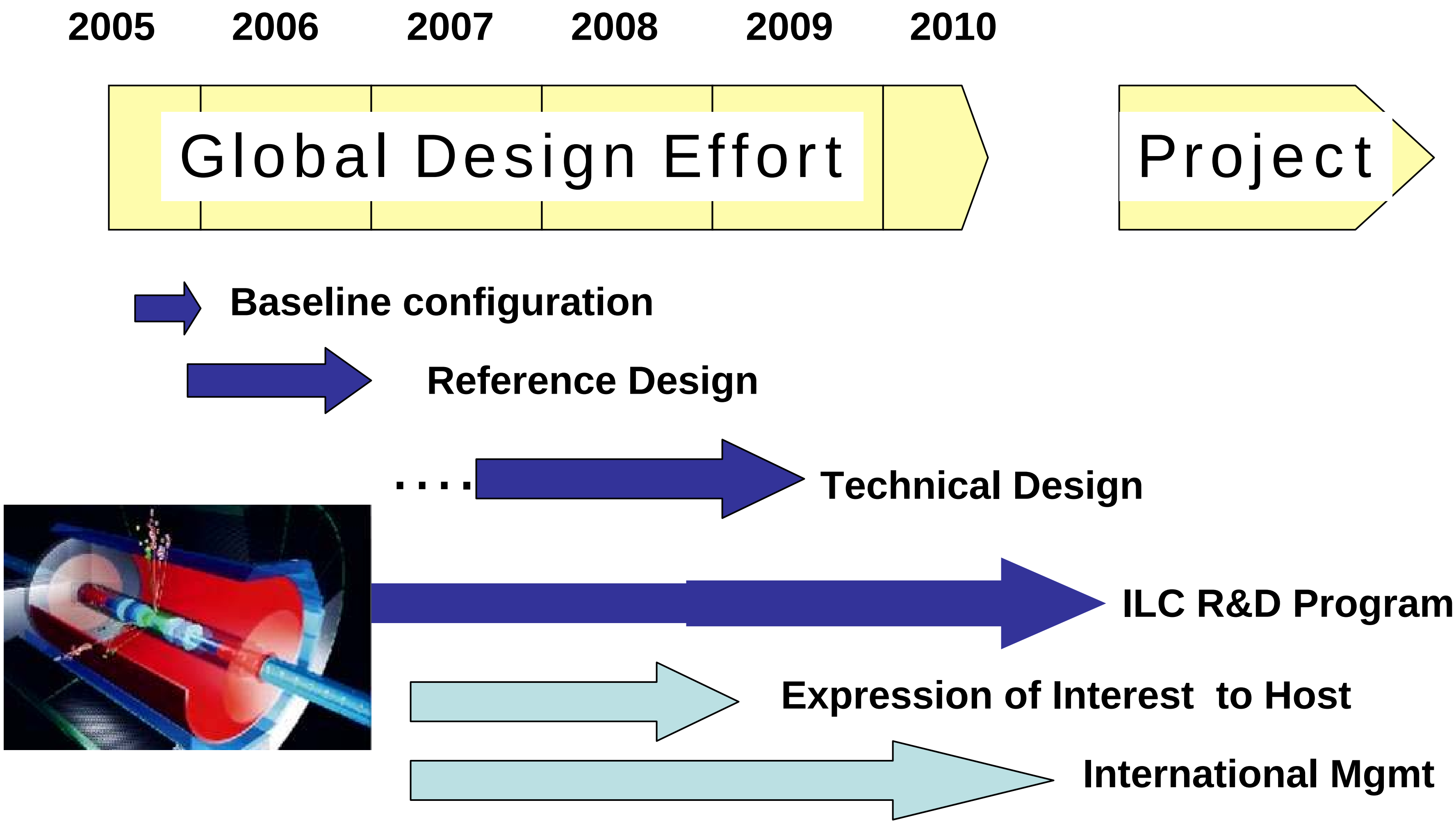
RDR Overview
Organization, Schedule, Approach and Goals

Barry Barish

GDE

Caltech

ILC Timeline



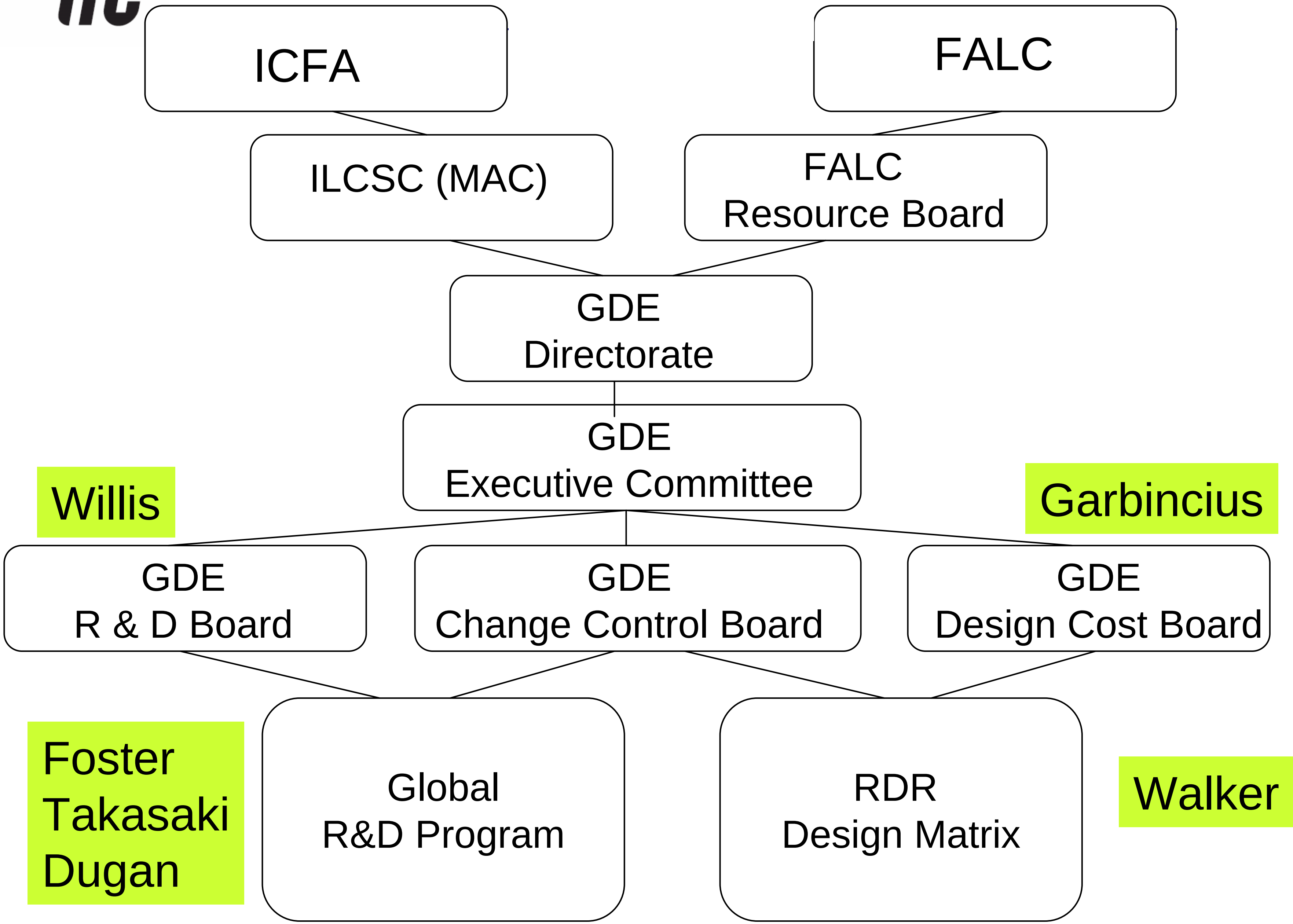
Next Goal – Reference Design

- Reorganized the GDE toward Design / Cost Effort
- A global effort to design / cost the ILC is underway and working
- Configuration Control; International Costing; Industrialization; Siting

