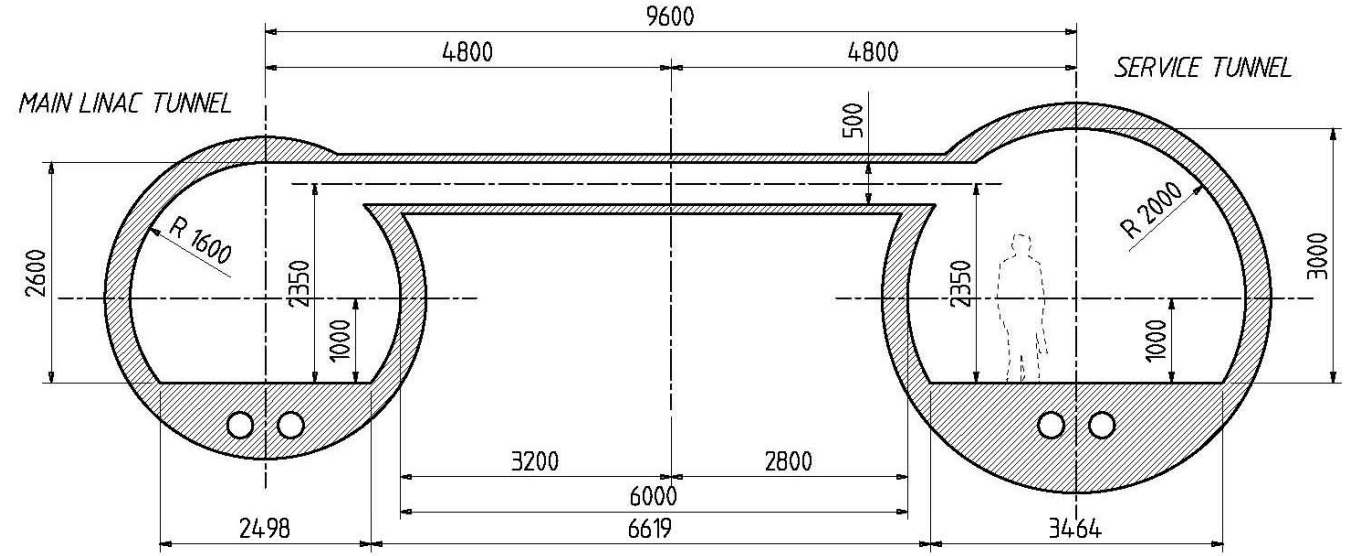
DESY Sample Plan

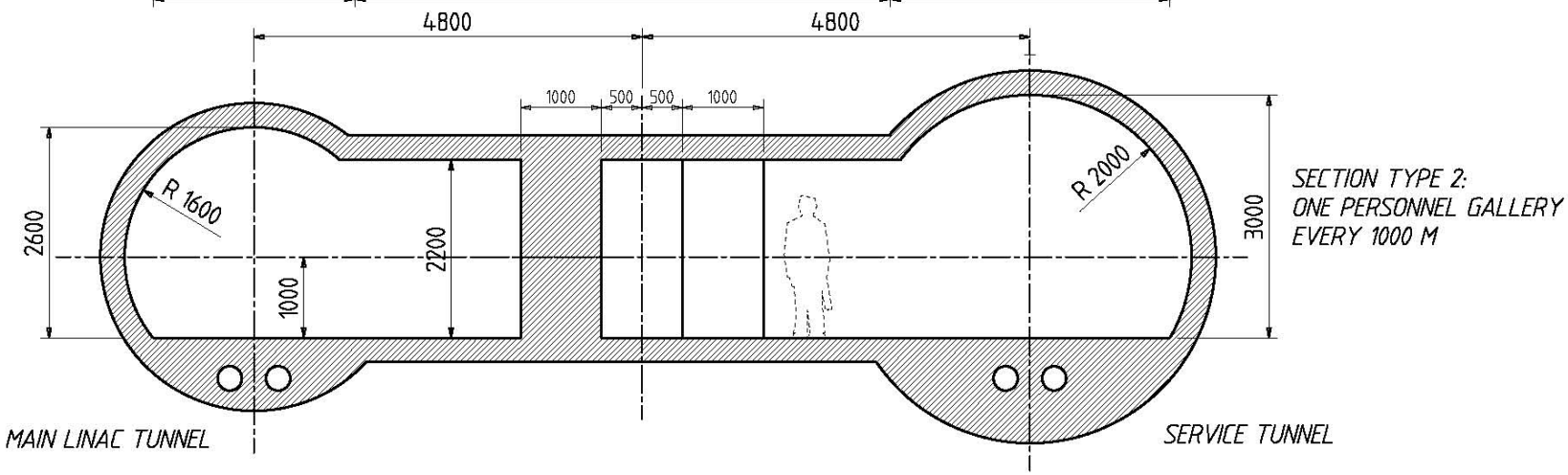


Longitudinal cross-section



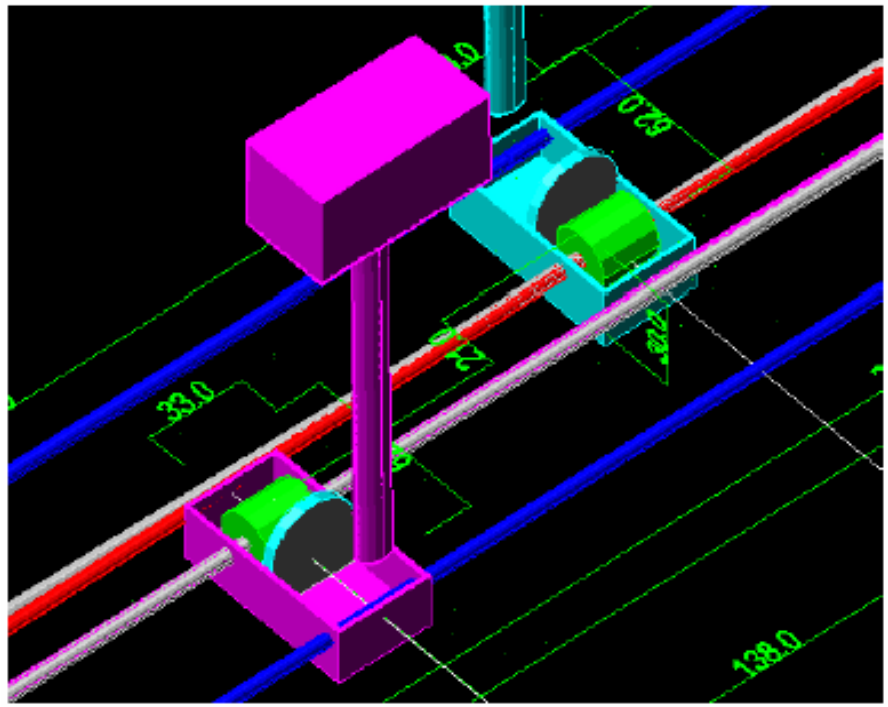
ILC Tunnel Cros sections





Detector Hall

- *Two interaction zones*
- *An above grade assembly building and below grade collision hall.*
- *Inside space for each IR collision halls is 33 meter wide by 62 meter long by 30 meter high.*
- *Steel multi storey mezzanines to provide areas for computer, control room and office facilities.*
