FemtoSource Project Development

(from now to CD-0)

Kem Robinson
LBNL
7 December 2001

Formal CD-0 Requirements

- Mission Need
- Project Description
- Alternatives and Special Studies
- Preliminary
  - Schedule
  - Cost Range
  - Acquisition Strategy
  - Risk Assessment
  - NEPA
  - Safety
- Complete conceptual design phase plan
- Preliminary Functional Requirements
- R & Development Plan
- Safeguards & Security
- Program sponsors & organizational relationships
- Relationships & Integration with other programs/projects
- Estimate of Design phase funding requirement
- Integrated Project Team

Mission Need – Scientific Case

- Machine characteristics must be tied to scientific requirements
- Need for source
  - —Range of experiments
  - —Domains of application
  - —Applicability to BES programs
  - —Augmentation and Enhancement of ALS
- Tailoring of machine to science, not science to the machine

Alternatives & Special Studies

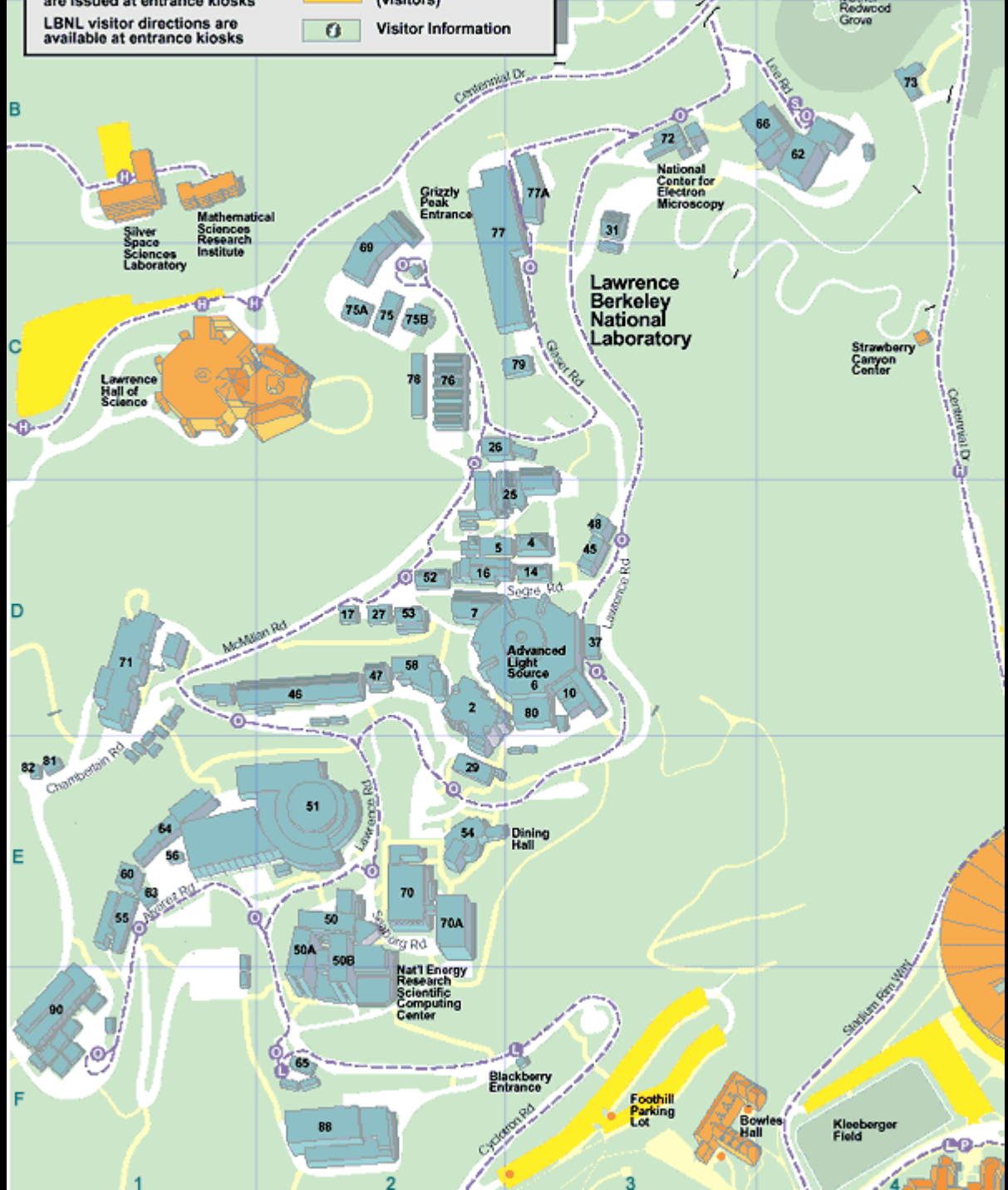
- Examination of limitation of other methods of generating fsec pulses
  - —Laser induced plasma x-rays
  - —Femto-slicing
  - —Other proposed machines
- Trade examinations of all major systems within the machine
- Documentation of assumptions in making selections
- Trade-study results of planned trade-studies

Trades or Options Study by Major Subsystem

- Injector
  - —Photocathode
    - RF gun
    - Pulsed DC gun
- Accelerator structures
  - —Superconducting vs. warm
  - —TESLA/Accel vs. JLab Upgrade cavities
- Recirculation
  - —Number of passes
  - —Dual accelerators vs. single
- Synchronization
- Crab cavities

Trades of Options Studies (cont.)

