GDE Remarks
ALCPG07 Closing Plenary

Marc Ross

Fermilab

Who is Ray Orbach?

U.S. Department of Energy

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United States Department of Energy

Office of Public Affairs

Washington, D.C. 20585

News Media Contact(s):
Craig Stevens, (202) 586-4940

For Immediate Release
June 1, 2006

Secretary Bodman Statement on Dr. Orbach Swearing In as DOE Under Secretary for Science

WASHINGTON, DC - Energy Secretary Samuel W. Bodman administered the Oath of Office to Dr. Raymond L. Orbach to be the Department of Energy's (DOE) first Under Secretary for Science, earlier this afternoon. Dr. Orbach was unanimously confirmed by the United States Senate on May 26, 2006. President Bush nominated Dr. Orbach for the new position, created by the Energy Policy Act of 2005, in December 2005. Dr. Orbach will continue to serve as the Director of the DOE Office of Science, a position he has held since March 2002.

Answer:

- *Equivalent of Science Minister* in European or Asian Government
  - **2 Levels below President**

- His attendance and his comments are a *positive* sign of US Government support for ILC
  - **Much better than being ignored!**

- (Though the above may be true, it does not reduce our workload.)

DoE Project Steps

DoE Order 413.3

B Barish

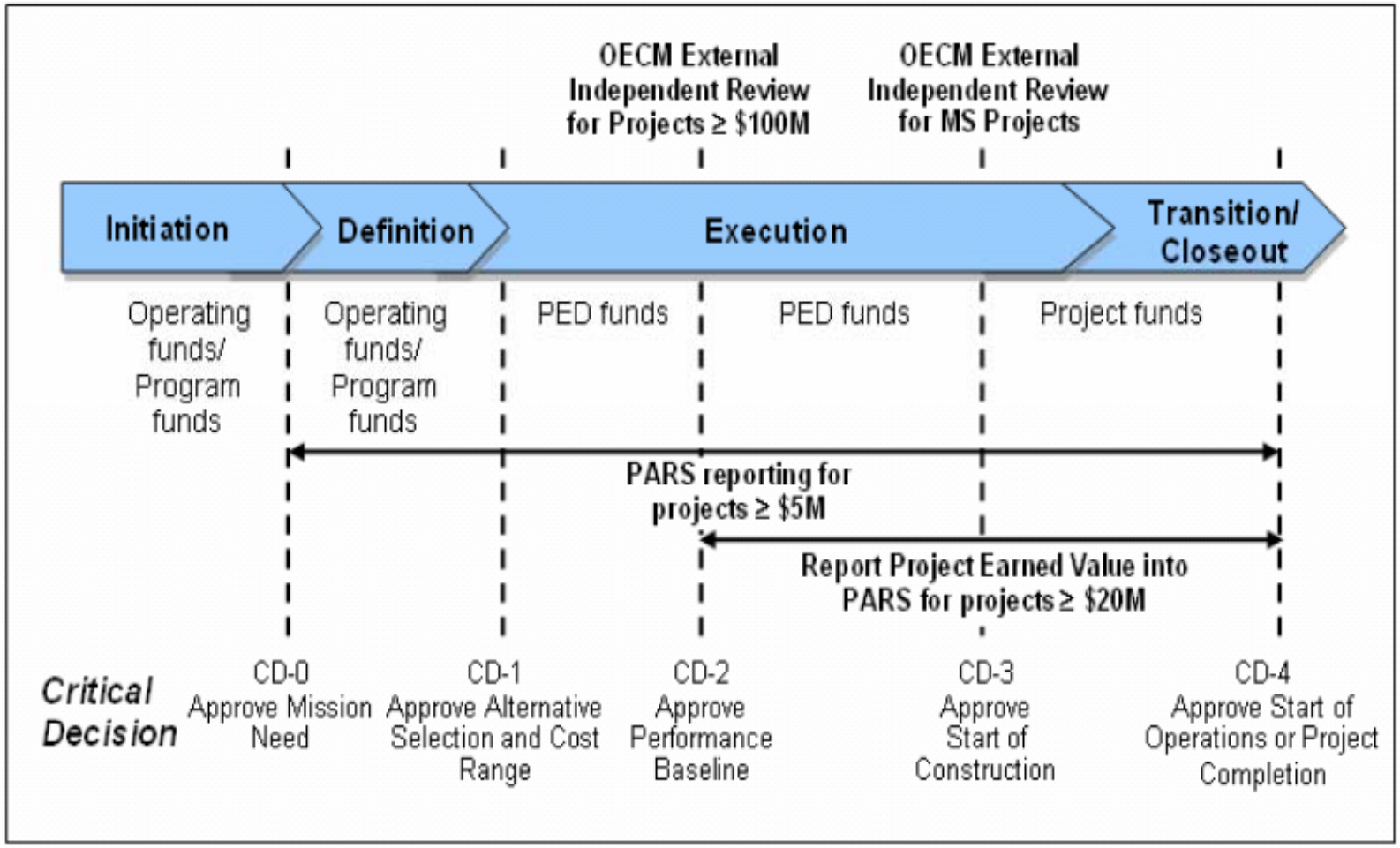

Figure 1. Typical DOE Acquisition Management System for Line Item Projects.