- *Other utility areas to house process water systems, electrical power services and air handling equipment.*



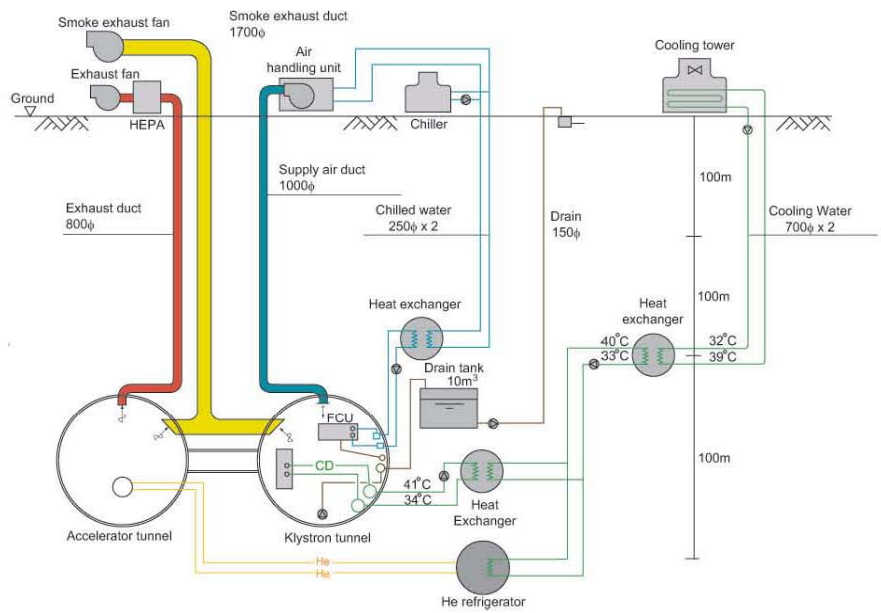
Interaction Region

Conventional Facilities – Power distribution

- *Supply from high voltage local network*
- *Substations → Staged medium voltages – buried transport lines (loop ?)*
- *Supply to large users directly from medium voltage (cryo-compressors, modulators, …)*
- *Substations → Low voltage for other users on short distances*
- *Safety systems with charger / battery devices or stand by generators*
- *Network monitoring from industrialized systems*

