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ILC Activities in the US Interest

ILC Detector R&D

HEPAP Meeting, July 7, 2006

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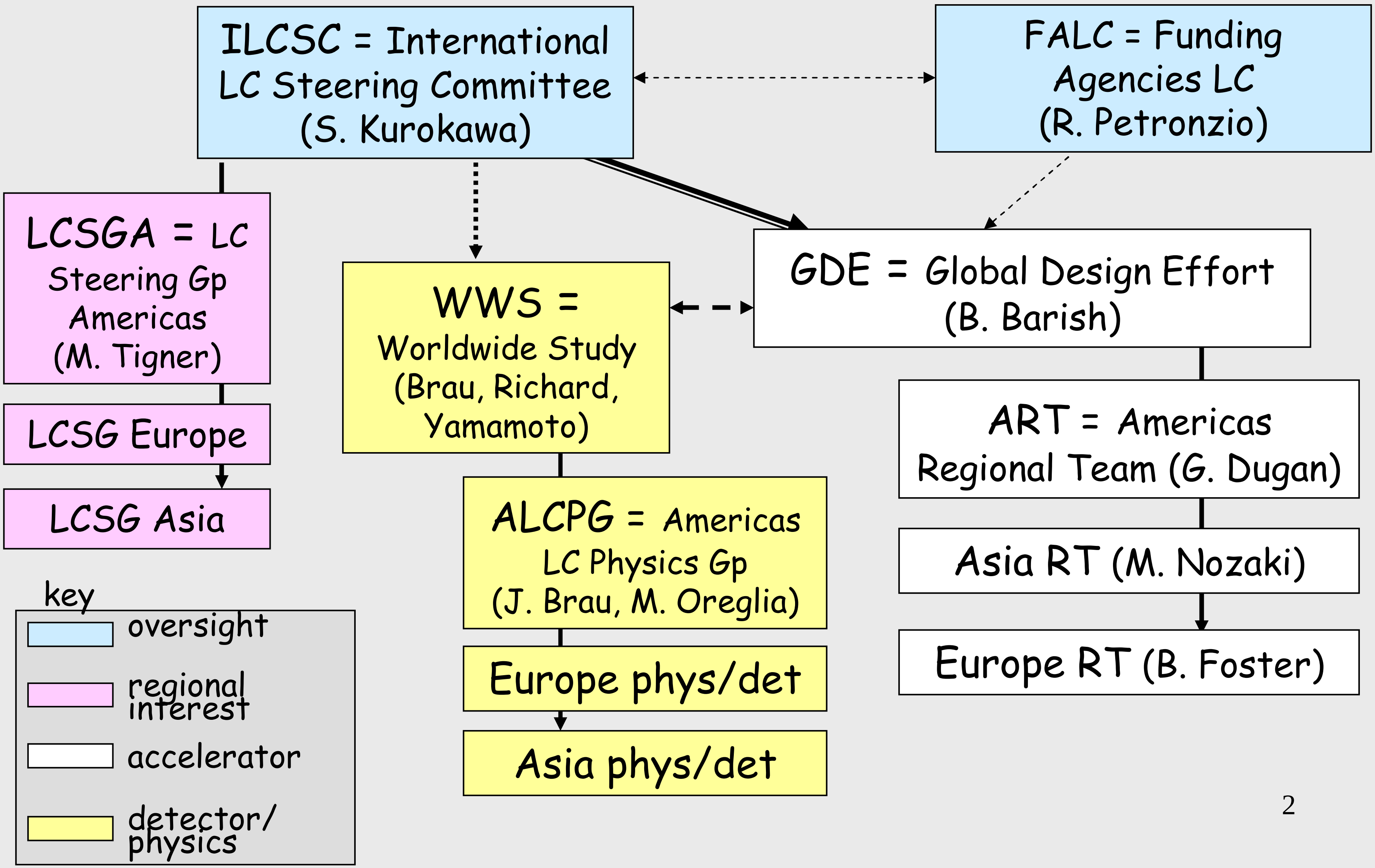
Alphabet Soup