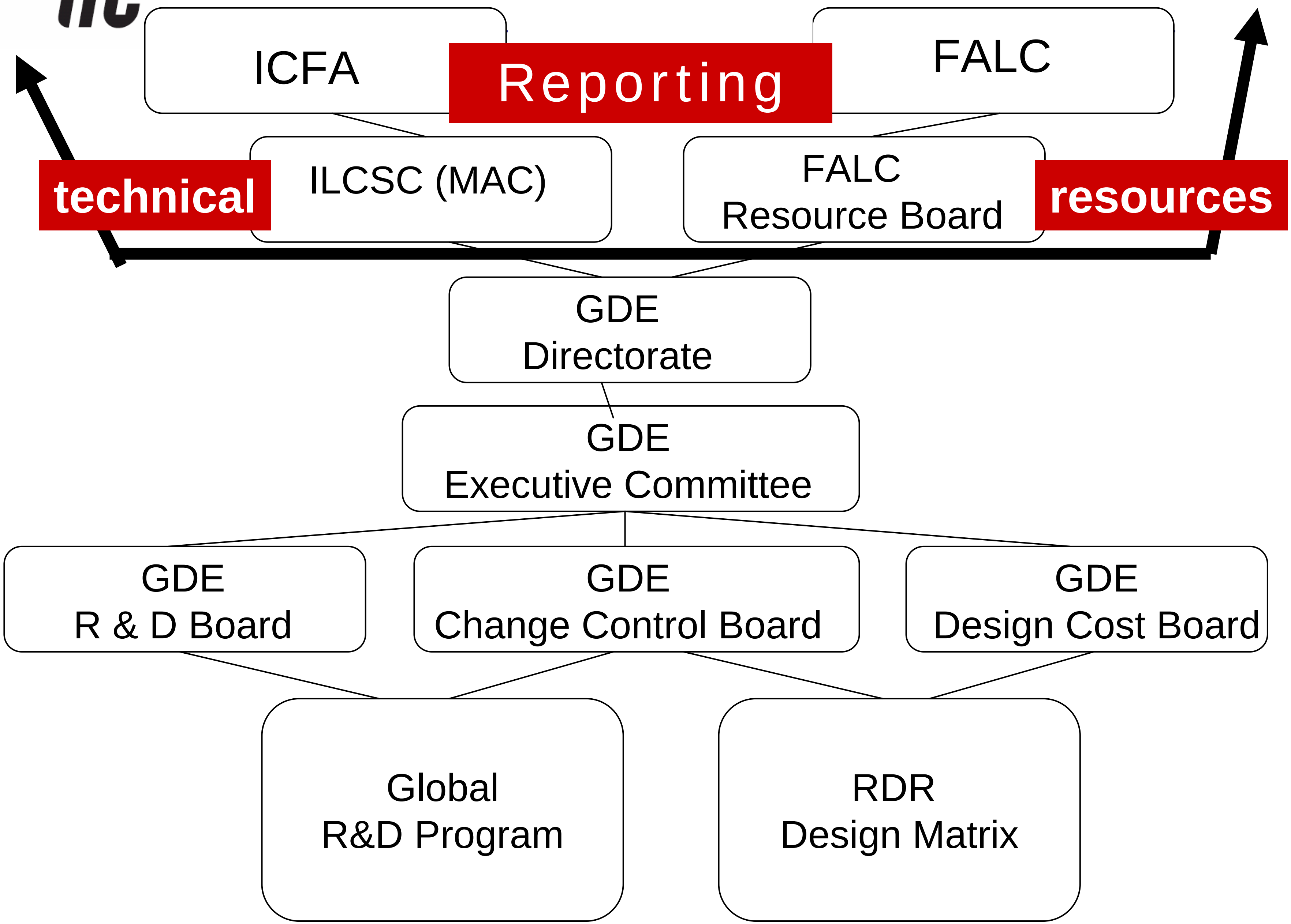
----

- A sound design must be established with convincing and affordable costing.
- Review and guidance for the Global R&D program to demonstrate the ILC, improve over the baseline and reduce costs.

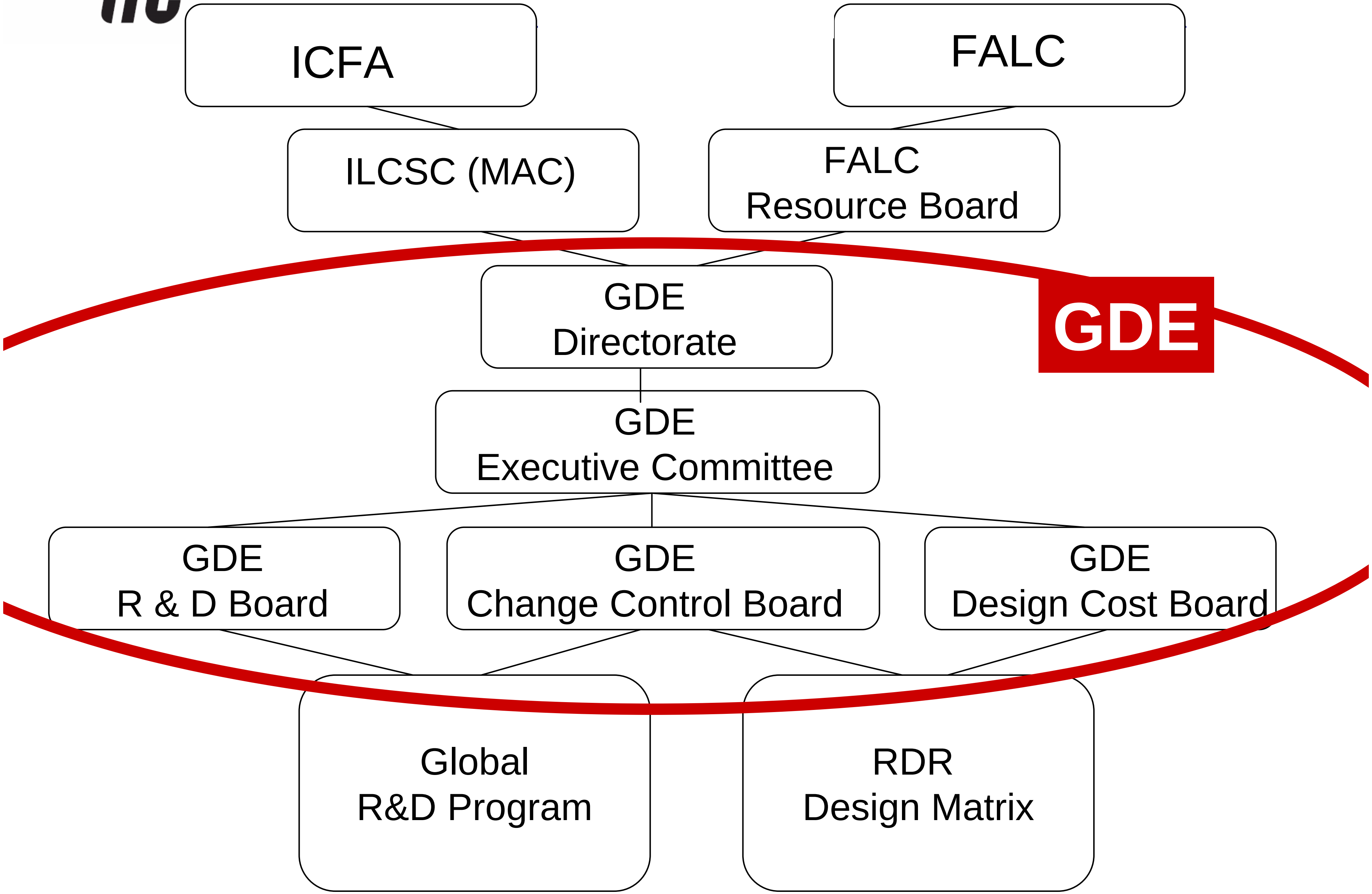
GDE RDR / R&D Organization



GDE RDR / R&D Organization



GDE RDR / R&D Organization



Change Control Board (CCB)