Conventional Facilities – Ventilation and Air-Conditioning

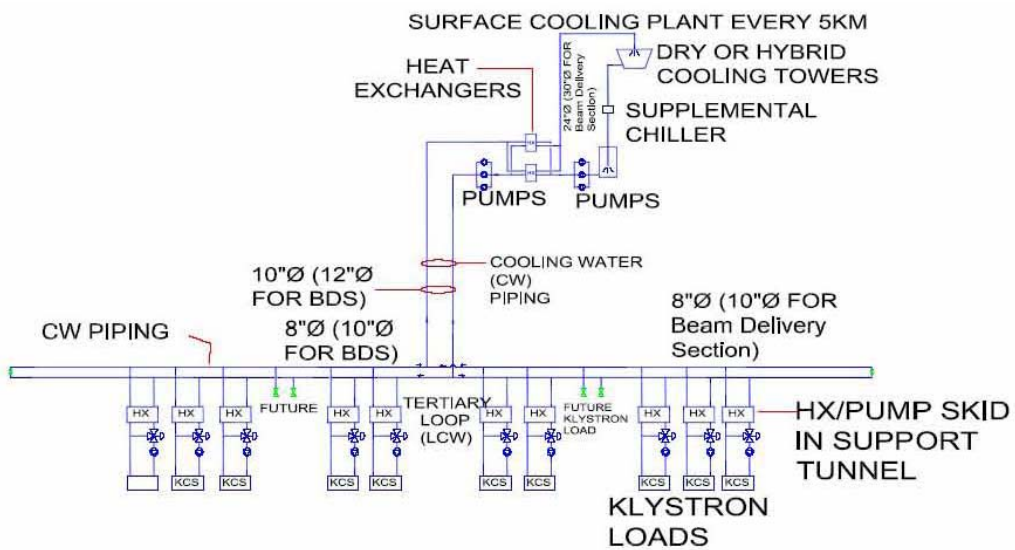
- *Heat extracted with water whenever possible*
- *Air handlers in surface buildings, → required temperature and humidity for tunnel*
- *Chilled water / an coils in service tunnel to remove heat*
- *Tunnels used as full section ducts*



Asian Region Ventilation and Cooling Scheme

Conventional Facilities – Cooling water system

- *Efficient cooling of klystrons, modulators and fan coils in service tunnel with water*
- *Cooling towers / hybrid towers / dry coolers / chillers in surface plants (every ~5 km)*
- *Heat exchangers and pumping station either at surface or underground*



Americas Region Cooling Water Scheme

Conventional Facilities – Survey and Alignment

- *Geodesic network with references points close to shafts.*
- *Additional leveling network.*
- *Geometry transferred to tunnels level through dedicated space in shafts.*
- *Underground references network to be set up (on slab or deeply anchored).*
- *Traverses based on gyroscopy likely to be sufficient for Civil Engineering work.*
- *Substantial studies and R&D to be carried out for alignment of components.*
- *Possible use of hydrostatic leveling system for linacs alignment.*
- *At IP, need for permanent view along beam through or aside detector.*

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ILC Project - CFS

CFS Reference Design Report (RDR)

Objective : *to adequately define scope, cost and schedule of the ILC conventional facilities, so that the Technical Design Report of the conventional facilities can be fully executed within the baselines established from the RDR information.*

Schedule : *assuming a completion deadline of December 2006, this task is planned in three phases :*
Phase I : the concept level of the report should be ready by March 06
Phase II : preliminary draft of the report should be ready by July 06
Phase III : the final draft should be ready by November 06

Information required : *throughout phases I, II & III, increasingly detailed information will be required from each Area System and Technical System.*

ILC International Linear Collider

ILC Project - CFS

NEXT GOAL : be ready by Bengalore to start actual design

- ***New organization fully clear and operational***
  (→ CFS point of contact)

