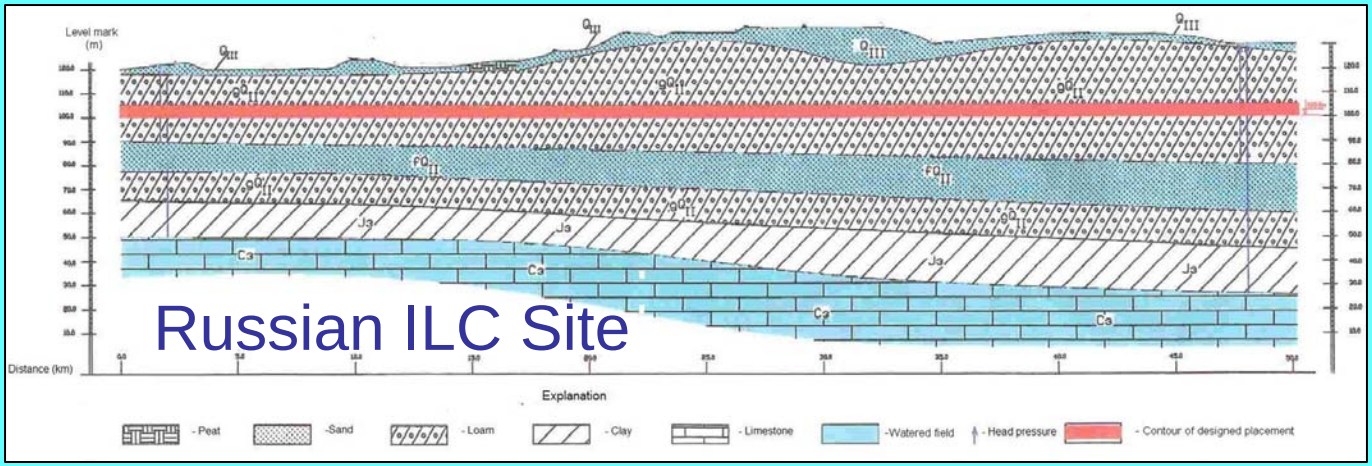
Progress in the ILC Program



Barry Barish

SiD Workshop – Boulder Colorado

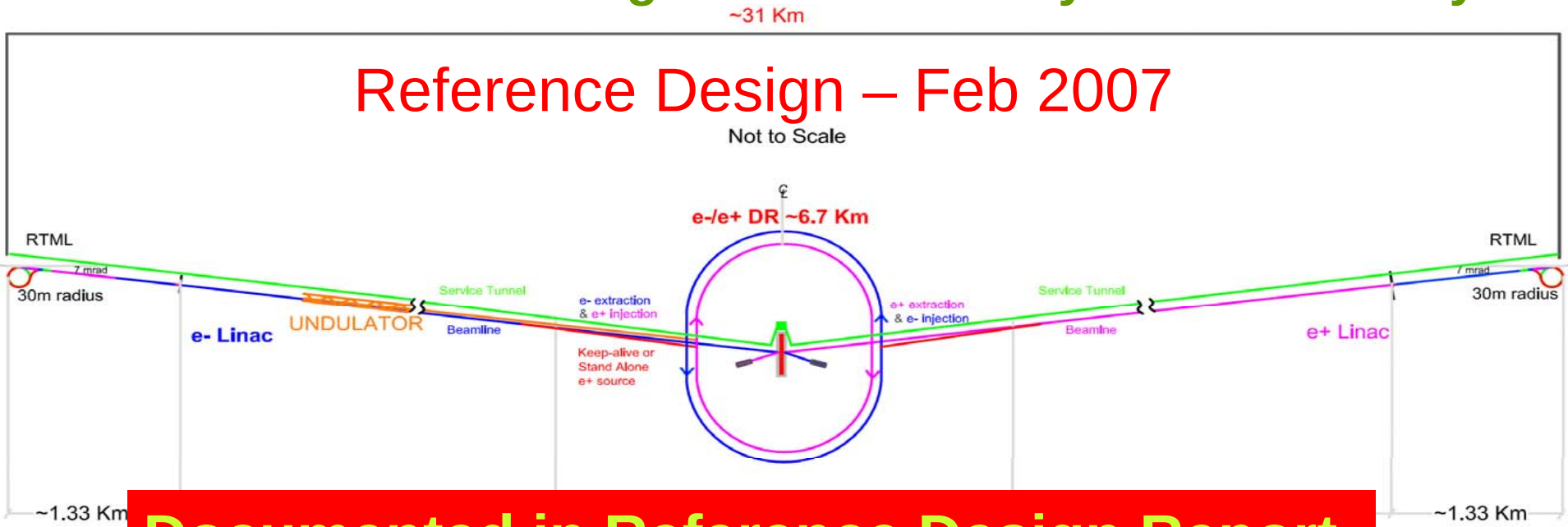
17-Sept-08

Today

- Recent developments in global program
  - **New contributors to Common Fund (Spain, India)**
  - **Some developments in China, Japan**
  - **A Russian initiative for ILC, including a site proposal**
  - **Initiating CLIC / ILC joint studies**
- Our Plan and Goals
  - **R&D Plan for the "Technical Design Phase"**
    - **R&D Milestones: gradient; electron cloud; final focus**
    - **Optimize Performance / Cost / Risk (Minimum Machine)**
  - **Developing a "Project Implementation Plan"**
    - **Siting; Governance; Industrializing, etc**

The Starting Point: ILC RDR

- **11km SC linacs operating at 31.5 MV/m for 500 GeV**
- **Centralized injector**
  - Circular damping rings for electrons and positrons
  - Undulator-based positron source
- **Single IR with 14 mrad crossing angle**
- **Dual tunnel configuration for safety and availability**

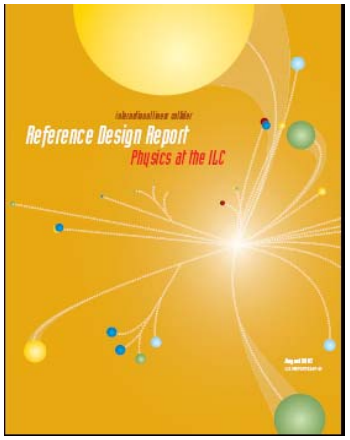


Documented in Reference Design Report

The Documentation

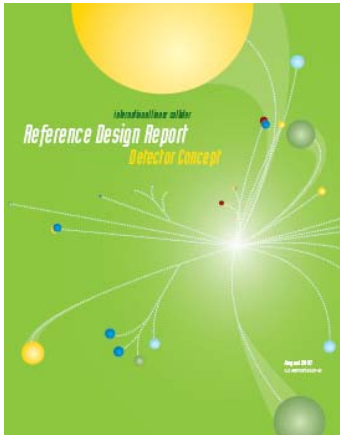
- **Reference Design Report (4 volumes)**