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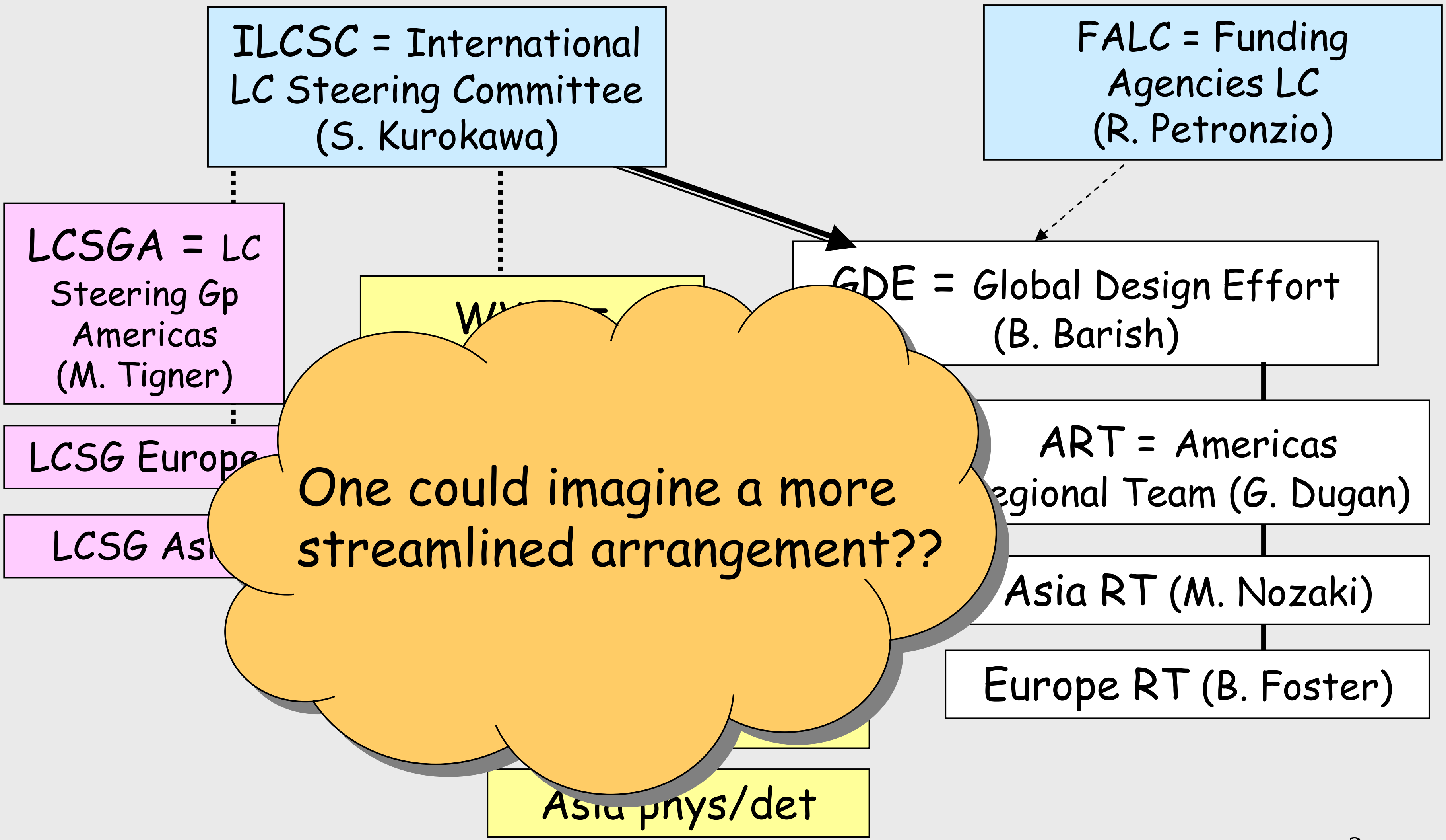

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What do the words mean?