Nobu Toge (chair)   Asia

Markiewicz	**US**
Mishra	**US**
Funk	**US**
Kubo	**Asia**
Kuriki	**Asia**
Pagani	**EU**
Blair	**EU**
Schulte	**EU**

Design Cost Board (DCB)

Peter Garbincius (chair) US

Phinney	US
Paterson	US
Kephart	US
Enomoto	Asia
Shidara	Asia
Terunuma	Asia
Bialowons	EU
Delahaye	EU
Mueller	EU

Design Cost Board (DCB)

- The Design / Cost Board will be responsible for assessing and providing guidance for the overall RDR design effort program. The DCB initial goals will be to propose the overall structure and content for the RDR document to be developed by the end of 2006. It also will provide early guidance required to enable the design / cost effort to get fully underway by the time of the Bangalore GDE meeting.

- The DCB will set goals and milestones for producing the RDR, conduct design reviews and provide guidance and assessments of the RDR effort. The DCB will report to the Director and EC regularly as the design / cost effort progresses, reporting on early evaluations of costs, problems and changes needed in the BCD, etc.

Garbincius

Global R&D Board (RDB)

Bill Willis (chair)   US

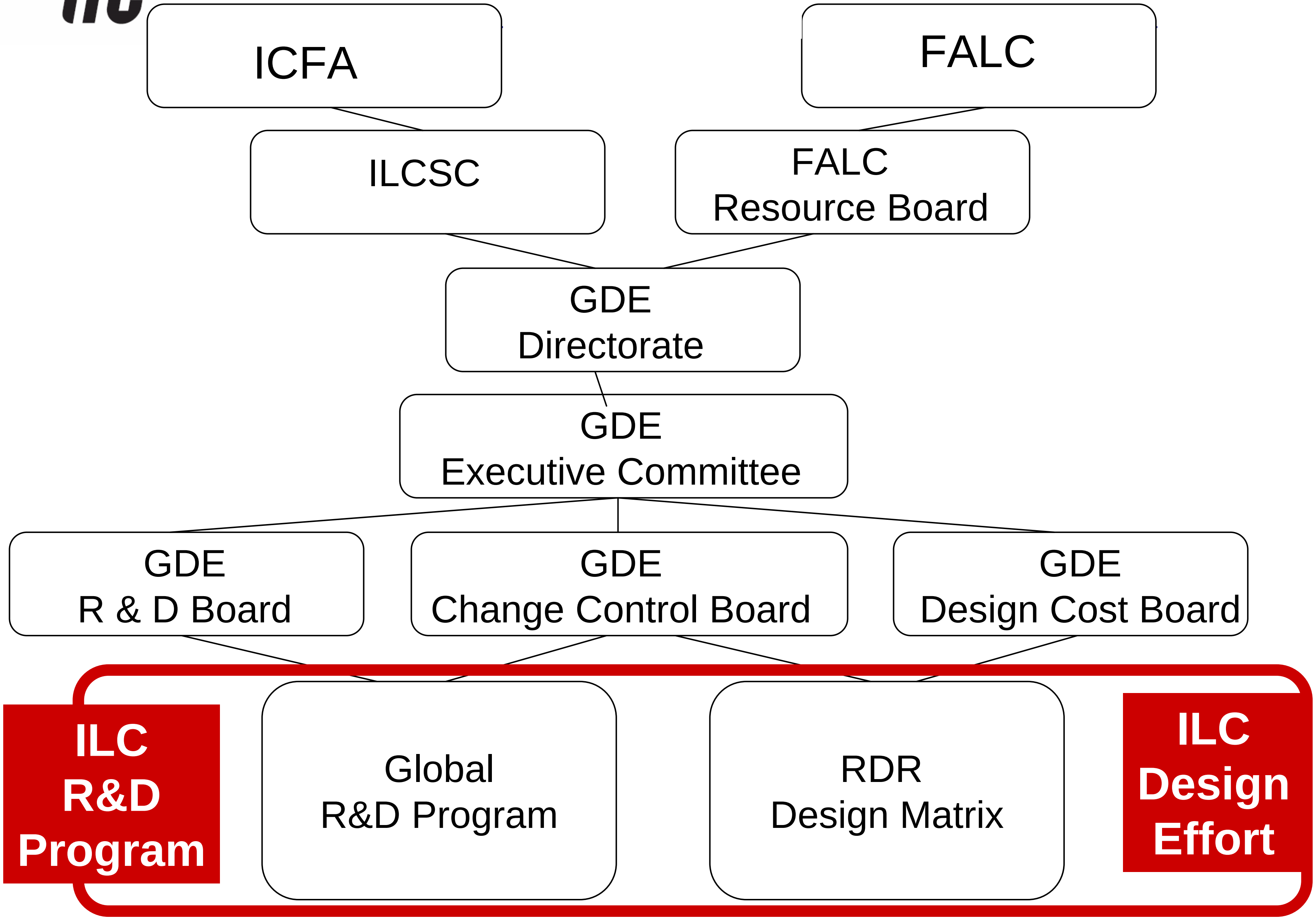
Padamsee	**US**
Himel	**US**
Wolski	**US**
Hayano	**Asia**
Higo	**Asia**
Elsen	**EU**
Lilje	**EU**
Garvey	**EU**
Damerell	**EU**

Global R&D Board (RDB)

- The Global R&D Board will be responsible for assessing and providing guidance for the overall R&D program. The RDB will suggest priorities for the research facilities and R&D supporting the baseline, the R&D on alternatives to the baseline and selective R&D that could further the field in the longer term. The mission will also include global assessments and recommended priorities for the detector R&D program and evaluate the balance between accelerator and detector R&D.

- The RDB will develop a proposal driven program, structured in the sense of defined goals, and milestones, and resources evaluated on a common basis to allow comparison across different regions and national funding systems. It will conduct reviews and identify gaps in coverage of topics, resource or technical issues, duplications, and other concerns..

GDE RDR / R&D Organization



Approach to ILC R&D Program

- Proposal-driven R&D in support of the baseline design.
  - **Technical developments, demonstration experiments, industrialization, etc.**
- Proposal-driven R&D in support of alternatives to the baseline
  - **Proposals for potential improvements to the baseline, resources required, time scale, etc.**
- Develop a prioritized DETECTOR R&D program aimed at technical developments needed to reach combined design performance goals

How and when to involve industry?