Executive Summary



Physics at the ILC

Accelerator



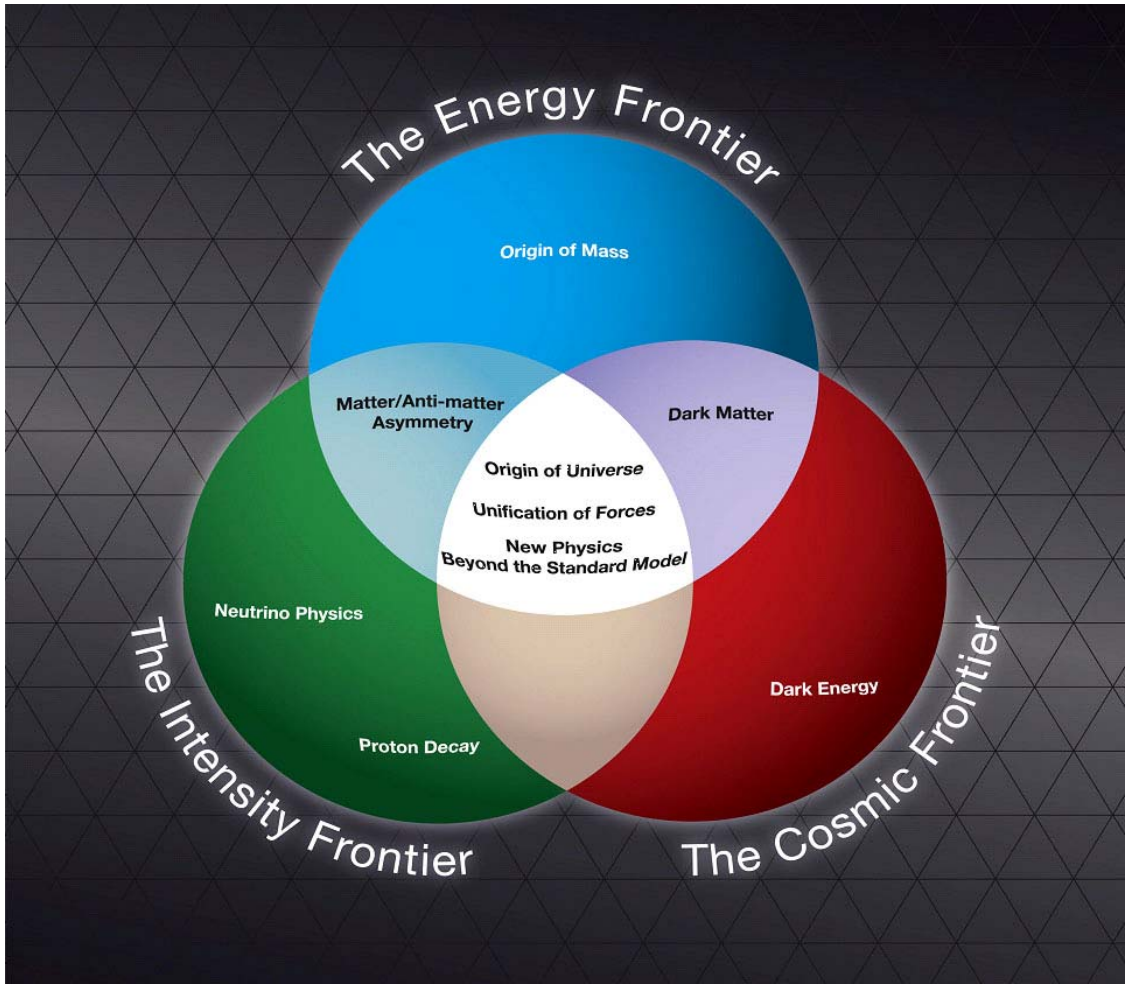
Detectors

US / UK Funding Actions

- UK ILC R&D Program
  - **About 40 FTEs. Leadership roles in Damping Rings and Positron Source, as well as in the Beam Delivery System and Beam Dumps.**
  - **All of this program is generic accelerator R&D, some of which are continuing outside the specific ILC project, retaining key personnel.**
- US Program
  - **ILC R&D reduced $60M → $15M for FY08. Planning a reduced level program for FY09 and beyond. US President & Congressional FY09 budgets = $35M**
  - **Generic SCRF also terminated in FY08, but is proposed to be revived in FY09 to $25M. and separated from ILC R&D.**

P5 – A New U.S. HEP Long Range Plan

P5 presentation to HEPAP 29-May-08



The Role of ILC in the Ten Year Plan

P5 Balancing Act

Too much ILC

Too little ILC

P5 Report: The Bottom Line

- The report strongly recommends restoring ILC R&D support over the coming few years (**at all budget levels**). (It does not however, indicate elements of a plan or strategy to realize the machine or to host it in the U.S.)

- ***"The panel recommends for the near future a broad accelerator and detector R&D program for lepton colliders that includes continued R&D on ILC at roughly the proposed FY2009 level in support of the international effort. This will allow a significant role for the US in the ILC wherever it is built."***

Proposed FY2009 Budget = 35.3M

ILC in India

Contribute to Common Fund

Superconducing RF

Meetings at TTC – next month

ILC in Spain

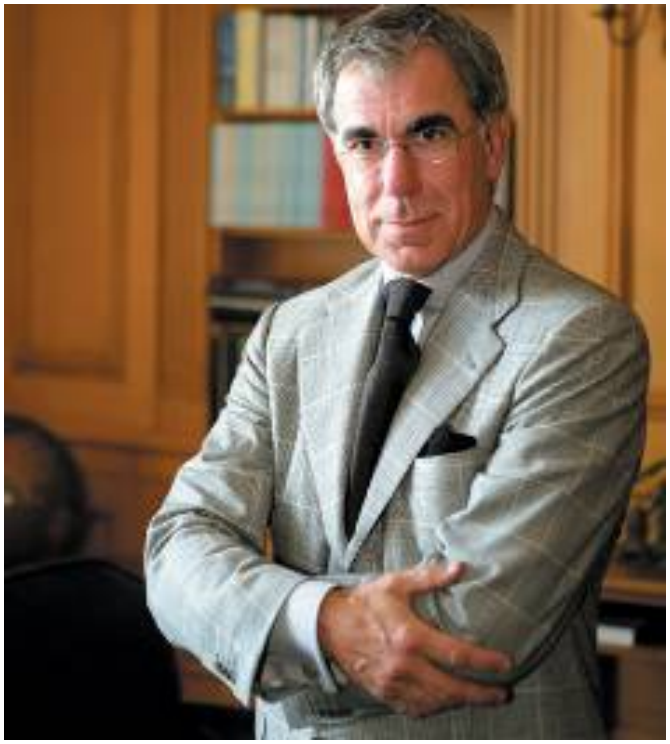
Contribute to Common Fund

Superconducting Quads

FALC – Madrid in January

New FALC Chair

Pierre Coulombe has served as President of the National Research Council (NRC) of Canada since January 2005. Coulombe brings a broad perspective to FALC, having worked as a private industry executive, a consultant, a professor of medicine and a senior official for the Québec government prior to assuming his NRC post. Though not a high-energy physicist, Pierre Coulombe is a supporter of large international projects, and with his broad credentials he will be an effective spokesman for FALC.



