Bernard Sadoulet
Dept. of Physics /LBNL UC Berkeley
UC Institute for Nuclear and Particle Astrophysics and Cosmology (INPAC)

Solicitation 1 process
Community-wide Site-Independent

S1 Mission
Deliverables and time table
Basic arguments, questions
Initial Suite of experiments

6 Principal Investigators
B.Sadoulet, UC Berkeley
(Astrophysics and Cosmology)
Eugene Beier, U. of Pennsylvania
(Particle Physics)
Hamish Robertson, U. of Washington
(Nuclear Physics)
Charles Fairhurst, U. of Minnesota
(Geology and Engineering)
Tullis C. Onstott, Princeton
(Geomicrobiology)
James Tiedje, Michigan State
(Microbiology)

Site Independent Study Mission

1) to unify the community

behind the idea of multidisciplinary, Deep Underground Science and Engineering Laboratory in the U.S..

2) to develop a compelling scientific justification

for such a laboratory, cutting across our many disciplines

3) to specify the infrastructure requirements

for such a laboratory that will address the needs of a broad cross section of science over the next 20-30 years and complement other facilities worldwide.

S1 Deliverables

High Level Report directed at generalists (government+funding agencies) in the style of "Quantum Universe."

- 40 pages maximum, including graphics
- The big science questions + generic first suite of experiments
- Key infrastructure, modules and management requirements
- Rising demand and international aspects. Why DUSEL in the U.S.?

Web-based technical synthesis directed at scientific community in particular, experts in the subfield and the corresponding program monitors

- 10-15 pages per working group
- Justifications and support the main report.
- These reports may refer to additional web-based appendices.

External review

- Both the main report and the technical reports

Time table

- Technical reports: drafts end of November/ ready for review end of December + Infrastructure requirement/demand
- High level document: making rapid progress. First draft early December
- January discussions within community and with agencies
- High level document and infrastructure requirement frozen by end of Jan
- Roll out workshop early March

Basic Message

Exciting scientific frontier

One of the three frontiers to unravel the mysteries of the Quantum Universe (+ accelerators and astrophysical observatories)

Unique opportunity for Earth Sciences to get long term access to great depth and to large physical and time scales

Unique chance for Geo-microbiology to observe *in situ* organisms at large depth for a long time

Great synergy potential

Fast growth of these 3 fields worldwide

Why DUSEL in the US?

A (eventually multi-site) national laboratory with three missions

- Operate premier facilities with unique characteristics which
  - support U.S. science
  - attract the best scientific projects worldwide
- Focus the national underground effort + coordinate it with
  - other national initiatives (accelerators, Earth Scope, SecureEarth)
  - other underground labs internationally (in particular SNOLab)
- Maximize societal benefits
  - Interagency, industry, multidisciplinary collaborations
  - Education of the next generation of scientists and engineers
  - A better general understanding of science at the frontier

Difficult Questions

Why is SNOLab not sufficient?

Clear for Earth Sciences and Biology

Physics: not redundant

Expansion of the community: need to document (help from working groups)

<= excitement for the science + relatively cheap

SNOLab likely to be saturated by 2009 for ≥ a decade

Exciting program in the 2012-2022: first suite of experiments

Complementarity to SNOLab and U.S. Facilities — coordination

In which way is DUSEL unique?

We have to make it unique / complementary to other facilities

Depth (>6000 m.w.e.)

Long term access (≥ 30 years)

Premier infrastructure: easiness of access 24h/day 365 days/yr

In particular size? ISO container w=2.4 m x h=2.6 m x l=6.1 m?

Dust, radon control

Local technical support, information infrastructure

Evolutionary: Additional cavities (e.g. Proton Decay/ Neutrino long base line)

Capability to address unconventional requirements (e.g. large cryogenic expt, fracture motion experiments)

Unique combination with accelerators (L≥1000km)

Multidisciplinary synergies, intellectual atmosphere.

First Suite of Experiments

Actually not a good way to fully define the initial program, especially with respect to Earth Sciences, Biology and Engineering.

