Project Director’s Report

D. L. Burke
NLC Project Director

U.S. NLC Collaboration Meeting
SLAC
January 31, 2000
NLC Events in 1999

- NLC Project Group formed at SLAC.

- NLC budget steps up $11M → $17M.
  - System level engineering, design, and analysis begins.
  - Industrial transfer of technologies begins.

- Memoranda of Understanding - LLNL and LBNL.
  - U.S. NLC Collaboration begins.

- NLC-JLC ISG settles into routine.

- DOE Lehman Review at midyear → Slides.
  - Tremendous effort by newly formed Collaboration.
  - Highly successful.
  - Congress stops DOE move to CD-1 at this time.

- Fermilab joins U.S. NLC Collaboration.
  - FY00 NLC Budget successfully defended.
## NLC Design Criteria

(HEPAP Sub-Panel - Gilman 1998)

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy</th>
<th>Luminosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initially</td>
<td>500 GeV</td>
<td>$5 \times 10^{33}$ cm$^{-2}$ s$^{-1}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Proven rf technology.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Linac sized for 1 TeV.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sources and Final Focus for 1.5 TeV.</td>
</tr>
<tr>
<td>Adiabatically</td>
<td>1 TeV</td>
<td>$\geq 10^{34}$ cm$^{-2}$ s$^{-1}$</td>
</tr>
<tr>
<td>Upgrade</td>
<td>1.5 TeV</td>
<td>$\geq 10^{34}$ cm$^{-2}$ s$^{-1}$</td>
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<tr>
<td></td>
<td></td>
<td>First stage compatible with highest energy.</td>
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<td></td>
<td>Extended length or rf power development.</td>
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*D. L. Burke*  
*U.S. Collaboration Meeting*  
*January 2000*
EXECUTIVE SUMMARY

Highlights

The overall conclusion of the Committee is that the NLC Collaboration has brought the R&D on the base linear collider technology to an advanced state that is an excellent starting point for the work to be carried out in the CD phase.

Further, the preparation for carrying out the CD/CDR is thorough and professional.

The NLC collaboration is well-positioned to proceed with the CD and preparation of a CDR, and the Committee recommends proceeding with the CDR phase ...
### NLC - The Next Linear Collider Project

#### NLC CD-1 Model
(Lehman - May 1999)

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td><strong>Total Project Cost</strong></td>
<td>5,107 M$</td>
</tr>
<tr>
<td><em>(FY2000, without detectors, contingency, or escalation)</em></td>
<td></td>
</tr>
<tr>
<td>Injector Systems</td>
<td>19 %</td>
</tr>
<tr>
<td>Main Linacs</td>
<td>39 %</td>
</tr>
<tr>
<td>RF Systems</td>
<td>20 %</td>
</tr>
<tr>
<td>Other Technical Systems</td>
<td>8 %</td>
</tr>
<tr>
<td>Civil Construction/Facilities</td>
<td>11 %</td>
</tr>
<tr>
<td>Beam Delivery</td>
<td>11 %</td>
</tr>
<tr>
<td>Global Costs</td>
<td>17 %</td>
</tr>
<tr>
<td>E.g. Controls/Software</td>
<td></td>
</tr>
<tr>
<td>Central Facilities</td>
<td></td>
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<tr>
<td>Management, Business Services,</td>
<td>14 %</td>
</tr>
<tr>
<td>and Miscellaneous</td>
<td></td>
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<tr>
<td>Total</td>
<td>100 %</td>
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</table>

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*U.S. Collaboration Meeting*
*January 2000*
NLC Progress Since Lehman

- R&D “in the pipeline” in May, now in hand ...
  - Solid-state modulator.
  - PPM klystron at 75 MW and 3μsec - twice as much energy per pulse as in the design presented to Lehman.
  - Multi-mode DLDS.
  - RDDS Structure.

- “Brainstorming” framing of next iteration of NLC design - NLC CDR 0.4 Model.
  - Alternate technologies identified for key systems ...
    - Permanent magnets for beamlines.
    - “Wireless” electronics located in the tunnels.
    - “Consumable” collimators.
    - Cut-and-cover civil construction.
  - Optimization and new ideas for accelerator designs ...
    - Re-evaluation of margins and performance overheads.
    - Subsystem optimizations and beamline configurations.
    - New solutions - e.g. “Raimondi” Final Focus.