- Large Scale Project Characterization
  - **Large Project Management**
  - **Precision Engineering**
  - **International Coordination**
  - **Costing**

- Industrialization
  - **Civil Construction & Infrastructure**
  - **Cryogenics**
  - **Superconducting RF structures, couplers, etc**
  - **Electronics and Control Systems**
  - **Large Scale Computing**

Coordinating the RDR

- RDR Management Group (Walker, Chair)
  - **Guides the design/cost efforts on day by day basis**
  - **Composition - Accelerator Leaders (Walker, Raubenheimer, Yokoya); Cost Engineers (Shidara, Garbincius, Bialowons); Integration Scientist (Paterson)**
- Coordinate both ILC design work and costing
- Reviews are to be conducted by Design Cost Board
- First Costing by Vancouver to have time for cost reductions by value engineering, scope options …

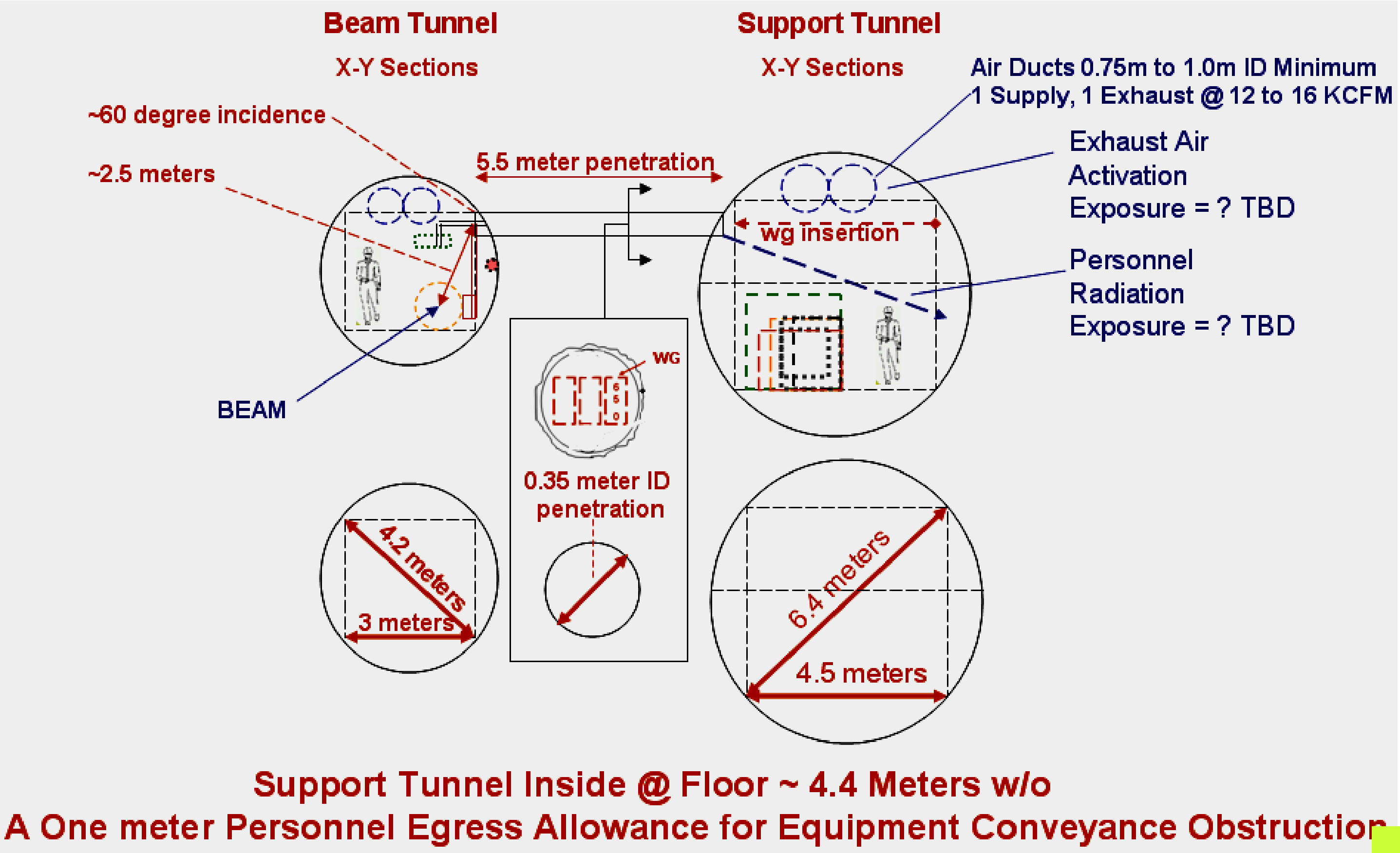
Walker

RDR Matrix

	e- source	e+ source	Damping Rings	RTML	Main Linac	BDS
Vacuum systems	X	X	X	X	X	X
Warm magnet systems	X	X	X	X	(X)	X
Cryomodule	X	X	(X)	X	X	(X)
Cavity Package	X	X	(X)	X	X	(X)
RF Power	X	X	(X)	X	X	(X)
Cryogenics	X	X	X	X	X	X
Accelerator Physics	X	X	X	X	X	X
Operations & Reliability	X	X	X	X	X	X
Instrumentation	X	X	X	X	X	X
Controls	X	X	X	X	X	X
Systems integration	X	X	X	X	X	X
CF&S	X	X	X	X	X	Walker
Cost	X	X	X	X	X	X

ILC Design

Almost complete for major items and cost drivers

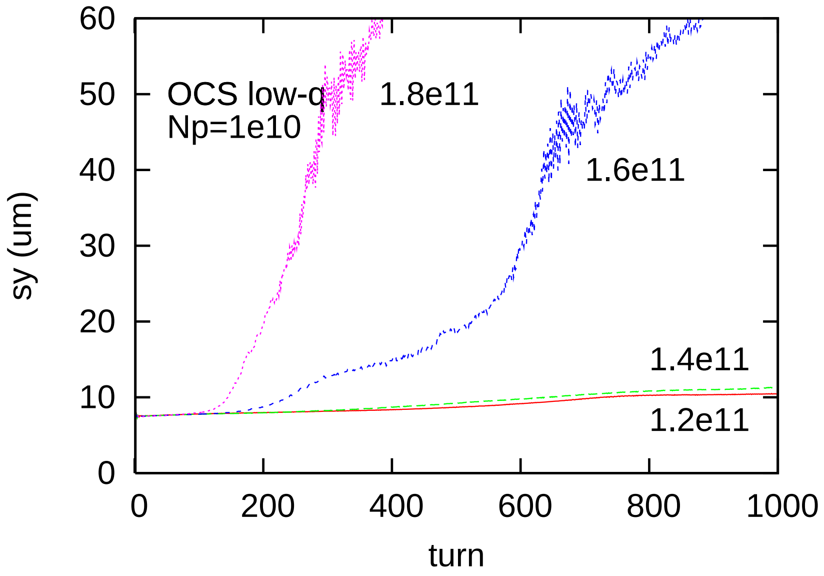


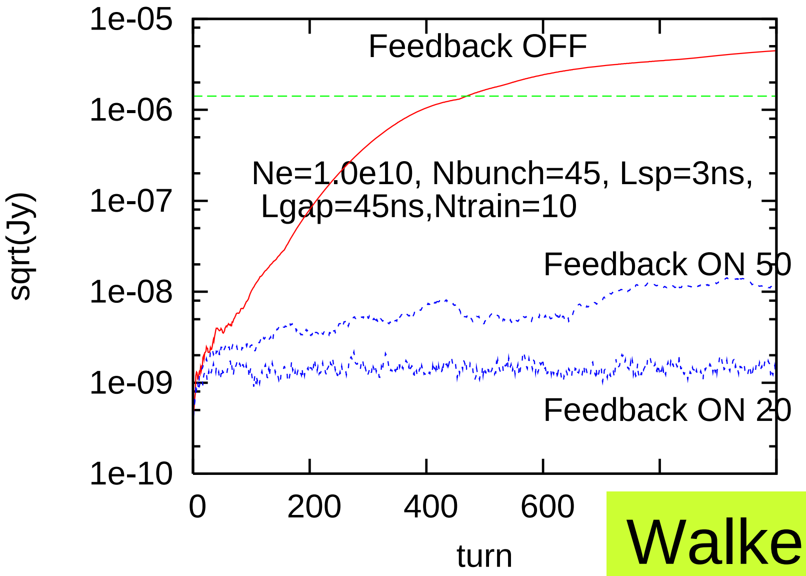
Walker

Damping Ring Design

Electron Cloud

- Ecloud: Threshold of electron cloud, 1.4×10^{11} m^{-3}.
- Ion: Feedback system can suppress for 650 MHz (3ns spacing),
- number of bunch in a train 45, and gap between trains 45ns..