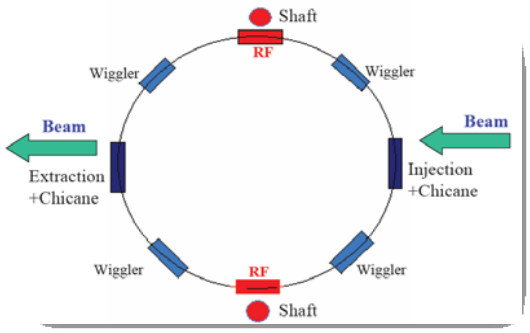
Pierre Coulombe

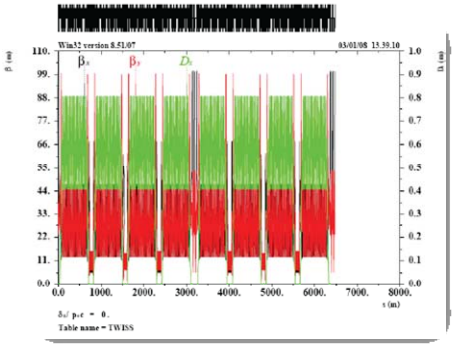
ILC in China

Growing Efforts

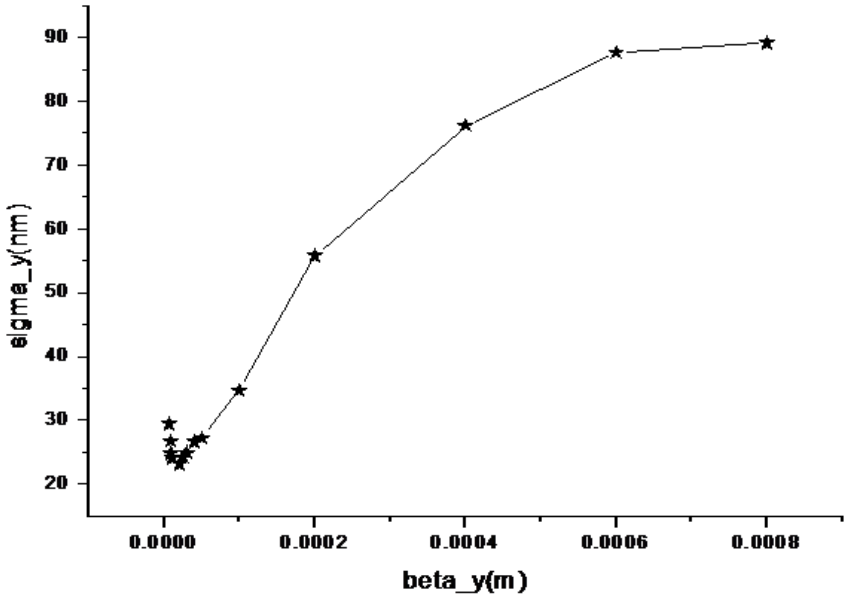
China

- Alternative DR lattice



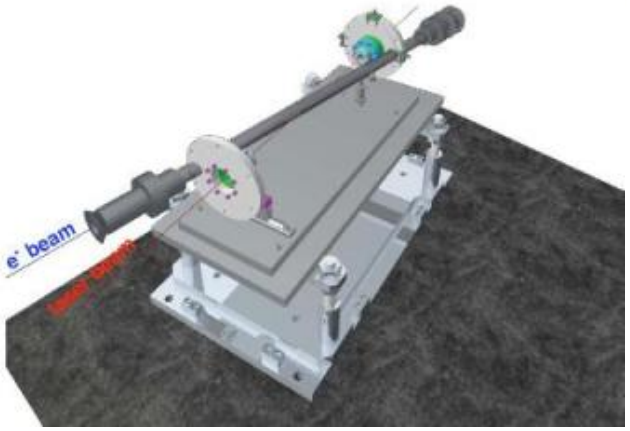


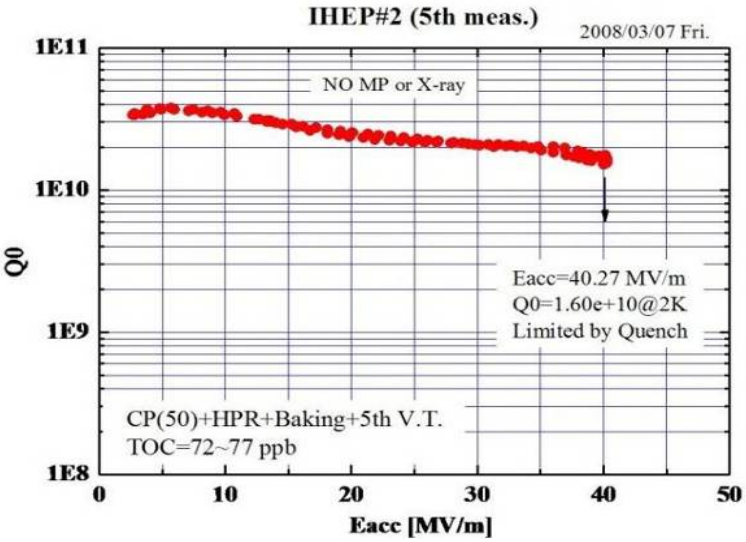
- Fabrication of ATF2 quads
- ATF2 lattice study



China

- Positron source study at ATF
- Large-grain cavity
  - **~48MV/m single cell, test at KEK**





Jie Gao

Dear Barry

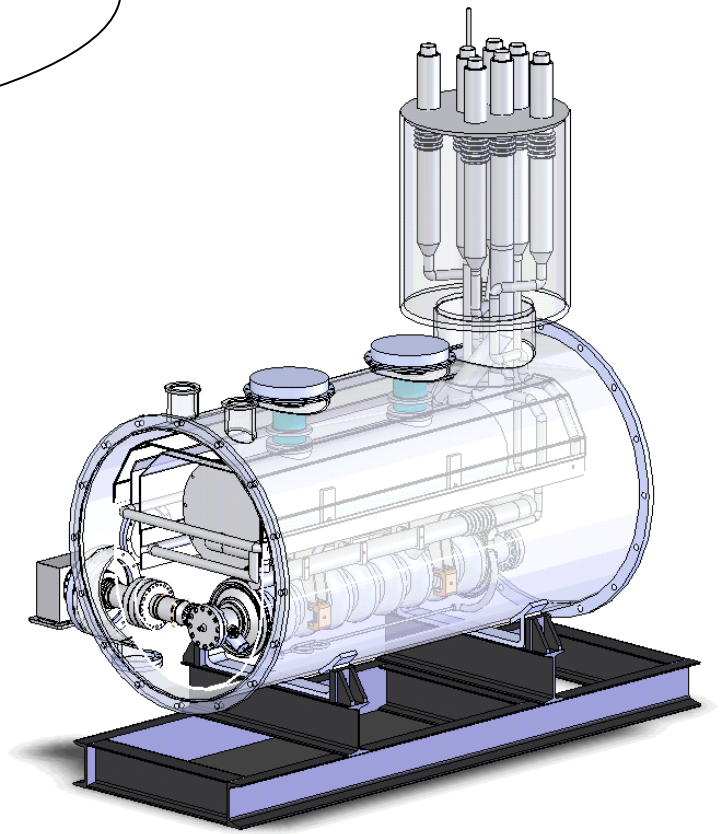
I am pleased to inform you that IHEP has proved my application of about 1.5M euros on superconducting technology R&D including 9 cell cavity and single 9 cell cryomodule including coupler, tuner, etc. So we will have more collaboration on ILC SC activities