ILC and DoE Order 413.3

B Barish

- We will immediately make sure that U.S. EDR work is in compliance with DoE Order 413.3 !
  - **DoE has defined the US ILC program as being in the pre-conceptual planning activity stage (pre-CD0).**
  - **This project stage is funded with DoE Operating/Program funds, not Project Engineering Design (PED) funding**
  - **We must understand what are allowable (non allowable uses) of DoE pre-conceptual planning activities funds and reconcile this with the US ILC plans.**
- In the ILC EDR stage, we are doing what is usually called a preliminary or technical or engineering design, not a final design.
  - **A final design or in DoE language a design using PED funds produces an engineering design having many engineering drawings and achieving project readiness for a construction project**
  - **For the ILC, this stage will begin only after site selection and will then involve doing the detailed site specific optimization and designs**

B Barish

Initiation Phase

(pre PEC funds)

During this phase, preconceptual planning activities focus on the Program's strategic goals and objectives. User needs are analyzed for consistency with the Department's strategic plan, Congressional direction, administration initiatives, and political and legal issues. One outcome of the analysis could be a determination that a user need exists that cannot be met through other than material means. This outcome leads to the development and approval of a Mission Need Statement. The information developed during this phase also provides the basis for the Project Engineering and Design budget request when preliminary design activities are planned.

ILC and DoE Order 413.3

B Barish

- Preliminary analysis indicates that US work on EDR are basically consistent with uses of operating/program funds under DoE Order 413.3 process.
  - **Analysis of whether need exists that cannot be met through other than material means.**
  - **user requirements, risks, costs, and other constraints, are analyzed ….. using Systems Engineering and other techniques and tools such as alternatives analysis and Value Management/Value Engineering.**
  - **Examples have been found of DoE projects in this phase doing activities very similar to GDE EDR.**
- We need to investigate precedents in interpretation of CD process for international projects?
- We need to develop a plan for advancing the ILC through the Critical Decision points in DoE Order 413.3

B Barish

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Example of a DoE pre-CD0 Solicitation

News Media Contact(s):
Craig Stevens, (202) 586-4940

For Immediate Release
September 28, 2006

DOE Makes Available $8 Million for Pre-Conceptual Design of Next Generation Nuclear Plants

WASHINGTON, D.C. – The U.S. Department of Energy (DOE) today announced that DOE's Idaho National Laboratory (INL) will make awards valued at about $8 million to three companies to perform engineering studies and develop a pre-conceptual design to guide research on the Next Generation Nuclear Plant (NGNP). The INL will issue a contract later this week to Westinghouse Electric Company for the pre-conceptual design of the NGNP, and will later issue contracts to AREVA NP and General Atomics to perform complimentary engineering studies in the areas of technology and design tradeoffs, initial cost estimates and selected plant arrangements.

This approach will provide the broadest range of technical input necessary to determine the research and development required over the next few years and to establish the technical and functional specifications for any subsequent design work. Each of the three companies will assemble an industry team to expand the overall capabilities and experience available for the NGNP.

Workshop Goals:

- The GDE meeting at Fermilab provides a critical juncture as it formally establishes the new ILC Engineering Design Phase Project Management.

- A focus of the meeting is the consolidation of the engineering design phase plans, leading up to the successful publication of the Engineering Design Report (EDR) by mid 2010.

ALCPG07 GDE Meeting

Specific Goals

- Summarize
  - **recent series of ED phase "kick-off" meetings**
  - **discuss critical technical issues for the ED phase,**
  - **Refine work packages (WP)**

- Consolidate and integrate the identified WPs into a complete Work Breakdown Structure for the ED phase, including the associated schedules and high-level milestones

- Produce and make a clear and transparent public process for allocation of the WPs, together with management deadlines for completion of the allocation

- Agree on goals leading up to the next GDE meeting in Sendai, Japan on 3-6 March, 2008 – 'TILC08'

The EDR

- Baseline Configuration – 2005 Document
- Reference Design – 2007 Report, with *value estimate*
- Engineering Design – 2010 Report, with updated value estimate and a *plan*

- What will the plan look like? →
  - **Engineering designs for cost drivers**
    - (Conventional facilities, SCRF,…)
  - **Siting**
  - **Component fabrication (mainly linac)**
    - Cryomodules, klystrons
- Kick-Off Meetings in order to get EDR started →
  - **August 20 to November 7**

Findings from KOMs (1)

- Base-line design parameters will be verified, including:
  - **Design parameter lists of each component,**
  - **Functional and physical Interface between components,**
- 'Plug-compatible' concept critically important to allow:
  - **Improvement of base-line design during EDR,**
  - **Development of alternatives within a well defined plug-compatible interface.**

- Complementary R&D effort is important
  - **Learn mass-production experience from XFEL ← vital**
  - **Complementary R&D underway**
    - To be ready to upgrade the BCD design, as needed, and if technically viable

Findings from KOMs (2)

Technical Group	Day	Finding (technical topics)
Controls & LLRF	8/20 ~	High availability control and redundancy
CFS-US	8/22 ~	ACD development
RTML	8/27 ~	Common housing/integration, beam dynamics (emit. Preservation)
CFS-EU	9/03 ~	Experience at LHC, Safety, IR Hall structure
CFS-AS	9/10 ~	Time scale required to reach construction, exp. from ITER
Cryomodule & Cryogenics	9/12 ~	Important plug-compatible interface definition, Thermal balance optimization b/w cryomodule and cryogenics, exp. at LHC.
Cavities (process, and production)	9/19~	< E> 30 toward 35 MV/m, Process, Shape, compatibility, Industrialization (XFEL exp.+ ,,) & further improvement (BCD/ACD)
E-source	9/24 ~	Cathode demonstration and vacuum R&D crucial
Main Linac Int.	9/27 ~	Beam dynamics (HP/HOM), Quad. alignment, dE acceptable?
HLRF	10/1~	Marx Gen. (ACD) encouraging, Effic. RF distributor, Min. remote control
E+source	10/8 ~	Target survivability, undulator, flux concentrator,
Beam Del. Sys.	10/11~	Crab and IR geometry, extendable to 1 TeV
Damping Ring	11/5~	Expect – beam dynamics