Walker

RDR Cost Estimating

- 500 GeV BCD machine + “essentials” for 1 TeV
- Follow ITER “Value” & CERN “CORE” model for International Projects
  - **Provides basic agreed to costs [common “value” + in-house labor (man-hr)]**
- RDR will provide information for translation into any country’s cost estimating metric, e.g. Basis of Estimate => contingency estimate, in-house labor, G&A, escalation, R&D, pre-construction, commissioning, etc.
- Assumes a 7 year construction phase

Garbincius

ILC Cost Estimate

- Based on a call for world-wide tender:
  lowest reasonable price for required quality
- Classes of items in cost estimate:
  - **Site-Specific (separate estimates for each site)**
  - **Conventional – global capability (single world est.)**
    High Tech – cavities, cryomodules, regional estimates
- Cost Engineers will determine how to combine and present multiple estimates
- WBS ; WBS Dictionary; Costing Guidelines are mature enough to begin the cost estimating

Garbincius

WBS Level of Detail - Cryogenics

LHC refrig. single units

%	percentage of total materials cost for USLCTOS 500 GeV Cold option these percentages for USLCTOS are somewhat sensitive, they are listed just to give idea of level of detail that has been attained		
WB_6feb_PG_8feb (follows USLCTOS)			This is what is on the web, the items 1.8.3.1.1.i
1.8.3 Cryogenic Plant and Distribution			were omitted. The green numbers on left are
4.08	1.8.3.1 Cryogenic Plants		percentage 4.08% of total USLCTOS 500 cold M&S
3.27	1.8.3.1.1 Cryo Refrigeration Unit (includes cryo distribution, but not civil utilities)		
This layer was not included - consider adding this layer to increase sensitivity			
1.12		1.8.3.1.1.1 Cryo Cold Boxes	
0.68		1.8.3.1.1.2 Cryo Warm Compressor System	
0.12		1.8.3.1.1.3 Cryo Cold Compressor System	
0.11		1.8.3.1.1.4 Cryo Purification System	
0.13		1.8.3.1.1.5 Cryo Refrigeration System Controls	
0.10		1.8.3.1.1.6 Cryo Liquid Helium Storage	
0.17		1.8.3.1.1.7 Cryo Vertical Transfer Line	
0.16		1.8.3.1.1.8 Cryo Distribution Boxes 1,2,8	
0.11		1.8.3.1.1.9 Cryo Distribution Boxes 3,6,7	
0.16		1.8.3.1.1.10 Cryo Warm He Gas Header	
0.09		1.8.3.1.1.11 Cryo Vacuum Barriers	
0.19		1.8.3.1.1.12 Cryo System Installation Contracts	
0.04		1.8.3.1.1.13 Cryo Miscellaneous	
0.05		1.8.3.1.1.14 Cryo Feed Boxes	
0.04		1.8.3.1.1.15 Cryo End Boxes	
0.25	1.8.3.1.2	Cryo Cooling Towers	
0.04	1.8.3.1.3	Cryo Warm Helium Storage	
0.04	1.8.3.1.4	Cryo Helium Gas (initial charge) **- should this be operating, not construction?**	
0.00	1.8.3.1.5	Cryo Vacuum Barrier	
0.01	1.8.3.1.6	Cryo Feed Boxes	
0.01	1.8.3.1.7	Cryo End Boxes	
0.17	1.8.3.1.8	Cryo Load Controls	
0.30	1.8.3.1.9	Cryo Cold Bypass (1 kilometer) - what was this? fairly pricey!	
	1.8.3.2 Cryogenic Distribution **- actually included above 1.8.3.1.1.i - so can discard this el**		

Garbincius

Cost Roll-ups

Area Systems

e- source	e+ source	damping rings	RTML	main linac	BDS

Technical Systems

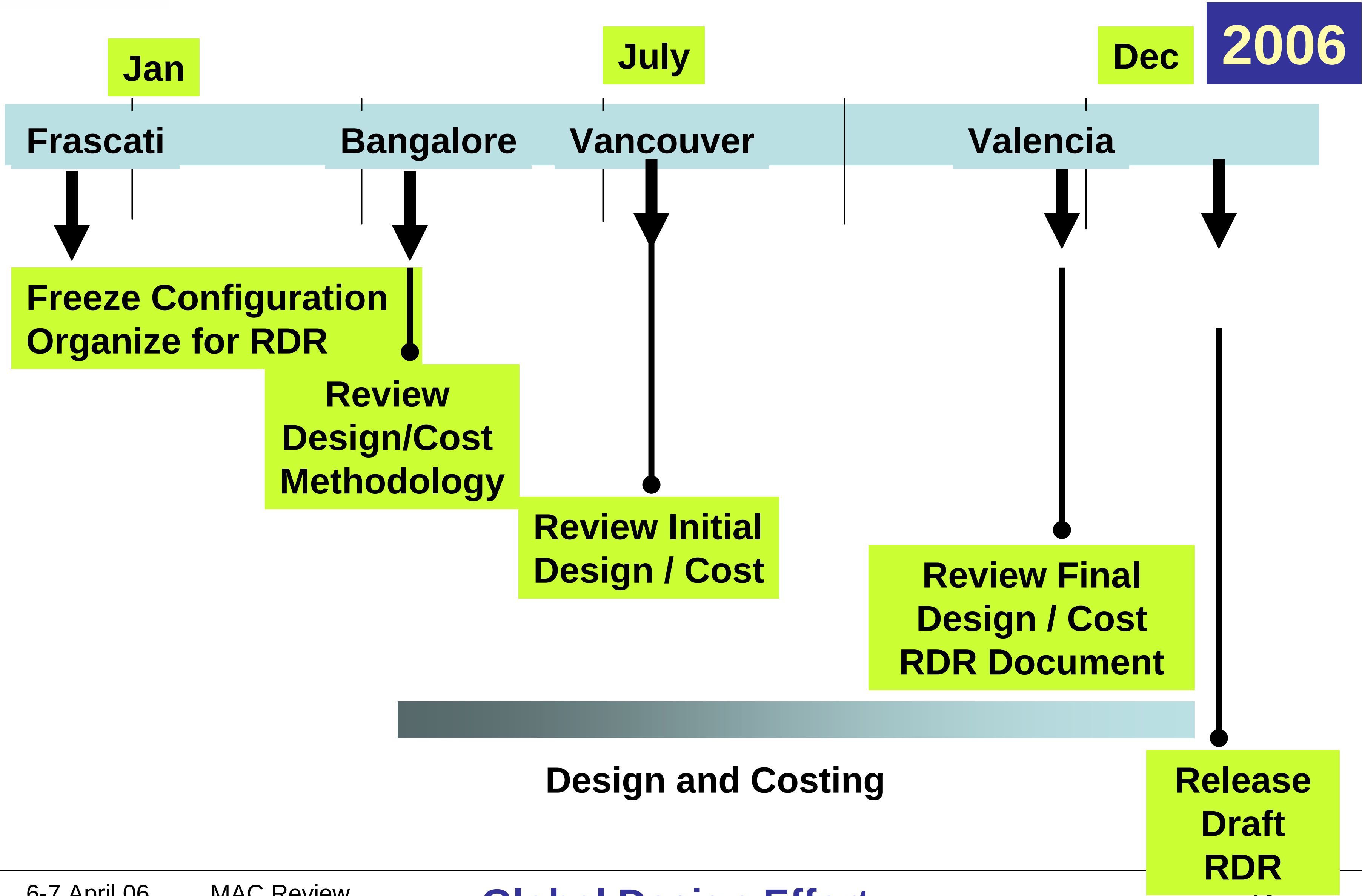
- Vacuum systems
- Magnet systems
- Cryomodule
- Cavity Package
- RF Power
- Instrumentation
- Dumps and Collimators
- Accelerator Physics