There are 4 phases

1) Before the excavation

Physics: R&D and low background counting facility.

Earth Sciences/Engineering: Full characterization of the site with a number of instrumented bore holes and imaging.

Biology: Use of bore holes for sampling

2) During excavation

Earth Sciences/Engineering: Monitoring of rock motion, modification of stress during construction

Tests of imaging methods

Biology: sampling ahead

3) First suite of experiments

See next two slides

4) Extensions in the first ten years

See next two slides

Initial Suite of Experiments (Draft)

Deep Campus

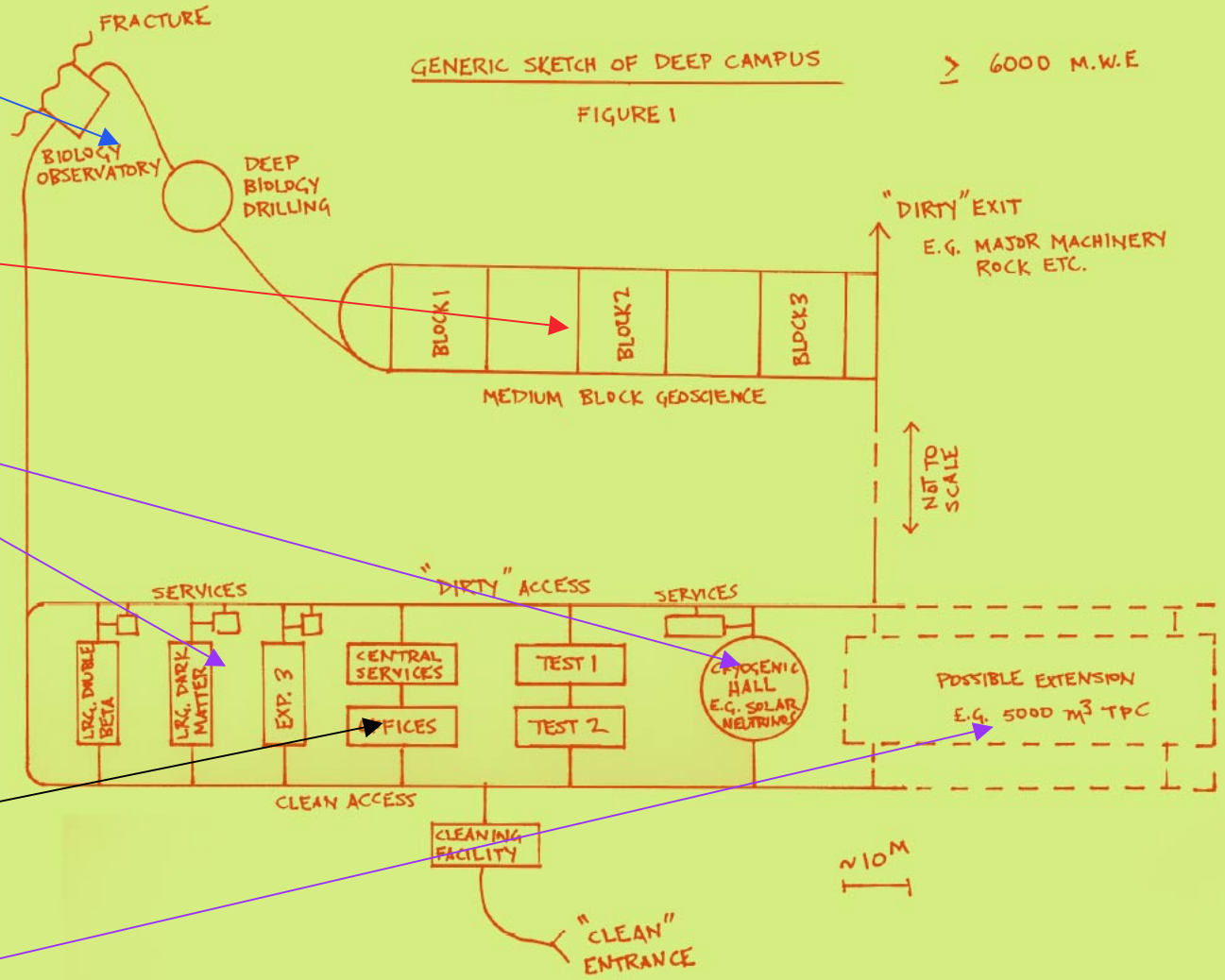
Biology observ.
Deep Biology Drilling

3 Medium block experiments

Dark Matter
Double beta
Exp. 3 TBD
Solar neutrino
2 test/small expt areas

Central services
Offices etc.

Possible extensions
large hall e.g for TPC



Initial Suite of Experiments (Draft)