Findings from the Cavity KOM – 'High Gradient' – Cavity Processing

- Cavity Gradient R & D remains top priority
- Recent DESY results (30 cavities) represent the largest systematically prepared set of cavities to date
  - **Encouraging and stimulating results**
  - **Review these results for further R&D basis**
- Assembling with US and KEK '07 results, we have substantial, new information to guide EDR R &D
  - **Field emission generally reduced!**
- US and KEK cavity processing and testing capacity is coming online in late 07/early 08.
- Steady progress in diagnostics and analysis of cavity processing and interior surface

Cavity Progress at DESY

EP w/o eth:

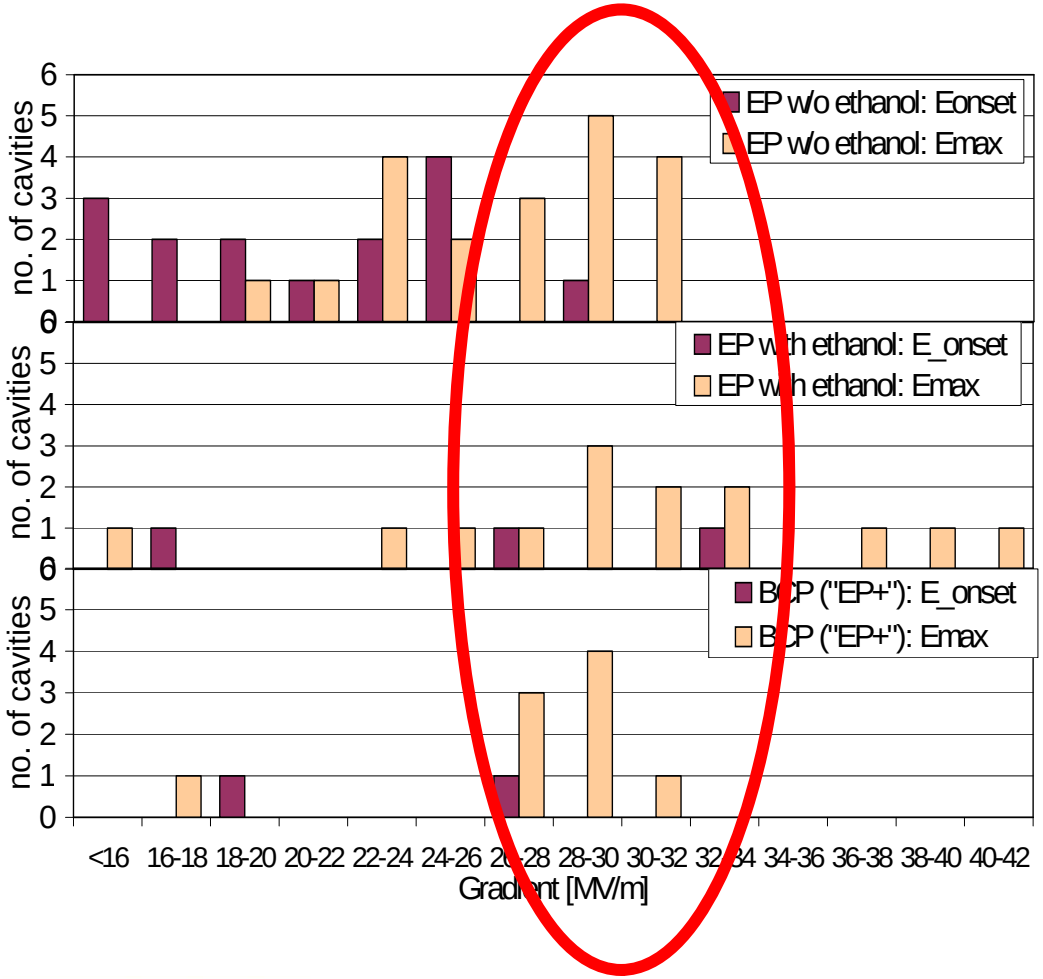
$< E_{acc,max} >$ = (30 ± 4) MV/m

EP with eth.:

$< E_{acc,max} >$ = (32 ± 6) MV/m (w/o Z110)

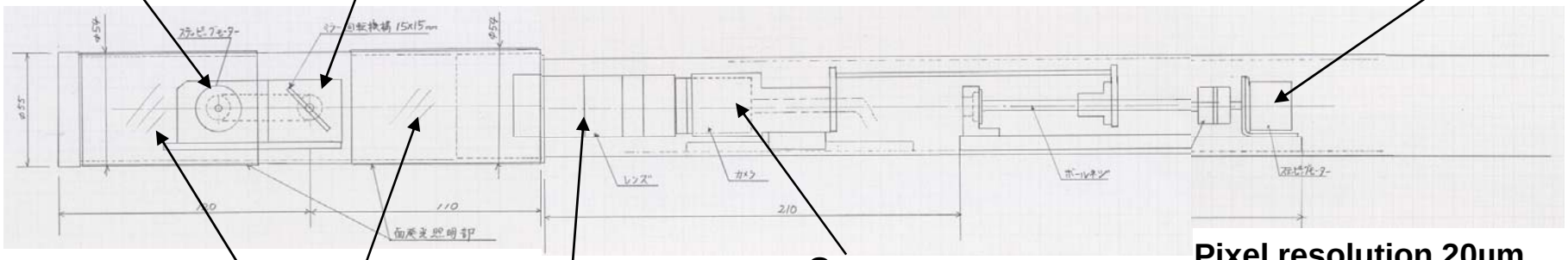
BCP (“EP+”):