Global Systems

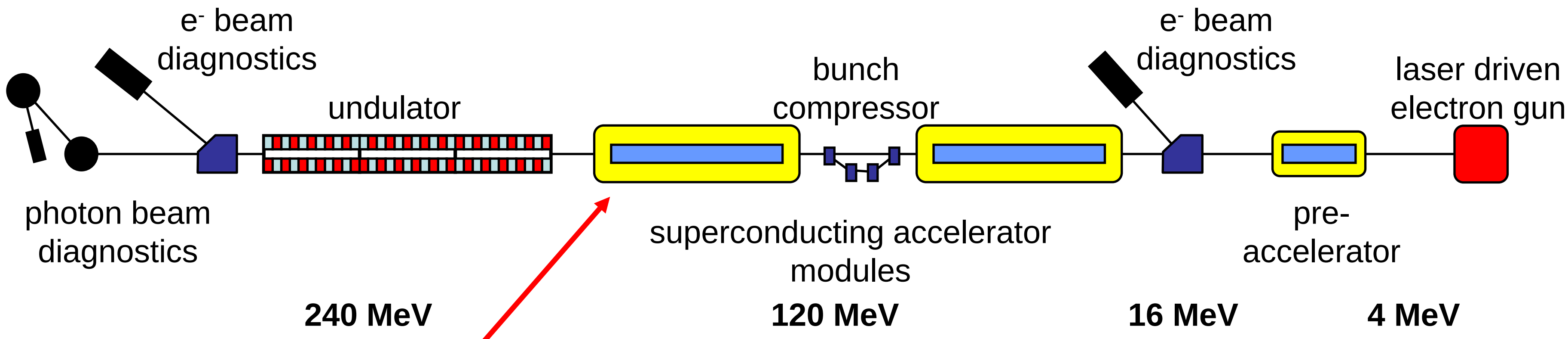
- Commissioning, Operations & Reliability
- Control System
- Cryogenics
- CF&S
- Installation