- ***All pending important questions answered / decisions taken***
  → to be translated into a general principle layout common to all

- ***Contents of RDR fully clear : level of details ? Documentation ?***

- ***Sound/common bases for cost estimation***

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ILC Project - CFS

PRESENT TASKS

- ***Set up a Work Breakdown Structure / Area systems (with mention of site dependant and independent items)***
- ***Set up a CF criteria list mentioning all structures and services***
- ***Clarify/decide points of contact with Area, Technical and Global Systems (after KEK meeting next week)***
- ***Collect all data relevant to CFS sector***

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ILC Project - CFS

WORRIES

- ***Time is short, specially between Bangalore and Vancouver (4 months to set up preliminary draft)***

- ***Resources (CE Group very limited) need to place contracts with Consultants soon : budget ?***

- ***Contribution from DESY ?***

ILC Internation

ILC Project - CFS

Work Breakdown Structure

CERN proposal

ILC PROJECT
CONVENTIONAL FACILITIES
WORK BREAK DOWN STRUCTURE

Site independant
Site dependant

		Area systems						
		e- source	e+ source	DR	RTML	Main Linac	BDS	TOTAL
x.x	**Conventional Facilities**							
x.x.1	**Civil Engineering**							
x.x.1.1	Engineering, study work and documentation							
x.x.1.2	Underground structures							
x.x.1.21	Shafts							
x.x.1.22	Tunnels							
x.x.1.23	Halls							
x.x.1.24	Caverns							
x.x.1.25	Miscelaneous and works							
x.x.1.3	Surface structures and ancilllary facilities							
x.x.1.31	CV buildings							
x.x.1.32	EL buildings							
x.x.1.33	Cryo compressors buildings							
x.x.1.34	Control buildings							
x.x.1.35	Workshops							
x.x.1.36	Site access control buildings							
x.x.1.37	Shaft access buildings							
x.x.1.38	Roads, car parks and utilities							
x.x.1.39	Environmental works							
	Total x.x.1							
x.x.2	**Power distribution**							
x.x.2.1	Engineering, study work and documentation							
x.x.2.2	High voltage equipment, energy transport							
x.x.2.3	Low voltage equipment, energy distribution							
x.x.2.4	Cabling and optical fibers							
x.x.2.5	Safe power sources							
x.x.2.6	Network, monitoring and surveillance							
	Total x.x.2							
x.x.3	**Air treatment**							
x.x.3.1	Engineering, study work and documentation							
x.x.3.2	HVAC systems and distribution network							
x.x.3.3	Pressurisation systems and duct work							
x.x.3.4	Smoke extraction systems and duct work							
	Total x.x.3							
x.x.4	**Water cooling**							
x.x.4.1	Engineering, study work and documentation							
x.x.4.2	Primary stations							
x.x.4.21	Cooling towers							
x.x.4.22	Primary stations and piping							
x.x.4.3	Secondary stations							
x.x.4.31	Demineralised water stations and distribution piping							
x.x.4.32	Chilled water stations and distribution piping							
x.x.4.33	Mixed water stations and distribution piping							
x.x.4.34	Compressed air							
x.x.4.4	Fire fighting							
x.x.4.5	Discharge water							
x.x.4.51	Clear water							
x.x.4.52	Waste water							
x.x.4.53	Oil separators							
	Total x.x.4							
x.x.5	**Handling equipment**							
x.x.5.1	Engineering, study work and documentation							
x.x.5.2	Lifts							
x.x.5.3	Electrical overhead travelling cranes							
x.x.5.4	Hoists							
x.x.5.5	Auxiliary lifting equipment							
x.x.5.6	Road transport and handling equipment							
x.x.5.7	Underground transport equipment							
	Total x.x.5							
x.x.6	**Safety equipment**							
x.x.6.1	Engineering, study work and documentation							
x.x.6.2	Safety alarm systems							
x.x.6.3	Safety access control systems							
x.x.6.4	Other safety equipment							
	Total x.x.6							
x.x.7	**Survey and alignment**							
x.x.7.1	Engineering and R&D work							
x.x.7.2	Geodesy and networks							
x.x.7.3	Metrology of the components							
x.x.7.4	As built measurements and integration							
x.x.7.5	Alignment of the components							
x.x.7.6	Metrology for the final focus areas							
x.x.7.7	Metrology for the detectors and exp. areas infrastructure							
x.x.7.8	Software, database and informatics							
	Total x.x.7							
x.x.	**TOTAL CFS**							