$< E_{acc,max} >$ = (30 ± 2) MV/m (w/o Z111)



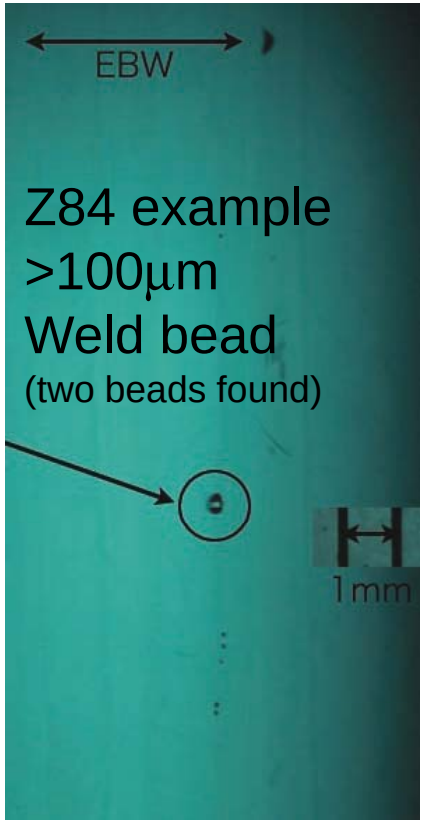
Inner Surface Camera development

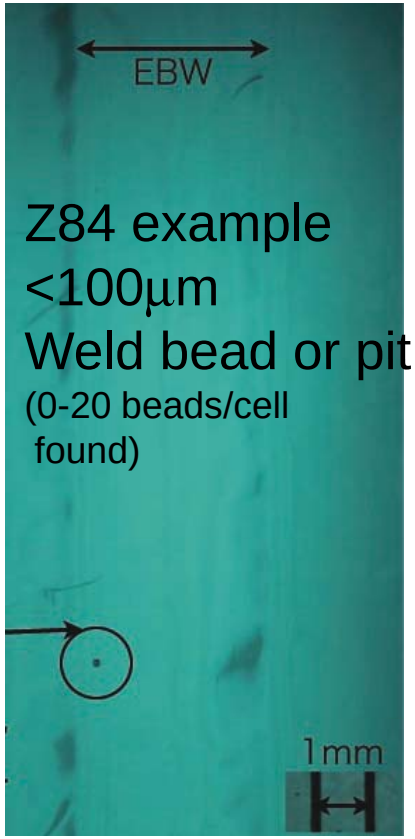
at Kyoto University



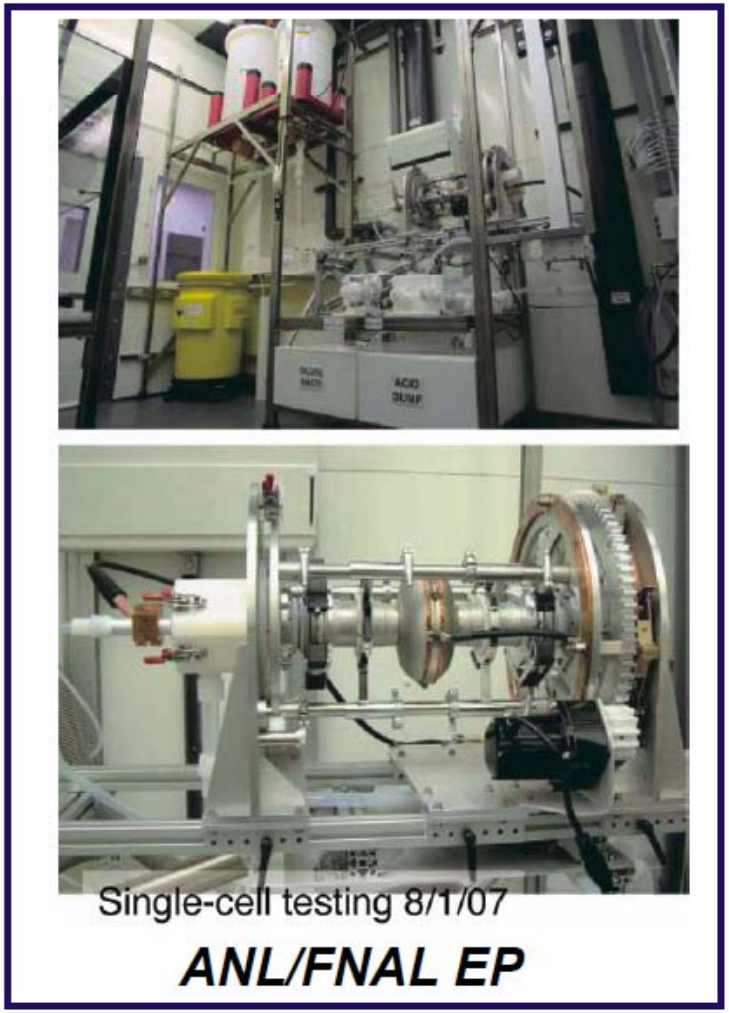
Pixel resolution 20μm

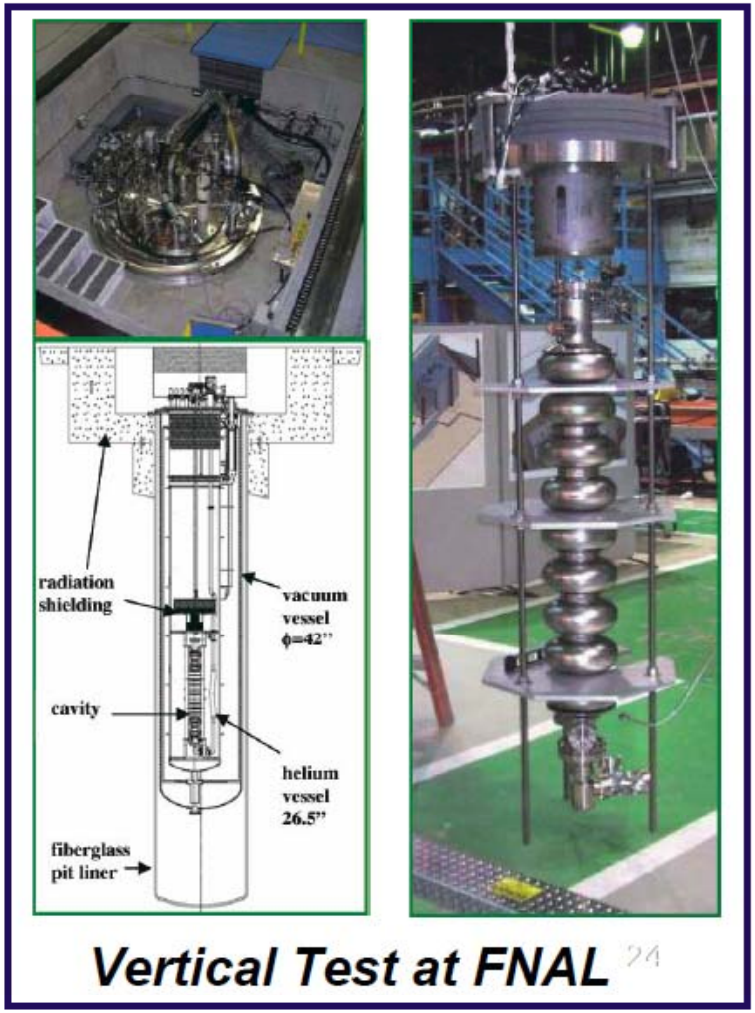
Scan test
Using Z84



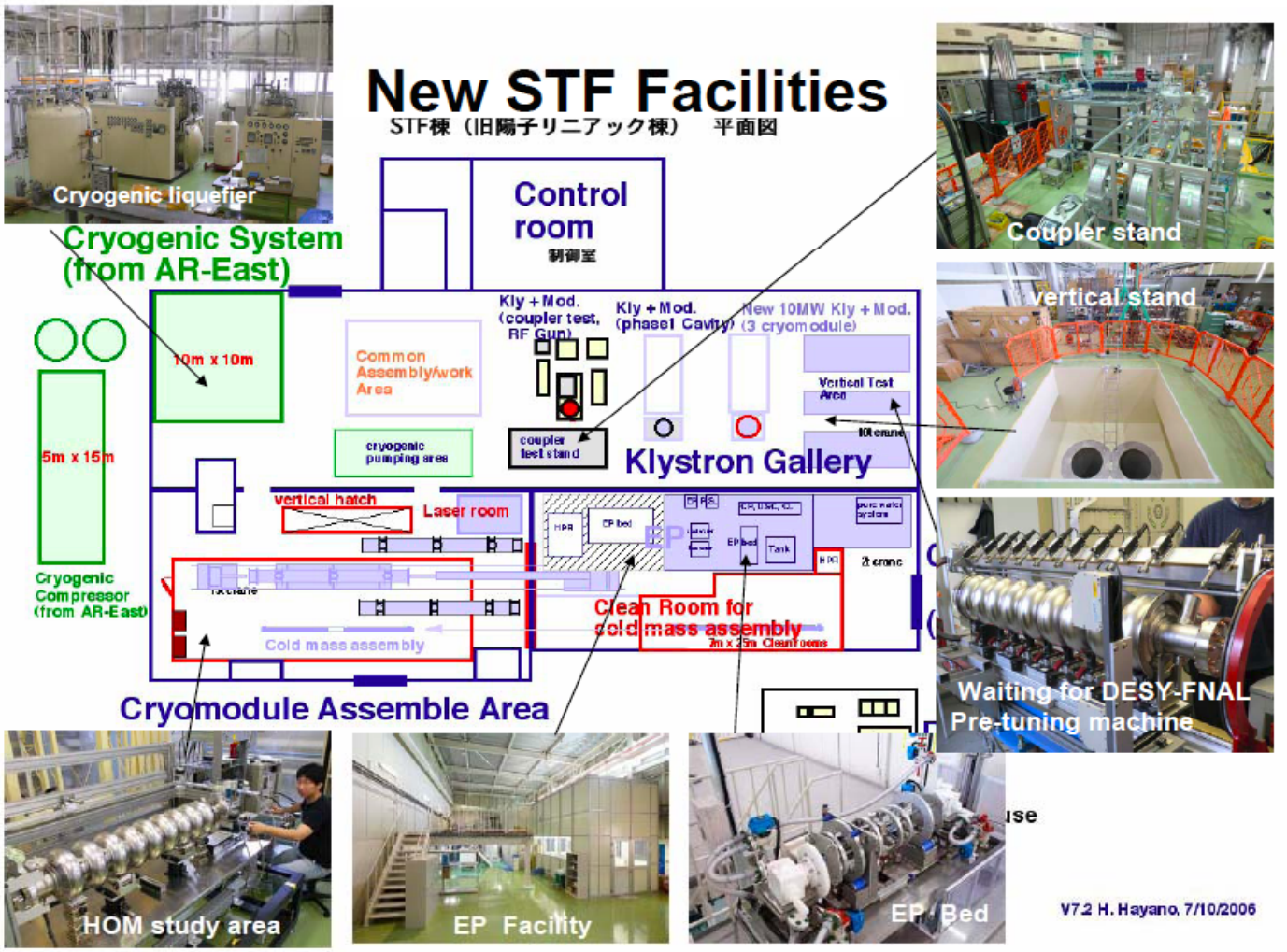


FNAL/ANL EP and Test Facility

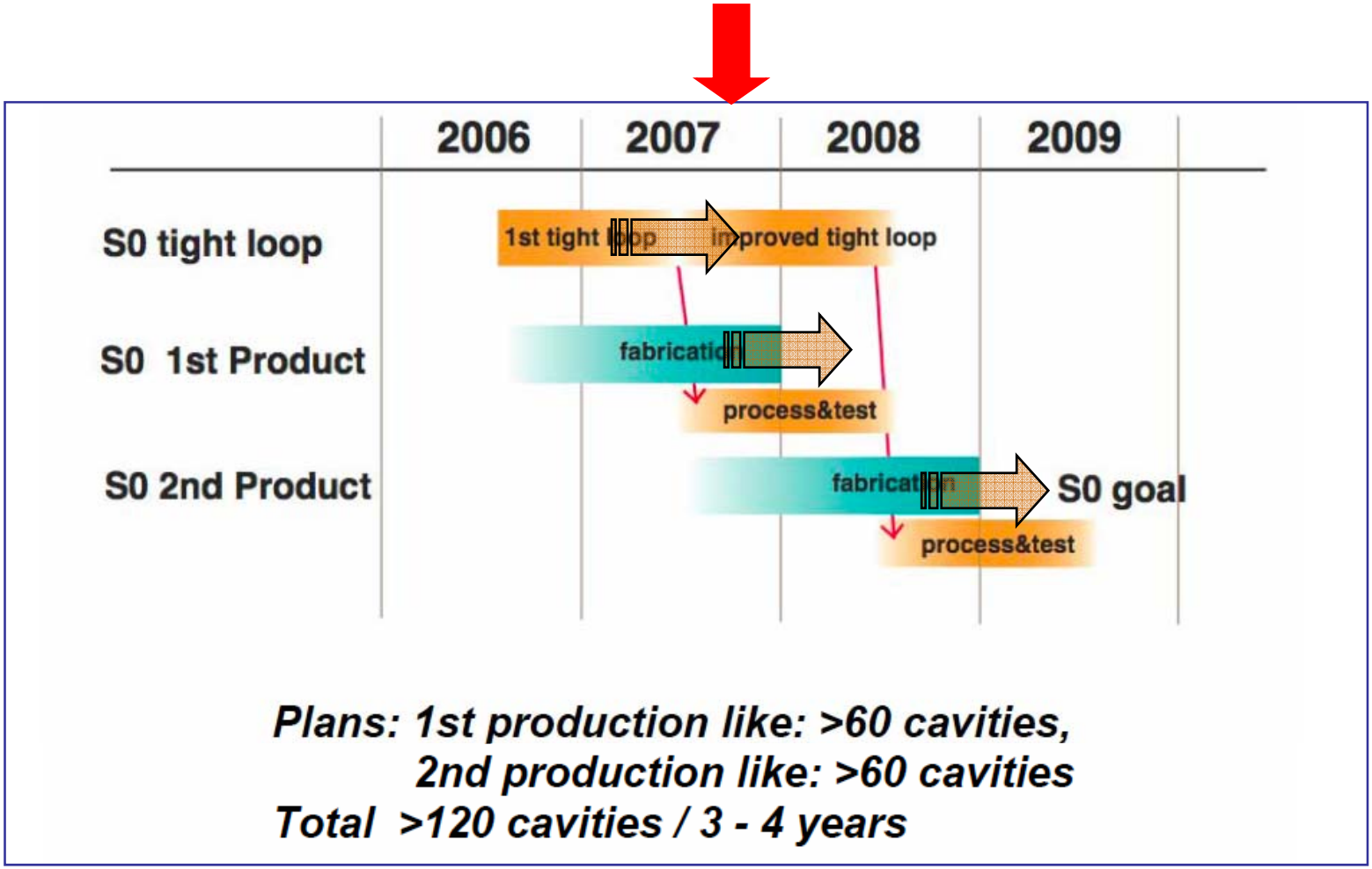




KEK EP and Test Facility



S0 – High Gradient R & D Task Progress and Plan



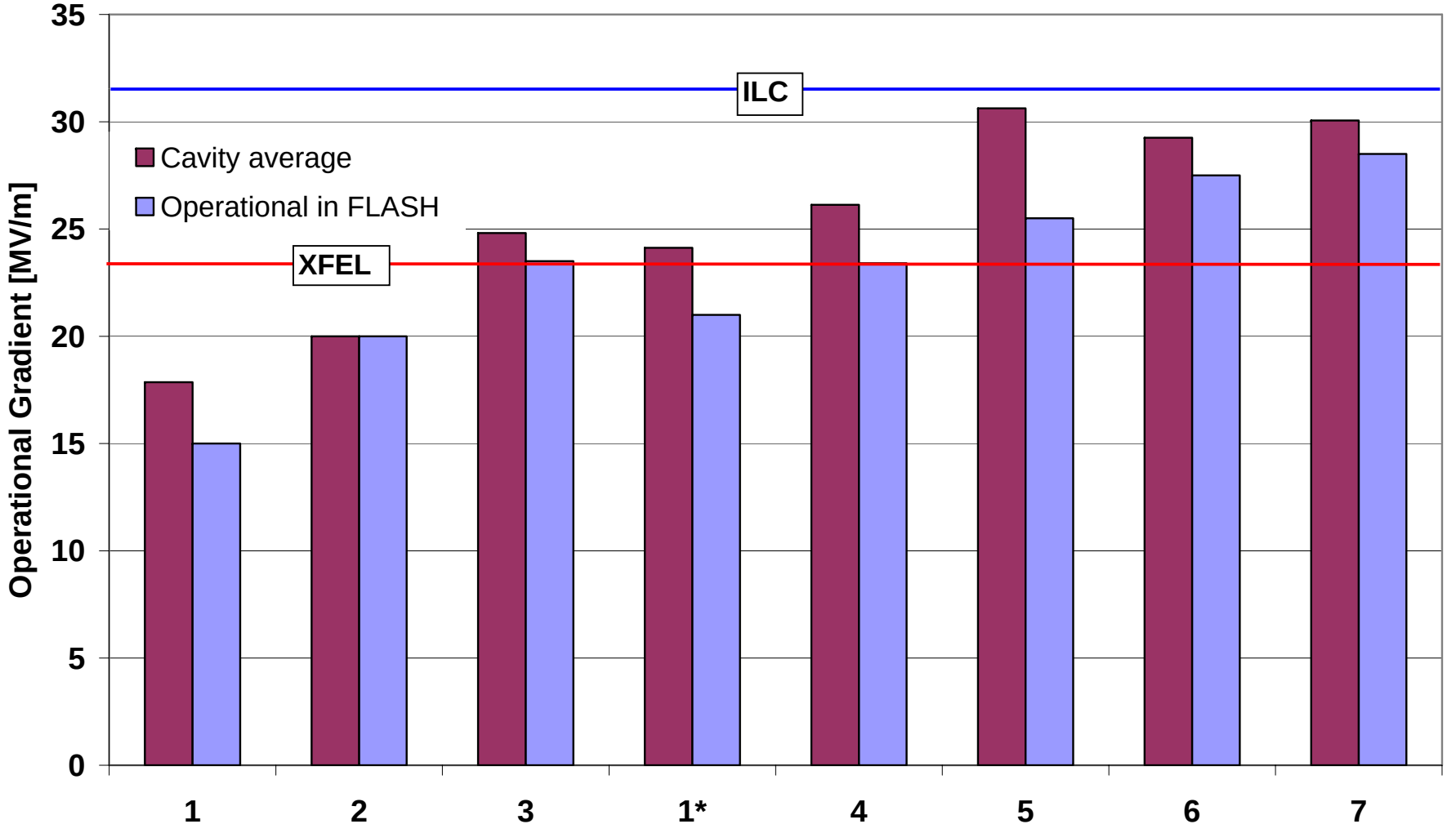
Presently, ~ a half year behind in schedule

Findings from the Cavity KOM - integration

- It should be possible to construct *a CM* with a choice of key components from different suppliers