Best regards

Jie

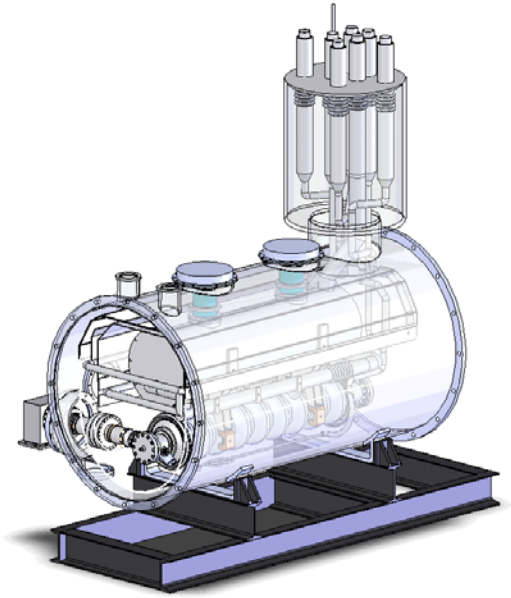
China - ILC Cryomodule

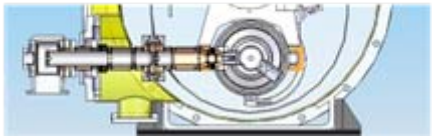
- 15MYuan ~ 1.5MEuro for 3 years
- Fabrication of a module with cavity, coupler, tuner, cryostat, LLRF
- Learn fabrication technology
- Can be used as horizontal test stand

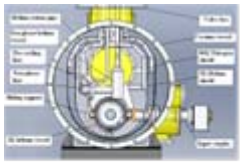


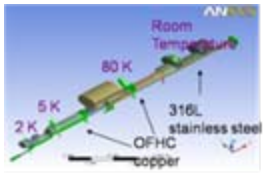
ILC Cryomodule Design

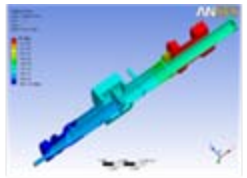
- Joint design work of IHEP and started Sep.2006.
- Completed the design o entire structure includin couplers with mechanical and thermo-dynamical simulation

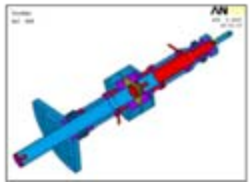


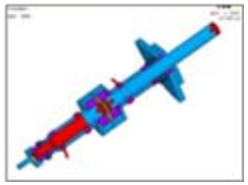


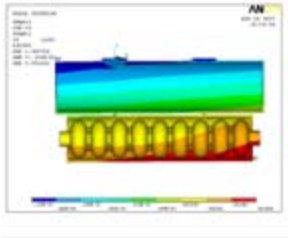


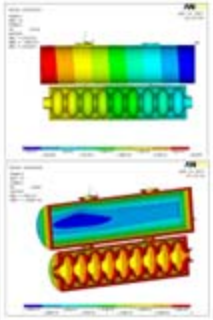








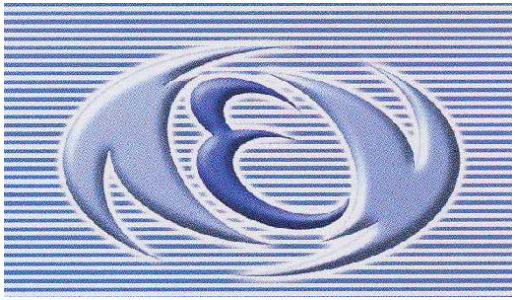




Japanese ILC Strategy

A. Suzuki to GDE EC on 5-Sept

Strategy toward ILC



ATSUTO SUZUKI
(KEK)

GDE-EC
(KEK, September 5, 2008)

Roadmap Review Committee in March 2008

Young Kee Kim (Fermilab), Rolf Heuer (Desy), John Ellis (CERN), Jonathan Rosner (Chicago), Maury Tigner (Cornell), Satoshi Ozaki (BNL), Jean Zinn-Justin (Saclay)□□□□□□□□

Policy promoting KEKB-upgrade, J-PARC and ILC

J-PARC

KEKB
- upgrade asap

2010 SuperKEKB

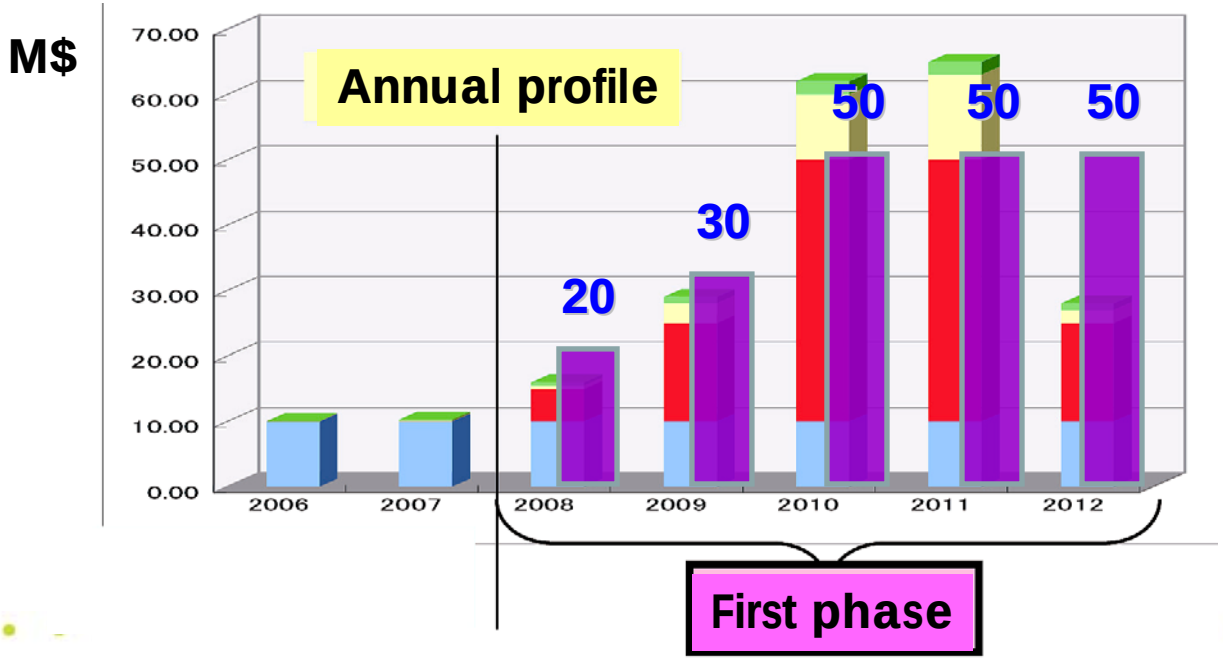
ILC R&D

2015~ 2020 ILC 2025~ 2030

ILC R&D Budget

First Phase (2008 ~ 2012) : 200 M$

- accelerator R&D 115 M$
- site related issue 35 M$
- GDE common fund 50 M$



Promoter's Meeting on Industry – KEK Collaboration Council

2008. 02.21

Industry – KEK Collaboration Council

(June 11, 2008)

Advanced Accelerator Technology Forum

60 industries and 30 research-institutes and universities joined this forum

Federation of Diet Members for promotion of the ILC project

- **Built in 2006 (June 15th):**
- **Members: At present more than 60 Diet members.**
- **Chair: Mr. Kaoru Yosano (former Cabinet Secretary, Minister of MEXT, METI,,,)**
- **Secretary: Mr. Takeo Kawamura (former Minister of MEXT)**

2006

June Foundation of the Federation

Sep. KEK visit of the Federation members

2007

Jan. ~ May --- a series of Workshop (1st – 7th)

Lecture by prominent physicists, economists, industry sector, etc.