They replace the colloquial term 'Bid to Host' used loosely and incorrectly. (Making a bid to host ILC will follow internationally agreed procedures and will require a conscious US decision to proceed.)

The phrase pertains to activities within the US that we believe will be needed to enable a credible bid to bring ILC to the US. At present these include:

- Develop US industry capability for key technologies (specifically fabrication of SC rf cavities)
- Set up test facilities in our labs to advance understanding of SC rf, test prototypes and ultimately production elements, & guide industrial development.
- Evaluate potential US sites for geology, ESH, environment, infrastructure & machine dependent design, in advance of a real bid to host
- Any other non-SC rf facilities thought lacking in the global plan

Activities in the US Interest

LCSGA – consulting with ART, DOE and NSF – established a panel with S. Ozaki as chair to evaluate the activities in US interest, particularly in for setting FY07 budget priorities.

DOE/NSF offered comment to LCSGA outlining the topics to be considered, need to optimize existing and new infrastructure, and the need to understand the priority relative to GDE R&D & design activities.

Detector R&D priority was explicitly excepted from the panel purview.

The ART plan is to fold the Ozaki panel recommendations into the larger matrix of inputs (US lab requests, GDE R&D Board advice, funding constraints) in making the FY07 budget requests to DOE.

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GDE (and thus ART) is not well structured to address specific regional needs and priorities, so these activities fall somewhat outside their jurisdiction.

However, developing key technologies and assuring worldwide capability to produce quality components in sufficient numbers for the ILC schedule is critically important to GDE.

We presently assume that significant US production of SC rf cavities will be required, regardless of ILC site.

Activities in the US interest and globally coordinated ILC-specific R&D will be funded in a common budget category.

Refining understanding of a US candidate site is a wholly US responsibility. A funding stream for this will likely have to be split off at DOE.

Developing US SC rf Infrastructure

Accelerators developed initially for HEP have expanded into many other sciences, and now find pervasive use across the DOE-SC programs:

Light sources based on electron accelerators are mainstays of research on condensed matter physics, materials science, structural biology, cell biology, environmental studies, plasma physics, chemical dynamics. Future SC rf ERL's will expand these opportunities.

Intense proton or ion accelerators are transforming nuclear & heavy ion physics, neutron scattering, neutrino research.

Of the ~15,000 accelerators in use worldwide today, all but ~100-200 are used for medical diagnostics and treatment, radioisotope production, electronics, food processing …

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Developing US SC rf Infrastructure

Future applications in all these fields will be transformed by new high gradient superconducting rf acceleration technology.

The HEP R&D on ILC is driving much of this development, but the impact will be felt across all DOE SC programs.

It makes sense to envision an initiative within DOE/OHEP for the development of SC rf technology, with US industrial capability and laboratory test facilities that serve the broad mission of DOE SC (a new definition of 'SC'?)

Probably the most important ILC impact on broader Science & Technology will be from this SC rf technology research and development.

ILC R&D spending Worldwide

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Using input from Europe and Asian Regional GDE Directors, we have made a comparison of regional spending on ILC R&D (including SCrf infrastructure).

Allowance for differing accounting methods must be made. The European report gave SWF and M&S. We assumed similar SWF/M&S ratios in Japan as in Europe and the US. Conservative guesses for other Asian nation contributions and XFEL/ILC synergy were made. For comparison purposes, US indirect costs rates were applied to Europe & Asia

- The result is that the President's request for FY07 aligns very closely with the expenditures in Europe and Asia for their fiscal years starting spring 2006.

R&D planning

ILC R&D has grown to significant levels in the HEP budget (8% in President's FY07 budget).

A part of the necessary management of a program this big is a clear plan for the R&D phase. We need a plan outlining the goals, what should be done when (milestones and deliverables) and resources (people, funds, infrastructure).

The April DOE/NSF review of ART recommended: "The committee calls for the development of an integrated multiyear R&D plan in the US showing resource needs and milestones, using significant input from the GDE."