  - **(also *a linac*, also a *cavity assembly*)**
  - **'plug compatibility'**

  Develop a schematic plan for how this would be managed
- There are valid reasons to explore this possibility, even while retaining a 'unified design' goal
  - **New shapes, cost cutting →**

Cryomodule: Data from DESY



Cavity average will be usable with alternative RF distributions (SLAC, XFEL)

Findings - Industrialization

- XFEL Production plan, based on in-kind contributions from EU, is nearing maturity
  - **Very exciting start for the project and for new infrastructure (SACLAY)**

  Review this plan and summarize strategic implementation
- Substantial opportunities for mutually beneficial activities
- Lessons for ILC mass production are valid, even with design differences

  Evaluate 'plug-compatibility' suggestions v/v industrialization plan
- Design differences are interesting and should be discussed

Beginning the next phase

- In the next 3 years we will:
  - **At once: concentrate our efforts and develop diversity within the community**
  - **Strengthen our design through engineering and RD**
  - **Develop a project plan**
- Confident that we have the resources for the envisioned scope
- Most amazingly →
  - **Someone else is paying for a 1G€ 'test facility'**
  - **DESY ←→ XFEL**

Tunnel mock-up completed and installations ongoing

International project organisation

Formation of the Consortium, which will provide the accelerator complex and related technical infrastructure as "in-kind" contribution to the XFEL is making progress

- Common proposal by institutes from DE, FR, IT, PL, ES for all work packages of the WPG1 (linac), except WP01 (RF system) presented to the IKRC – total volume ~150 M€; some details of task distribution and possible additional partners (China) still to be clarified
- Several expressions of interest on accelerator sub-system & infrastructure items
- Substantial contributions expected from Russian partner institutes – discussions to define Russian contributions to the consortium have started

What is a 'Work Package'

- Did everybody come here just to fill in forms?