June ~Nov. Discussion on the preliminary report by Federation

Nov. Publish preliminary report (1st summary report)

2008 Jan. Start of the next workshop series

English Version in

http://suchix.kek.jp/~tishika/ilc_report/

user ID = *ILC* password = *ilc777*

Chair: Mr.Kaoru Yosano

Mr. Shoyama(Hitachi CEO)

Secretary: Mr .Takeo Kawamura

Prof. Sasaki (former President of Univ of Tokyo)
And Prof. Koshiba

Expand to Suprapartisan Federation for solidifying a bid-to-host activity of ILC and for promoting advanced accelerator science

Kickoff Meeting : July 31st

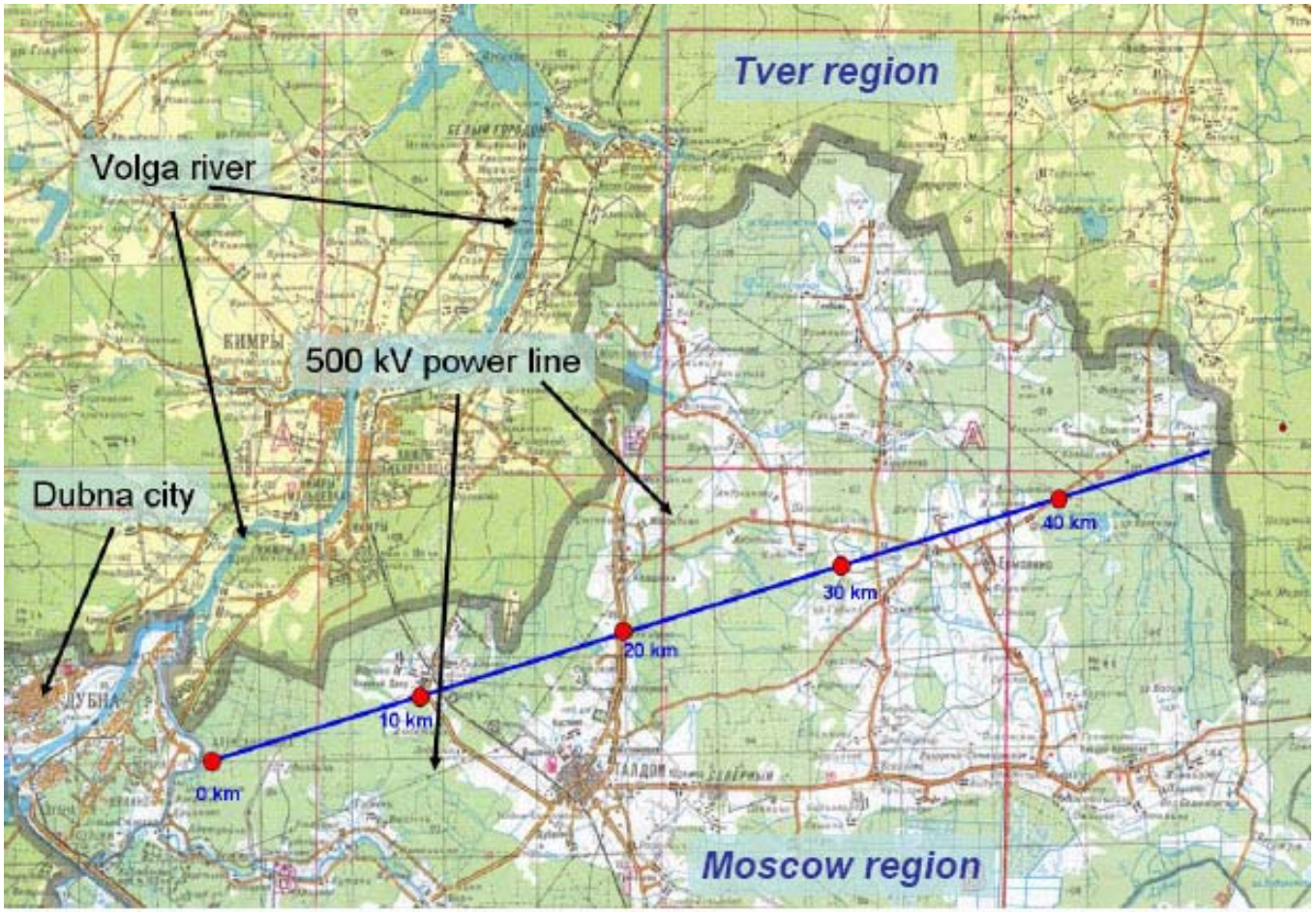
the ~ 50 members of Congress in almost all political parties