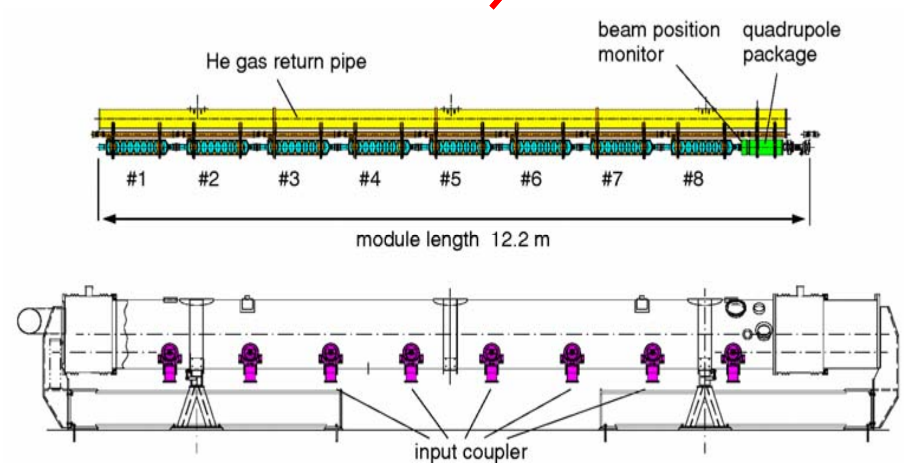
Garbincius

From Baseline to a RDR



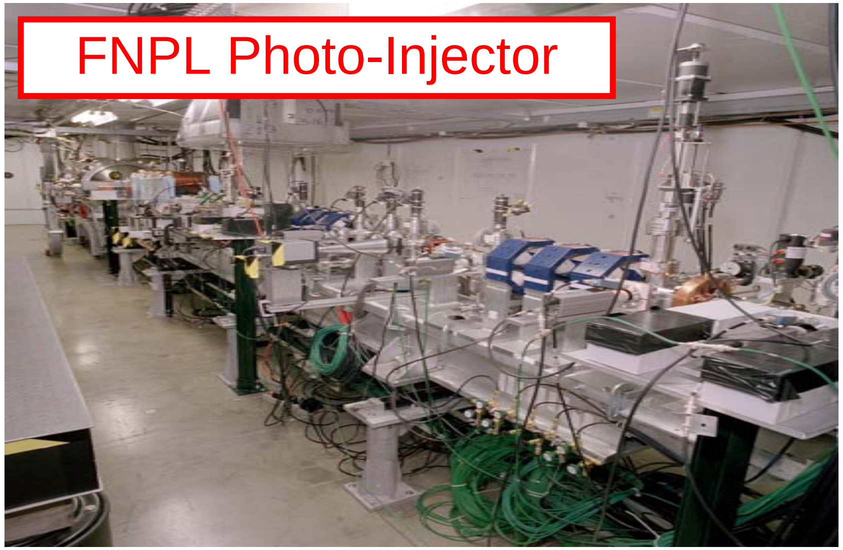
TESLA Test Facility Linac - DESY





Willis

Fermilab – SCRF Test Facility



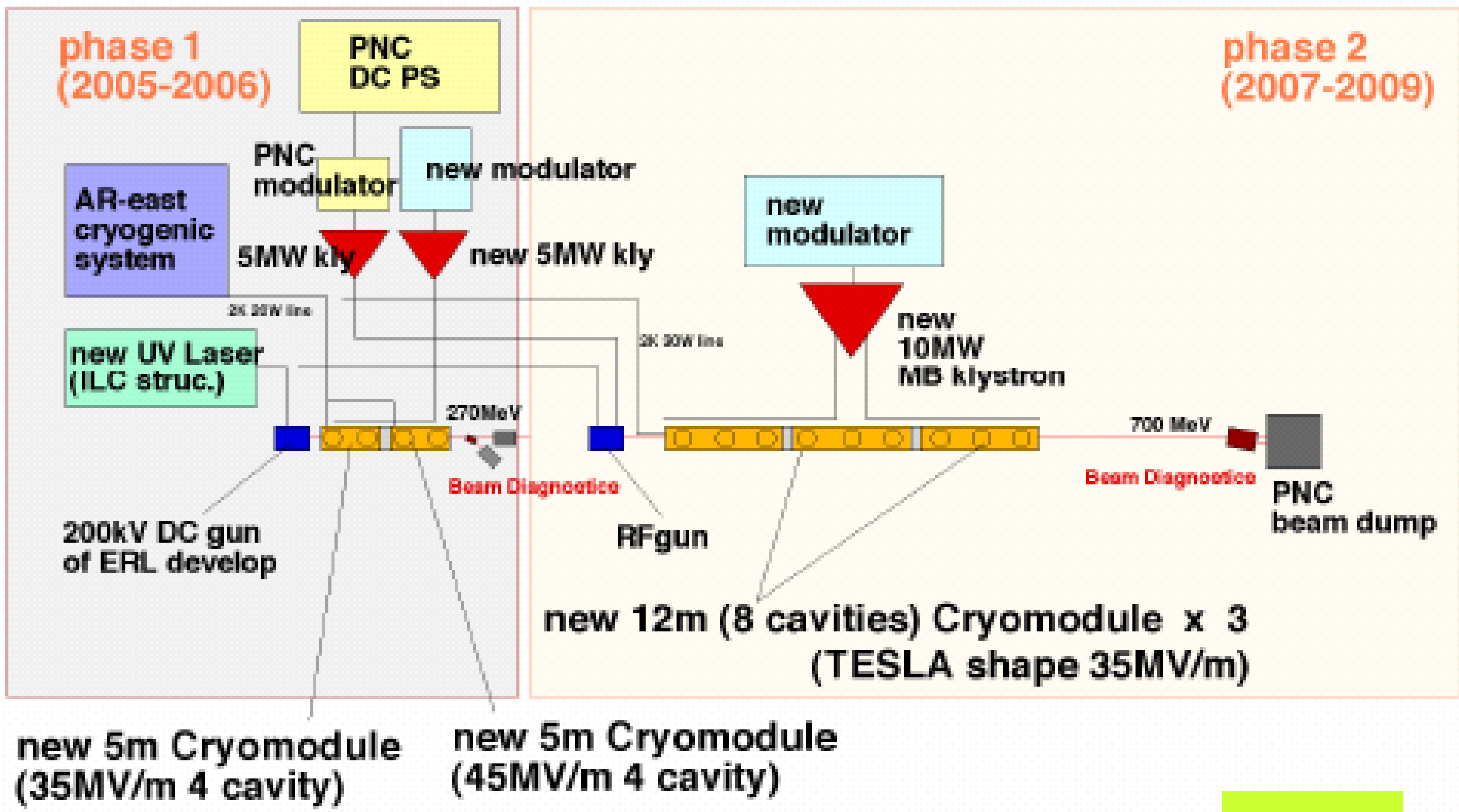
- ILC cryomodule string test facility planned for the New Muon Lab

- Upgraded FNPL will provide beam tests of ILC cryomodules (FY08 and 09)

Willis

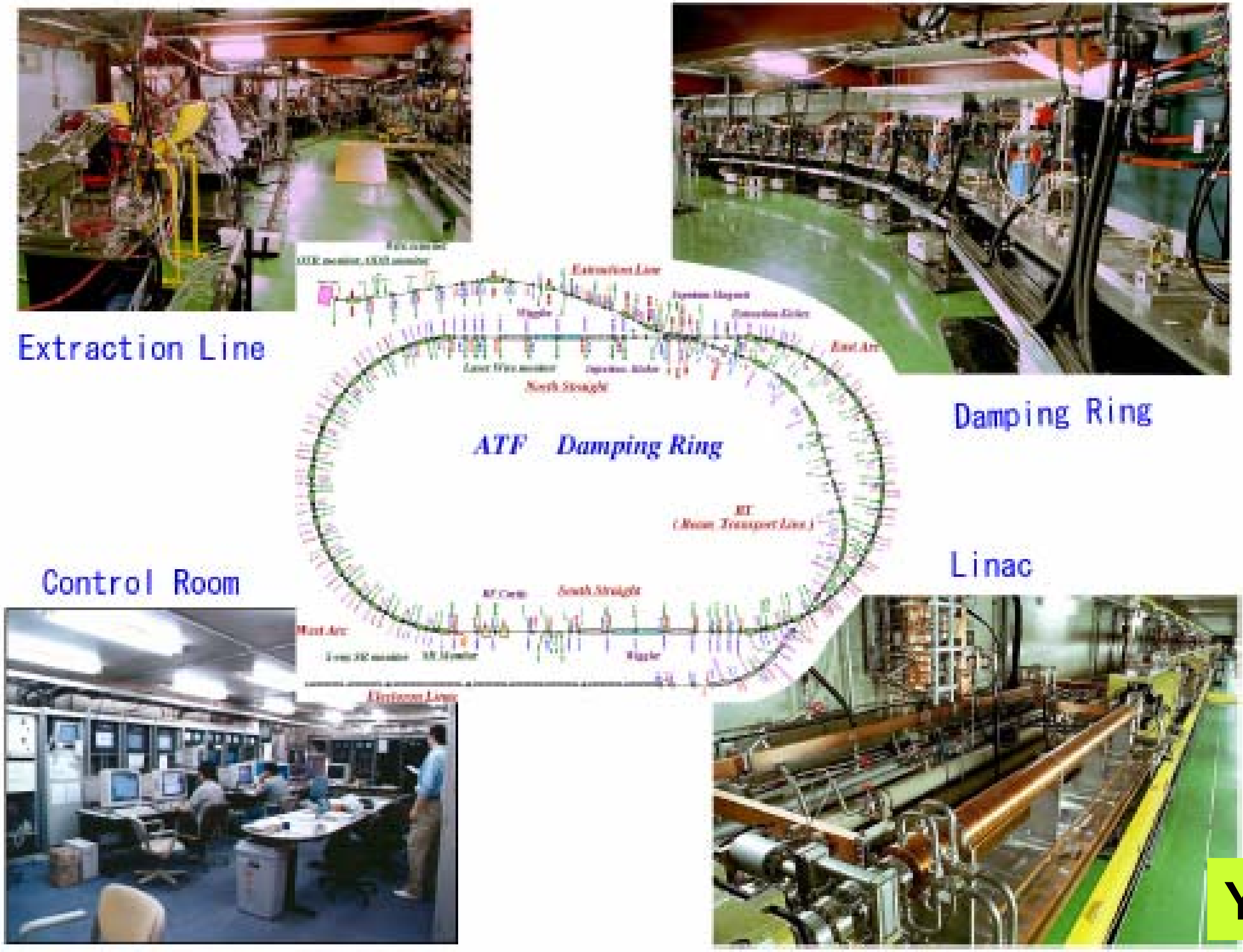
ILC R&D KEK STF

Plan of Superconducting RF Test Facility (STF)