→ Talks by Adolphsen and Raubenheimer.
“Brainstorming”

**Process**
- Put results and ideas on the table.
- Rough and limited analysis of performance, cost, and risk
  - “Is it 3M$, 10M$, 30M$, 100M$ and what does it mean for the machine?”
- Documentation.
  - Working Group Web sites and “Brainstorming” Database.

**Over 130 major items generated.**
- ~ 50 Incorporated (≥ 1.0 B$)
- ~ 30 Pending (≥ 0.5 B$)
- ~ 20 Tabled
- ~ 5 Change Scope (≥ 0.5 B$)
  (FY00 w/o esc or contingency)

**Potential cost reduction of ~ 1/3**
- incorporated or pending further analysis - without change of scope of the project.
<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Month</th>
<th>Event Description</th>
</tr>
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<tbody>
<tr>
<td>FY2000</td>
<td>January</td>
<td>Frame NLC CDR 0.4 Model</td>
</tr>
<tr>
<td></td>
<td>May</td>
<td>MAC Review of CDR 0.4</td>
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<td></td>
<td>September</td>
<td>Release NLC CDR 0.4 Model</td>
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<tr>
<td>FY2001</td>
<td>Oct-Dec</td>
<td>Frame NLC CDR 0.8 Model</td>
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<tr>
<td></td>
<td>January</td>
<td>New President/Congress, New DOE Secretary/SC-1</td>
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<tr>
<td></td>
<td>July</td>
<td>SNOWMASS ’01?</td>
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<td></td>
<td>September</td>
<td>Release NLC CDR 0.8 Model, DOE CD-1?</td>
</tr>
<tr>
<td>FY2002</td>
<td>Oct-Dec</td>
<td>Frame NLC Two-Site CDR</td>
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<td></td>
<td>March</td>
<td>SLAC-FNAL Request FY04 Start</td>
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<tr>
<td></td>
<td>September</td>
<td>Release NLC Two-Site CDR</td>
</tr>
<tr>
<td>FY2003</td>
<td>September</td>
<td>[Continued R&amp;D, Site Selection, NEPA, Pre-Construction A&amp;E]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NLC CDR Baseline</td>
</tr>
<tr>
<td>FY2004</td>
<td></td>
<td>NLC Title I Start</td>
</tr>
</tbody>
</table>

_D. L. Burke_  
_U.S. Collaboration Meeting_  
_January 2000_
# NLC CDR 0.4 Calendar

<table>
<thead>
<tr>
<th>Event</th>
<th>Dates</th>
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<tbody>
<tr>
<td>U.S. Collaboration Meeting (@SLAC)</td>
<td>Jan. 31 – Feb. 2</td>
</tr>
<tr>
<td>NLC-JLC ISG5 (@SLAC)</td>
<td>February 22 - 25</td>
</tr>
<tr>
<td>CDR 0.4 Machine Configuration Finalized</td>
<td>March 2</td>
</tr>
<tr>
<td>Project Review(a) (WBS)</td>
<td>March 16 - 17</td>
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<tr>
<td>Physics and Detectors Workshop (@LBNL)</td>
<td>March 29 - 31</td>
</tr>
<tr>
<td>Project Review(a) (Technical and Cost)</td>
<td>April 20 - 21</td>
</tr>
<tr>
<td>Project Review(a) (Technical and Cost)</td>
<td>May 18 - 19</td>
</tr>
<tr>
<td>MAC Briefing (@FNAL)</td>
<td>May 25 - 26</td>
</tr>
<tr>
<td>CDR 0.4 Optics and Hardware Finalized</td>
<td>June 8</td>
</tr>
<tr>
<td>Project Review(a) (Technical, Cost, and Schedule)</td>
<td>June 22 - 23</td>
</tr>
<tr>
<td>Project Review(a) (Technical, Cost, and Schedule)</td>
<td>July 27 - 28</td>
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<tr>
<td>CDR 0.4 Release</td>
<td>September</td>
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(a) Reviews with System Managers and Others as Needed

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*D. L. Burke*

U.S. Collaboration Meeting

January 2000
NLC Outlook and Plans

- Technology R&D meeting goals.

- Collaboration on R&D with KEK continues to provide essential progress.

- Strong U.S. national program emerging.

- Successful peer (HEPAP) and DOE (Lehman) review.

“We are firmly convinced that the future for world HEP research must include an electron machine, such as the NLC, capable of reaching an ultimate energy of 1 TeV or higher.”

Martha Krebs
Director, DOE Office of Science
Charge

- Continue Technical Progress and Coordination

- Finalize FY00 Milestones and Plans

- Longer Term Milestones

→ Path to a CDR.