Russian ILC Initiative

Sissakian -- Dubna

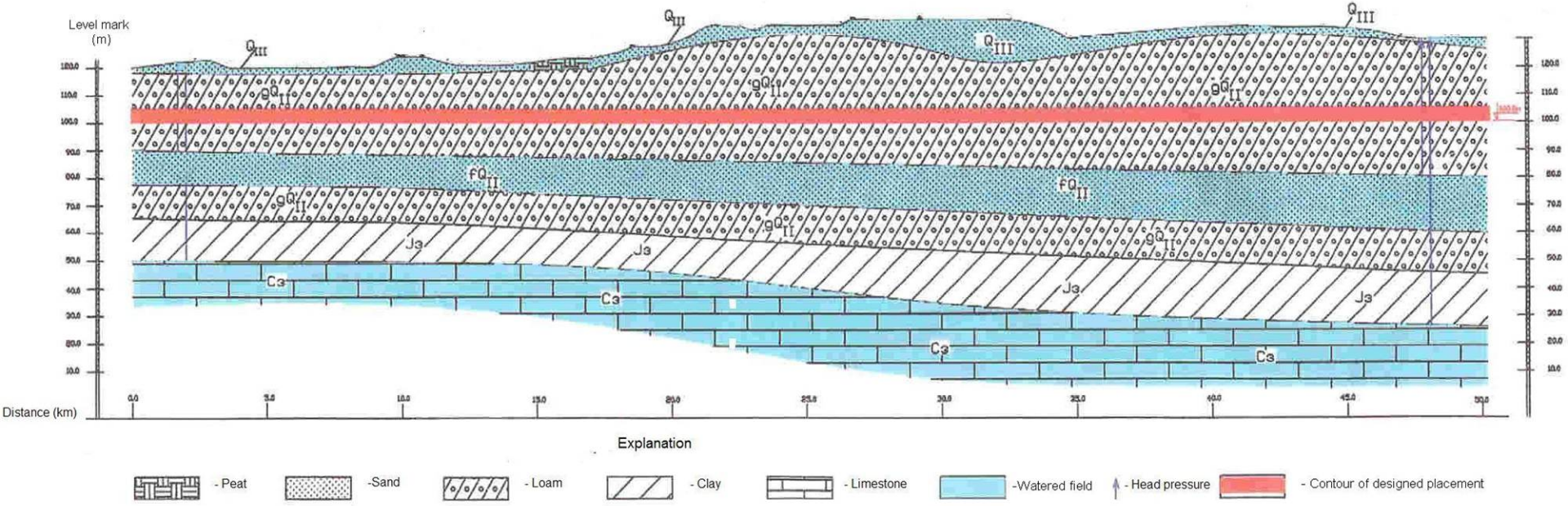
Russian Site

- ***Unique shallow site – thick loam layer near the surface.***



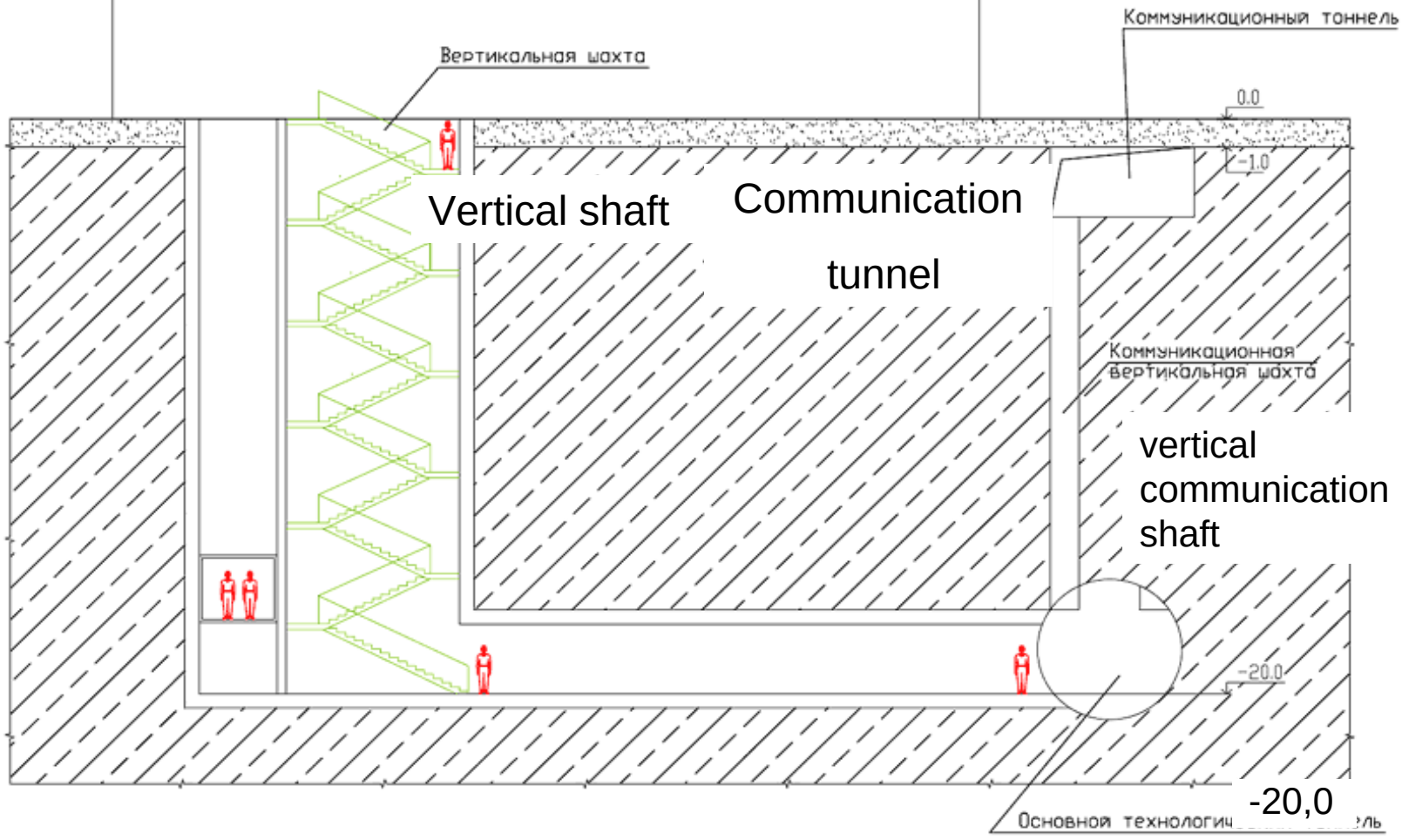
Russian Site

The ILC linear accelerator is proposed to be placed in the drift clay at the depth of 20 m with the idea that below the tunnel there should be impermeable soil preventing from the underlying groundwater inrush. It is possible to construct tunnels of the accelerating complex using tunnel shields with a simultaneous wall timbering by tubing or falsework concreting.