- Most Basic:
  - **A symbol of common parameters, goals and deadlines evolved from (often) independent, institutionally-centered, programs**
  - **NOT A TRIVIAL EXTENSION of RDR**
    - Expanded focus includes R & D and Alternatives
- More importantly:
  - **Mechanism for managing an emerging project**
    - With global basis

Examples of WP titles

1	**SCRF Linac Technology**
1.1	**Cavity Processing**
1.1.1	Gradient Performance (S0 Task:surface treatment-vertical test)
1.1.2	Shape decision (shape-gradient-HOM-Lorentz_detuning-input_port)
1.1.3	Fabrication (material selection, method selection, junction, HPV regulation)
1.1.4	Beam dynamics (HOM-HOM_coupler-Input_coupler, alignment, straightness)
1.1.5	Flange and seal (material & method selection)
1.2	**Cavity production and integration**
1.2.1	Lorentz detuning compensation (specification, method, required rigidities, fast
1.2.2	Tuner selection (Orsay tuner, Brade tuner, Slide-jack tuner, Ball-screw tuner,
1.2.3	Coupler selection (variable coupling, fixed coupling, port diameter)
1.2.4	Magnetic shielding method (inside or outside vessel)
1.2.5	Vessel material (material selection, junction, HPV regulation)
1.2.6	Alignment method
1.3	**Cryomodule**
1.3.1	Cryomodule Documentation and Standards for Manufacture and Testing
1.3.2	Cryomodule Components Development and Design
1.3.3	Optimization of the Cryomodule Assembly with Designing Components (for cr
1.3.4	Cryomodule Global Design with 3D and 2D CAD on EDMS
1.3.5	Cryomodule Test
1.3.6	Shipping Study of Cryomodule
1.3.7	Cost reduction issues

DR Work Package Matrix

Technical Area Group Leader:
Andy Wolski, Cockroft Institute, UK

WP#	WP Title	ANL	Cornell	FNAL	SLAC	LBNL	LANL	LLNL	UIUC	UM	CI	DESY	LNF	KEK	IHEP	KNU
1	Lattice design and acceptance	X	X			X				??			X		X	X
2	Orbit, optics and coupling correction	X	X		X	X				??	X		X	X		
3	Wiggler		X			X										
4	Instrumentation, diagnostics, controls		X	X		X								X	X	
5	Impedance & impedance-driven instabs.	X			X	X					X			X	X	
6	Fast feedback systems				X	X							X			
7	Electron cloud	X	X	X	X	X	??						X		X	X
8	Power systems		X		X											
9	Other collective effects		X	X	X	X							X		X	
10	650 MHz RF system		X		X	X										
11	Magnets and supports					X									X	
12	Systems integration and availability										??					
13	Vacuum system				X	X					X		X		X	
14	Injection and extraction systems		X	??	X	X		X	X				X	X		
15	Ion effects		X		X	X						X		X	X	X
16	Conventional facilities and cryogenics	X		X		X									X	
	Global Systems Work Packages															
	Conventional facilities															
	Control systems					X									X	
	Cryogenics systems	X														
	Survey and alignment	X														
	Installation and commissioning plans	X														
	Polarisation										X	X				

RDR Completion and Next Step:

- Success of the GDE – a ‘grass-roots’ organization without a strong institutional center
  - **Capitalize on this and**
  - **Lay groundwork for a stronger – yet still de-centralized - ‘ILC Engineering Design Project’**
  - **Critical Mass**
- Our community ‘votes with its feet’…
  - **given the structure and the**
  - **opportunity to contribute to their labs future and the future of the science.**

Our Community – global basis:

- The GDE is committed to EDR development
  - **as a global project, ← *this is a major ILC strength***
  - **building on the success of the RDR.**
- We must also:
  - **ensure that internal momentum is maintained and**
  - **foster continued growth in the enthusiasm and commitment of the international ILC community.**
- Challenge →
  - **maintain effective communication paths between co-workers separated by great distances.**
- Strength →
  - **diverse technical expertise**
  - **wide ranging laboratory infrastructure**
  - **(result of years of hard work and preparation.)**

ILC R & D Plan for FALC and ILCSC

- Information provided this week
  - **Global basis established / re-affirmed through 'Expressions of Interest'**
  - **THANKS to GROUP LEADERS**
- R & D Plan to be delivered end of November, 2007
  - **include analysis of resources presently applied to EDR**
    - (not what we WISH would be applied)
  - **clearly indicate activities in support of other projects (e.g. XFEL) that benefit EDR**

We would like to:

- Wish Bonne Chance to
- Jean-Luc Baldy – CERN / CFS
- Merci !

- Welcome –
- John Osborne – CERN

Jean-Luc Baldy

- With Jean-Luc's experience and leadership, we have been able to take direct advantage of CERN LHC 'lessons-learned'
  - **LHC / LEP is the world's largest accelerator tunnel & infrastructure complex**
  - **He has connected us to this truly unique and invaluable resource**
  - **(more than this of course)**
- Together with the CFS leaders, Vic Kuchler and Atsushi Enomoto, Jean-Luc helped form a truly global CFS team.
  - **a big asset for starting the EDR**
- Thank you Jean-Luc !