- Photon production region
  - —Number / length of undulators
  - —Type of bend magnet
    - Normal
    - Superconducting
- Beam disposal
  - —Energy recovery
  - —25 kW high energy beam dump
- Siting
  - —Old Town
  - —Chicken Creek
  - —Bevatron
  - —Richmond Field Station


LBNL visitor directions are available at entrance kiosks
(Visitors)
Visitor Information
Redwood Grove
Centennial Dr
Lone Rd
National Center for Electron Microscopy
Grizzly Peak Entrance
Silver Space Sciences Laboratory
Mathematical Sciences Research Institute
Lawrence Berkeley National Laboratory
Strawberry Canyon Center
Lawrence Hall of Science
Gayley Rd
McMillan Rd
Segrè Rd
Lawrence Rd
Advanced Light Source
Chamberlain Rd
Dining Hall
Hearst Rd
Seaborg Rd
Nat'l Energy Research Scientific Computing Center
Blackberry Entrance
Foothill Parking Lot
Bowles Hall
Cyclotron Rd
Stadium Rim Way
Kleeberger Field
A
B
C
D
E
F
1
2
3
4

Possible Sites: Old Town

ADVANTAGES

- Relatively flat area
- Adjacent to ALS
- Shared Infrastructure

DISADVANTAGES

- Molecular Foundry
- Unknown D&D
- Displacement of existing programs
- Unacceptable to Management

CONCLUSION: Removed from further consideration

Possible Sites: Chicken Creek

ADVANTAGES

- Proximity to ALS
- Undeveloped Site
- No displacement of existing programs
- Limited shared infrastructure
- Proximity to substation

DISADVANTAGES

- Special study area in relatively flat area
- Steep where not special area
- Power lines
- Stability of soils/bedrock

CONCLUSION: Difficult to develop; ranked 3rd

Possible Sites: Richmond Field Station

ADVANTAGES

- Undeveloped Site
- No displacement of existing programs
- Flat well characterized site
- No impediments to development

DISADVANTAGES

- Not at main Lab site
- No existing infrastructure
- Loss of synergy with ALS

CONCLUSION: Ranked distant 2nd as isolated

Possible Sites: Bevatron

ADVANTAGES

- Flat building area
- May use existing slab
- Proximity to ALS
- Limited shared infrastructure
- On main Lab site
- Possible structure usage

DISADVANTAGES

- Bevatron
- Vibration
- Cryogenics plant location
- User facilities
- Ambient magnetic fields

CONCLUSION: Ranked 1st but must be characterized

Cost Range Estimate

- Important to identify options and simplifying assumptions
- Must take both pessimistic as well as optimistic costs
- Identification of adequate margins for uncertainty and development
- Site development must be realistically assessed
- Scope contingency must be anticipated from the beginning

Risk Assessment

- Identify assumptions
- Identify unknown aspects
- Development complications
- Site uncertainties

Functional Requirements and R&D Plan

- Major areas of development:
  - —RF Gun
  - —Flat beam
  - —Crab cavities
  - —Synchronization
- Functional Requirements
  - —Clear identification
    - Hard / Soft
    - Implicit / Derived
    - Science / Techonology
  - —Implication

Points to Remember

- In pre-conceptual stage it is important to understand nature of configuration selection
  - —Science driven
  - —Simplifying assumption
  - —Site constraint
  - —. . .
- Scientific case must drive machine parameters
- Prepare for BESAC prior to CD-0
- Range of options and development tasks must be carefully considered

Can We Get There?

- Funding
  - —Presently 2nd year LDRD: $500k
  - —Requested an additional Strategic $300k
  - —Need 1-2 years more at similar rate
- Development (2-3 year program)
  - —Crab cavities
  - —High repetition rate rf gun
- Resources
  - —Can't get cryogenics expertise until ~April 02
  - —Mainly fractional people
  - —Insufficient support to carry engineering

"We're right behind you"

- AFRD Support
  - —Considered THE major initiative
  - —Best resources available have been allocated
    - Cannot forgo existing commitments
- ALS Support
  - —Very interested, but only one of two major initiatives
  - —Must maintain commitment to existing programs
- Lab support
  - —*Rousing* support at Directors Retreat
  - —Science and project development

The Long March

- DOE Environment
  - —CD process is presently clouded
  - —Future budgets?
  - —Distinguishing ourselves
  - —Science case!!!
  - —Homeland security
- Timing: (*Fast DOE Project* = Oxymoron[?])
  - —CD-0 and PED funds
  - —Site difficulties
  - —Distinguishing ourselves from others

Navajo guides typically travel with nothing more than a blanket, a small amount of water, and a couple of handfuls of parched corn