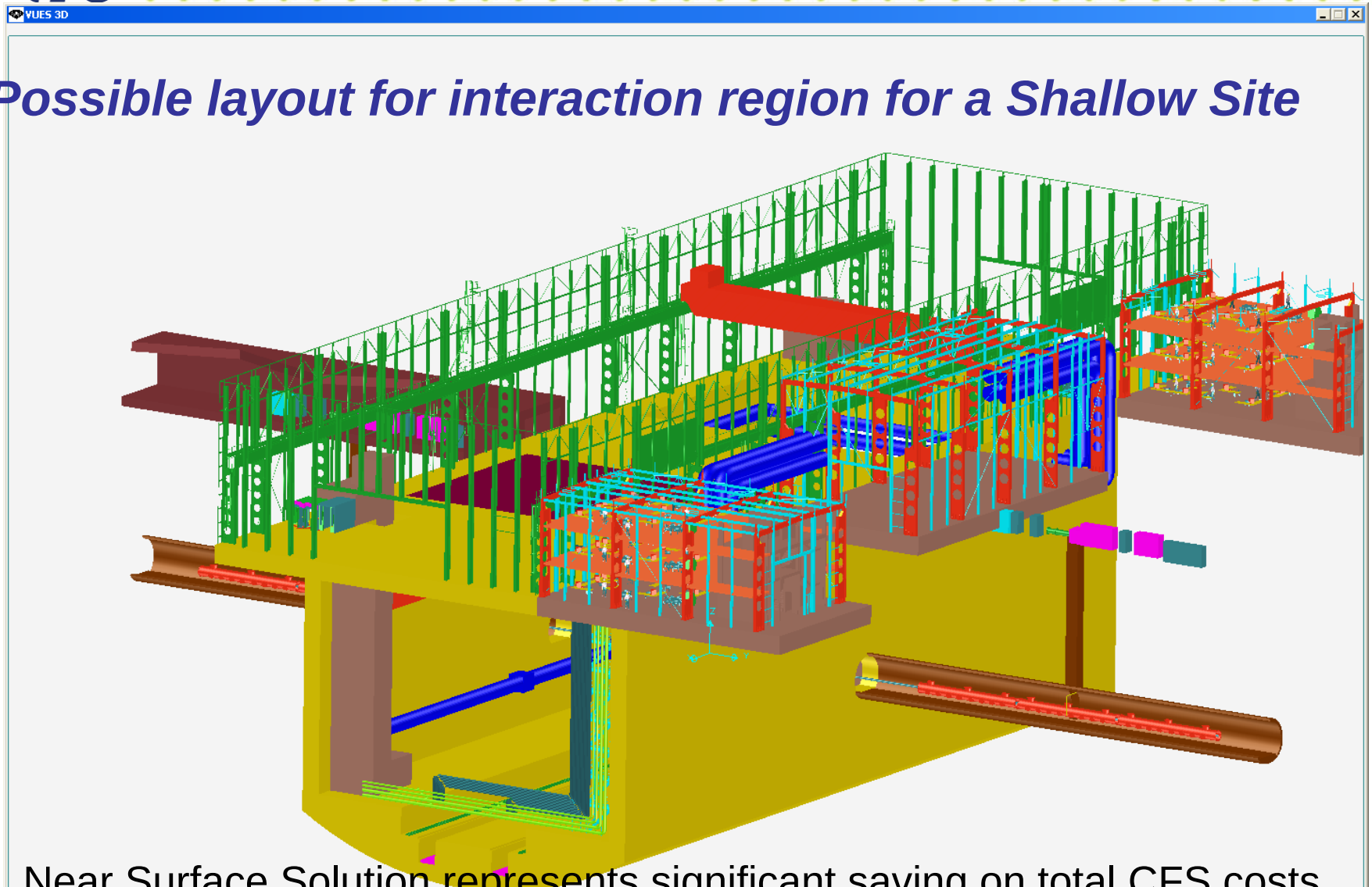
Russian Site

Cross section of beam tunnel 20m below surface



Russian Site

Possible layout for interaction region for a Shallow Site



Near Surface Solution represents significant saving on total CFS costs for experimental hall + much less technical risk

An Integrated Effort to a Linear Collider

- Meetings at CERN in November when I visited CERN to give an ILC colloquium
  - **Meeting with the CLIC Extended Steering Committee, where I suggested we explore areas of joint work, where both stand to gain.**
  - **Meeting with R Aymar, who also endorses the general idea of increasing areas of joint work**
- Follow up meeting in February and May to organize and identify areas of joint interest
- Dubna meeting focused on joint ILC-CLIC site studies and costing methodology

Initiating Joint Areas

- **Co-conveners of the CLIC-ILC working groups**
  - **Civil Engineering and Conventional Facilities (CFS): Claude Hauviller/CERN, John Osborne/CERN, Vic Kuchler (FNAL)**
  - **Beam Delivery Systems and Machine Detector Interface: D.Schulte/CERN, Brett Parker (BNL), Andrei Seryi (SLAC),, Emmanuel Tsesmelis/CERN**
  - **Detectors: L.Linssen/CERN, Francois Richard/LAL, Dieter.Schlatter/CERN, Sakue Yamada/KEK**
  - **Cost & Schedule: John Carwardine (ANL), Katy Foraz/CERN, Peter Garbincius (FNAL), Tetsuo Shidara (KEK), Sylvain Weisz/CERN**
  - **Beam Dynamics: A.Latina/FNAL), Kiyoshi Kubo (KEK), D.Schulte/CERN, Nick Walker (DESY)**

So, where does ILC effort stand?

- In the UK we have retained the key ingredients (e.g. intellectual leadership) in our efforts toward a linear collider.
- In the U.S., our budget should be restored at a level ~35M$ FY09 and for the next few years. Likely “Continuing Resolution” in the US for FY09 is a complication
- We are lacking a long range strategy towards the ILC. But, we know what we need: exciting validating science from the LHC; a successful TDP that includes technical demonstrations, cost reductions, a siting plan, **detector program**, and a realistic project implementation plan

The Plan - Technical Design Phase

- First Official Release
- Released in Dubna in June 08
- Next review and release: December 08

How do we propose to move forward!

General Theme: ***RISK REDUCTION***

- We must re-examine our design and optimize for cost to performance.
- This will require aggressive studies of the major cost drivers, reducing scope, staging, etc. We will do this openly and in full coordination with experimentalists.
- We must develop our technical design, such that major technical questions (gradient, electron cloud, etc) are positively resolved
- We must develop the technical design in preparation of making a construction proposal (plug compatible designs, value engineered concepts, etc.)
- Finally, we must develop an attractive, realistic and flexible Project Implementation Plan

Essential Elements of TDP

- Draft Document
  - ***"ILC Research and Development Plan for the Technical Design Phase" Release 2 June 2008***
- Key Supporting R&D Program (priorities)
  - **High Gradient R&D - globally coordinated program to demonstrate gradient for TDR by 2010 with 50%yield**
  - **Electron Cloud Mitigation – Electron Cloud tests at Cornell to establish mitigation and verify one damping ring is sufficient.**
  - **Final Beam Optics – Tests at ATF-2 at KEK**

TD Phase 1

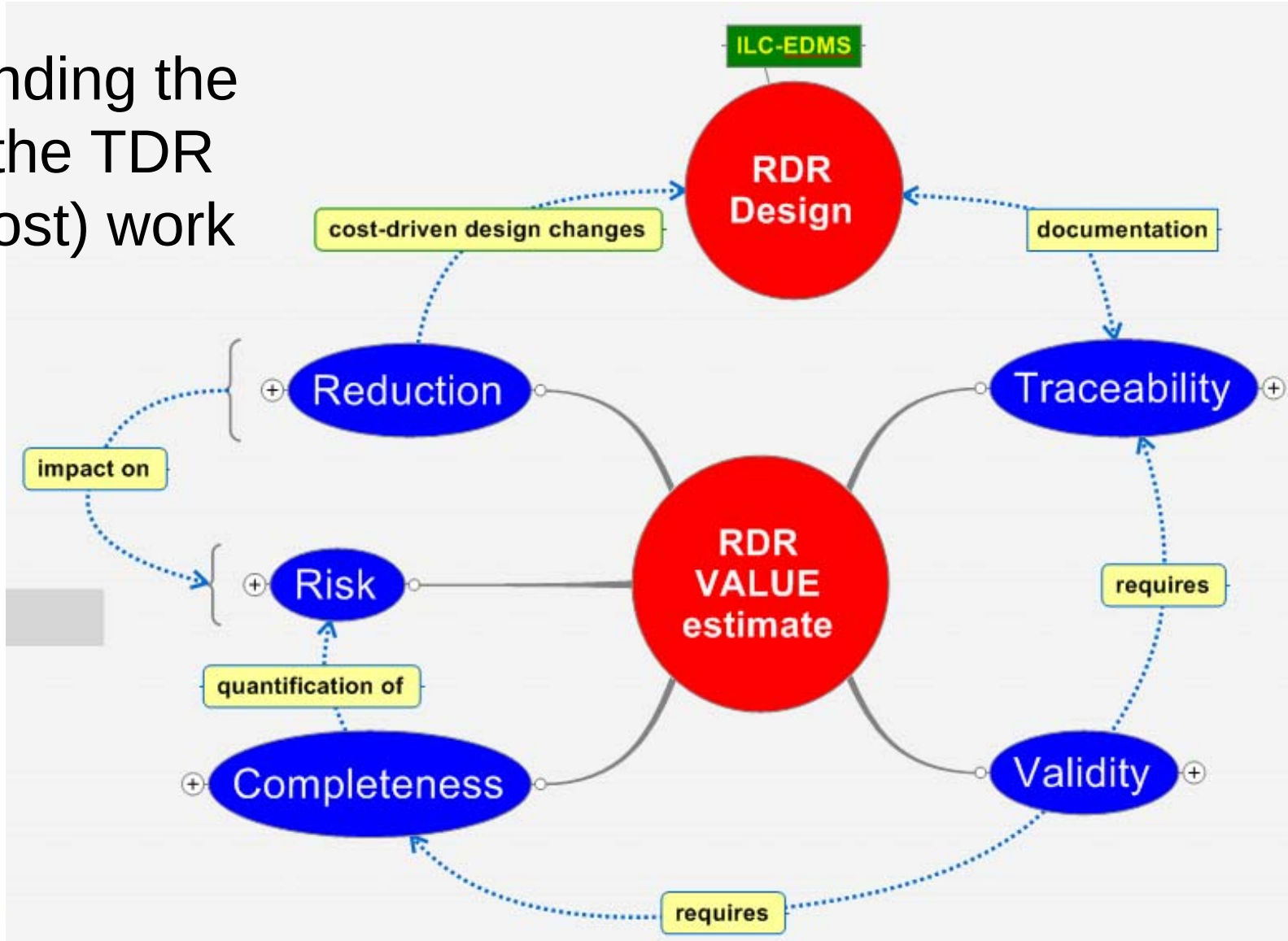
- Timescale: Interim report mid 2010
- Major theme: High-priority risk-mitigating R&D
  - **Superconducting RF linac technology – technical demonstration of gradient, plug compatiblity and identifying potential cost reductions**
  - **Confirm mitigation of electron cloud effects**
  - **The re-baseline will take place after careful consideration and review of the results of the TD Phase 1 studies and the status of the critical R&D.**