We need this plan this year to defend the projected funding trajectory, and do effective oversight. We would welcome a companion GDE global plan on a similar time scale.

Generic vs. ILC specific R&D

The total laboratory and detector community requests for FY07 funding exceed the President's request by roughly a factor of 2, so programmatic decisions are needed.

Some fraction of the requests are for infrastructure or generic needs that serve broader purposes than ILC.

Examples include test stands for SC rf cavities, more efficient modulators, high resolution beam position monitors, new high reliability power supplies, general use Si pixel readout chips, test beams, …

At the President's budget level, all ILC-specific R&D (accelerator and detector) will be charged to the ILC B&R code. After validation that some expenditures are truly generic or broader infrastructure, such could be placed on core research budgets, to the extent available at the Labs.

Future of University ILC Accelerator grants

DOE & NSF instituted university grants for ILC-related accelerator R&D in 2002. This program was intended to stimulate interest in ILC, prior to GDE organization.

- In FY06 about $700K (DOE) and $200K (NSF) was allocated.
- The President's FY07 DOE budget has +$5M (+18%) for general accelerator research.
- NSF is planning APPI (Accelerator Physics and Physics Instrumentation), funded at $2.8M in FY06 with hopes to grow in future.
- Past proposals have spanned the continuum between generic and ILC-specific.
- We now have ART in place to advise on overall ILC R&D priorities.

It seems useful to transfer these ILC university program grants after FY07 to AARD (or APPI) programs, or to ILC funds.

The ILC component of the SBIR program will continue.

US Detector R&D

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Since 2002, DOE and NSF have conducted a program for university-based ILC detector R&D. For FY05 – FY07 these funds are distributed through subcontracts from an umbrella grant to Univ. of Oregon.

FY05 grants totaled $700K (DOE) and $117K (NSF).

The FY06 funding is $1048K (DOE) and $300K (NSF), supporting 34 projects at 27 universities and 2 labs (ANL and LBNL). Funding distribution: 13% LEP, 14% vertex det., 24% tracking, 42% calorimetry, 7% PID/μ

It is our intent to continue this program in future years.

❖ As with accelerator R&D, the detector program has some elements that are more generically applicable.

University effort in ILC R&D

Both DOE and NSF recognize the high priority placed by HEPAP and the recent NRC EPP2010 report on conducting a vigorous R&D program that could lead to the ILC project. Both agencies currently fund university grants for both detector and accelerator research with applicability to the ILC. These programs have been modest but have grown over the past several years.

Both agencies respond to grants through the peer review process. They welcome proposals for which ILC detector or accelerator R&D is the whole or a component of the effort, as well as for generic research that may have some bearing on ILC issues. In addition, there is often some latitude within existing grant funds to consider new directions. The use of existing grant funds for ILC-related research depends upon the details of each proposal and grant holders are encouraged to speak with their program monitors on the appropriate extent of such activities.