Willis

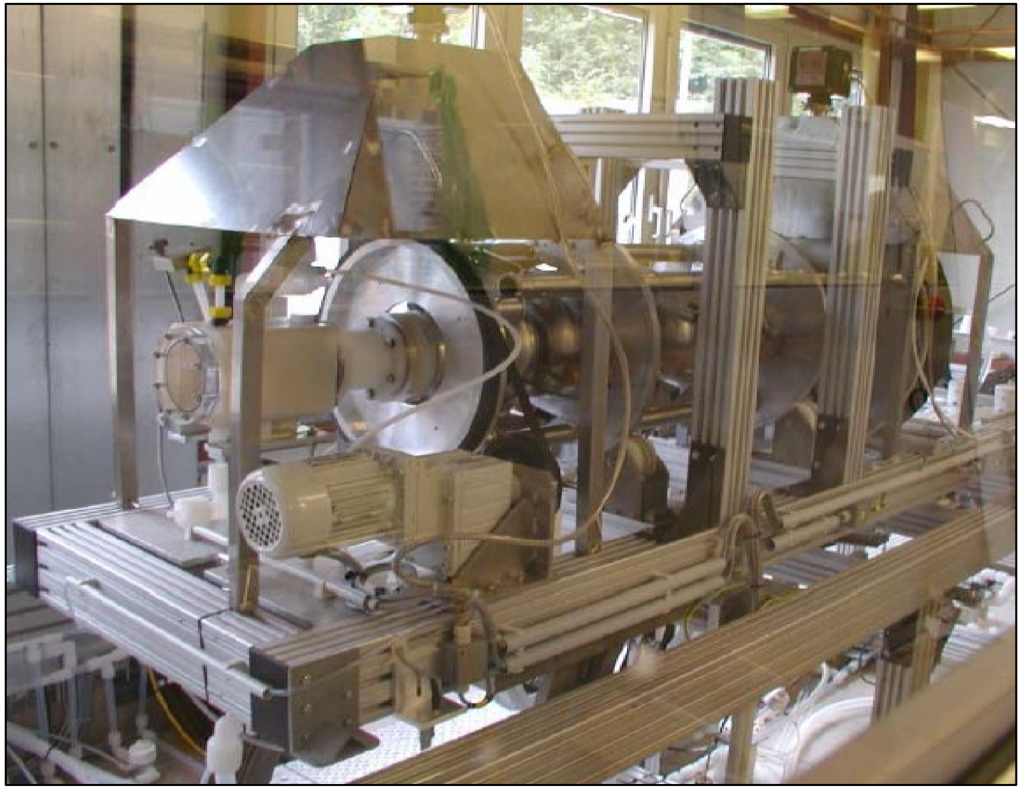
ILC R&D KEK ATF → ATF2

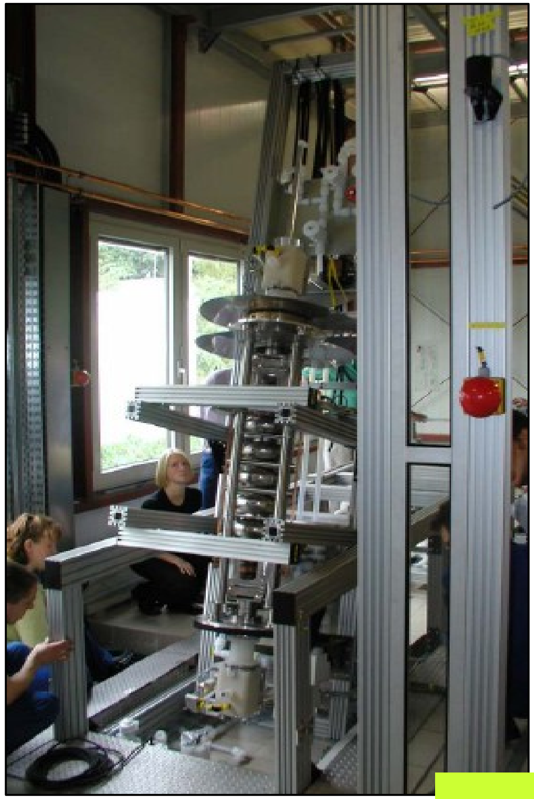


Yokoya

ILC R&D DESY Cavity Preparation

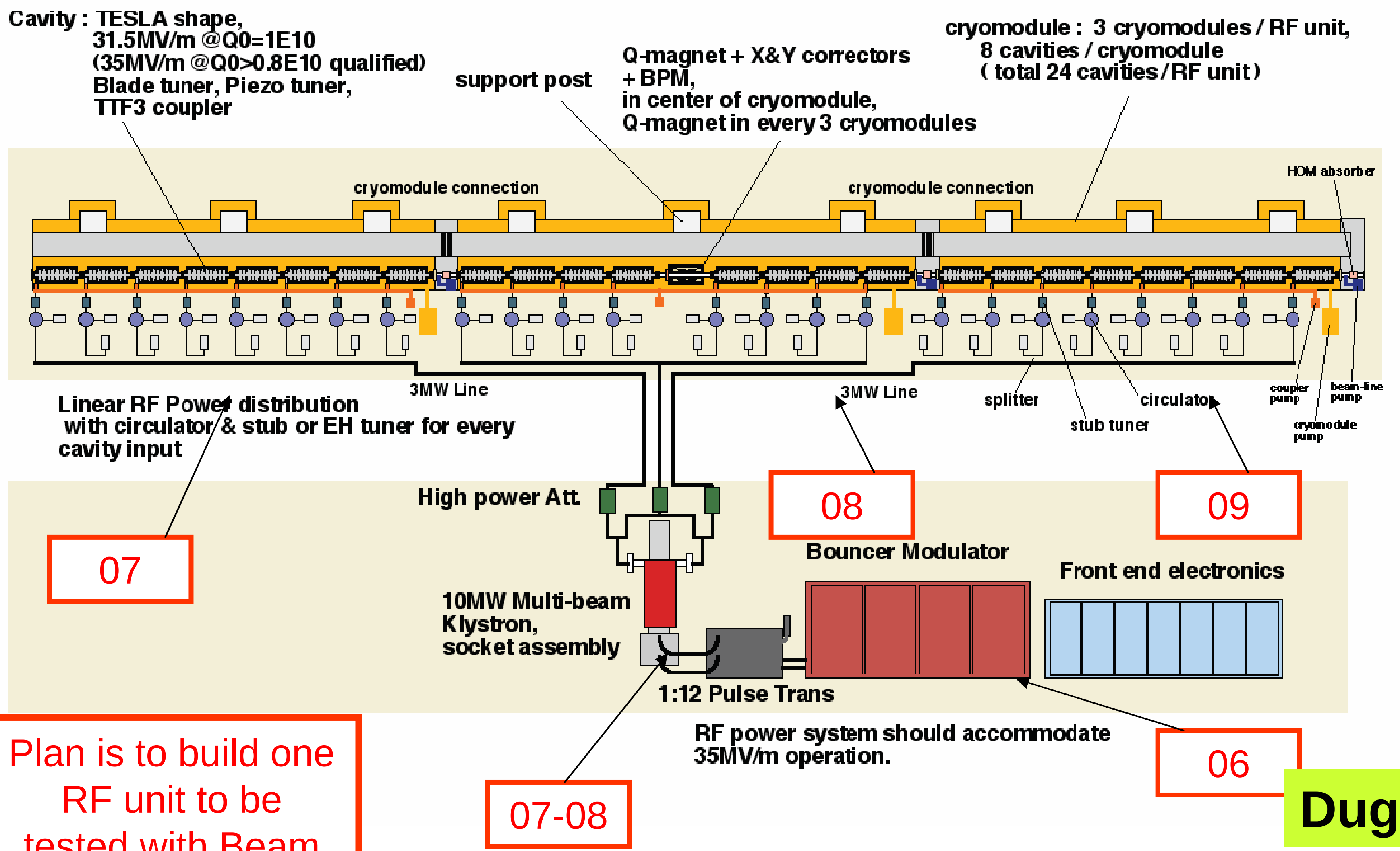
- **Electropolishing Studies @ DESY**





Foster

ILC RF unit at Fermilab



Plan is to build one RF unit to be tested with Beam by 2009.

Dugan

RDR Goals

- The BCD is now being used as the starting point and basis for the reference design / cost effort this year.
- Our goal is to produce a consistent design for the ILC, capable of delivering design performance.
- We will make every attempt to contain costs for the basis machine, while determining costs on an "international basis."
- The design will continue to evolve following the RDR, as the R&D provides CCB actions.