TD Phase 2

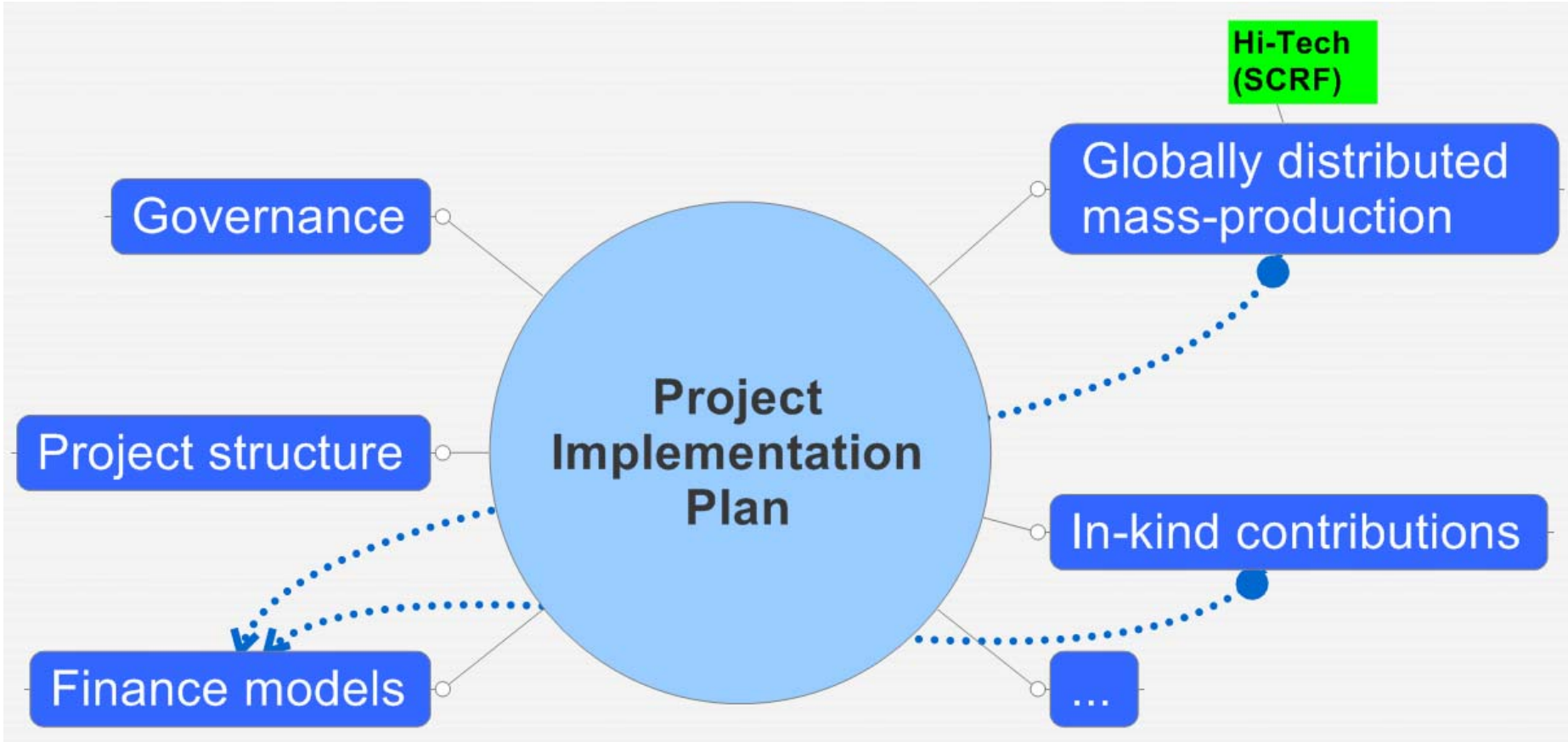
- Timescale: Produce report mid-2012
- **First goal:** New baseline design
  - **SCRF – S1 Test of one RF unit – (difficult!)**
  - **Detailed technical design studies**
  - **Updated VALUE estimate and schedule.**
  - **Remaining critical R&D and technology demonstration**
- **Second Goal:** Develop a Project Implementation Plan (Siting plan; industrialization; governance; funding plan; etc)

Cost Consciousness and Reduction

Understanding the scope of the TDR (design/cost) work



Project Implementation Plan



Conclusions

- We are making progress with our plan for Technical Design Phase.
  - **A two stage ILC Technical Design Phase (TDP-1 2010 and TDP-2 2012 is proposed)**
- Overall Goals: Cost and risk reduction, complete the technical design and implementation plan on the time scale of LHC results (~ 2012)
- SCIENCE remains the key to ultimate success.

Unsolicited Advice for SiD

- **KEEP DEVELOPING SiD: THE TECHNOLOGIES, THE SIMULATIONS AND A TECHNICAL DESIGN THAT WILL MEET THE SCIENTIFIC GOALS**
- **Expand SiD into a more balanced global collaboration.**
- **The LOI process is critical for the accelerator design, because of the very close coupling of the machine and detectors. We need to work with experimentalists!**
- **The LOI process is crucial to developing detectors that will meet the very challenging ILC performance goals.**
- The DoE (NSF) need to be convinced why they should support the LOI process !!