Detector R&D worldwide

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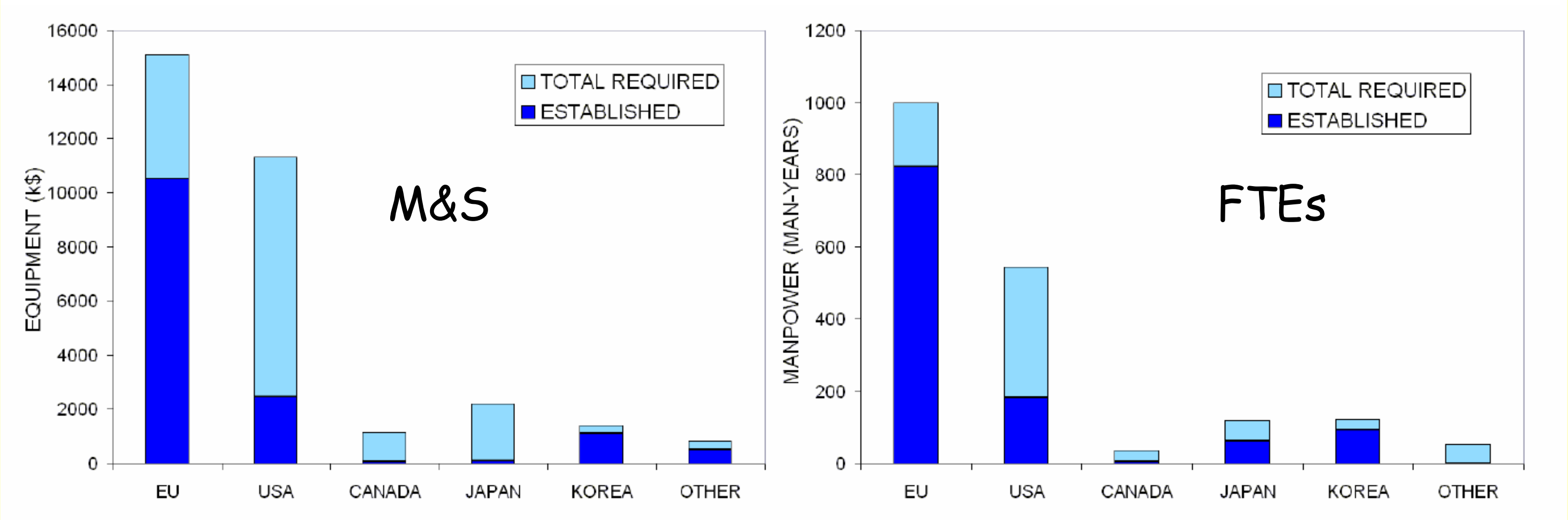
A 2005 WWS panel chaired by C. Damerell compared currently funded and self-estimated needs for detector R&D in the three regions. The US and Japan lag behind Europe significantly. The US effort was about 4 times less than Europe, and was funded at about 35% of the estimated need.



Detector R&D at Labs

The Laboratory effort on detector R&D in FY06 was reported by the labs early in the year. About 80% is SWF. FY06 detector funds were from Lab core research; in FY07 the ILC-specific detector effort should be on ILC budget. Generic R&D useful for ILC and other experiments could continue on core research budgets if available.

	FTE	SWF($K)	M&S($K)	Total($K)
SLAC	11.1	$2007	$460	$2467
FNAL	11.2	$1635	$420	$2055
LBNL	2.8	$335	$145	$480
ANL	3.3	$355	$100	$505
BNL	~1	$100	$0	$100
TOTAL	29.3	$4432	$1175	$5607

Actual FY06 expenditures may differ somewhat.

Future US Program

Informal and preliminary request by ALCPG for the scope of the ILC detector university program in FY07 is about $3M, with $1M coming as a supplement early in the year.

DOE and NSF have asked the ALCPG for a multi-year resource-loaded schedule that includes the prioritized goals of the R&D in the US in the world context. We expect to have the first draft within a month, prior to any actions on supplemental requests. Substantial increase in detector R&D funding will require this plan, and the detector effort will be subject to program review by the Agencies.

Present detector R&D is matrixed: proto-detector concepts and subsystem R&D. Planning the transition to proto-detector collaborations & proposals is needed.

Balance of Detector and Accelerator R&D

There is at present no constituted body that is ideally suited to advise on the relative priority between machine-related R&D and detector R&D, although LCSGA could provide some useful perspective.

For making FY07 allocations, we will seek advice on this relative priority from LCSGA, augmented by some individuals who span the boundary between accelerators and detectors.

Informal coordination of detector R&D at universities and labs is reasonably good, but a more tightly integrated approach by ALCPG is needed.

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Conclusions

In one year since formation of GDE, much progress has been made.

- Good President's FY07 budget request.
- Progress in defining, designing, costing ILC by GDE.
- GDE common fund initiated by FALC.
- Better understanding of the coordinated global effort on accelerator and detectors.

Issues remain:

- Developing plan and priorities for ILC R&D phase, both accelerator and detector.
- Better coordination of accelerator, detector, regional interest efforts, in US and worldwide.