Intermediate levels

- Low background counting
- Accelerator
- e.g. SN burst

- Underground fabrication facilities, Ge & Cu refining
- Outreach module

- Intermediate level block experiments
- Intermediate biology observatories

- Fracture motion experiment: Far

- Potential expansions:
  Megaton neutrino/proton decay

Dependence on depth
or evolution along a given feature

Conclusions

Close to the finishing line:

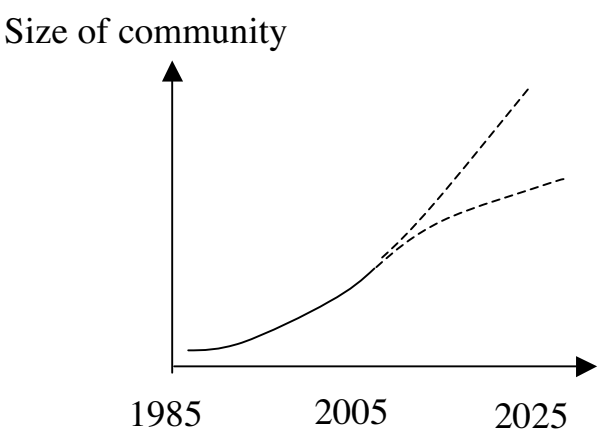
We have to be done by end of January 06

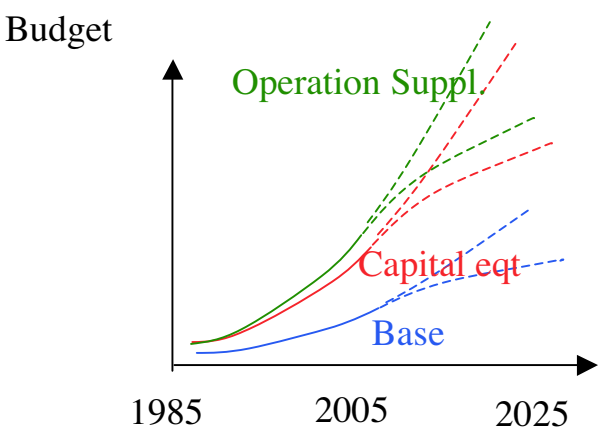
Help of working groups /community

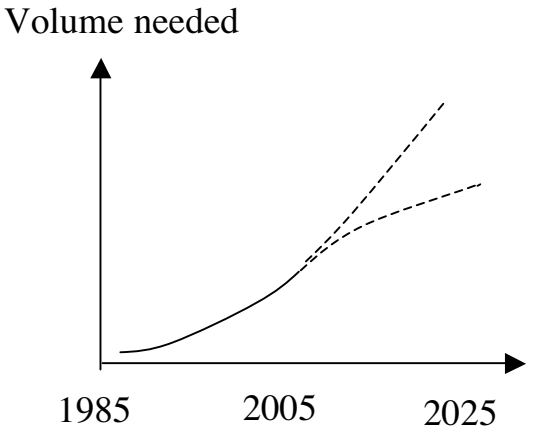
Finish the technical documents NOW
Interactions with Infrastructure Group
Generic first suite of experiments: first draft to take apart!
Evolution of field and demand <= still need to specify form

Graphs we need! Qualitative Examples

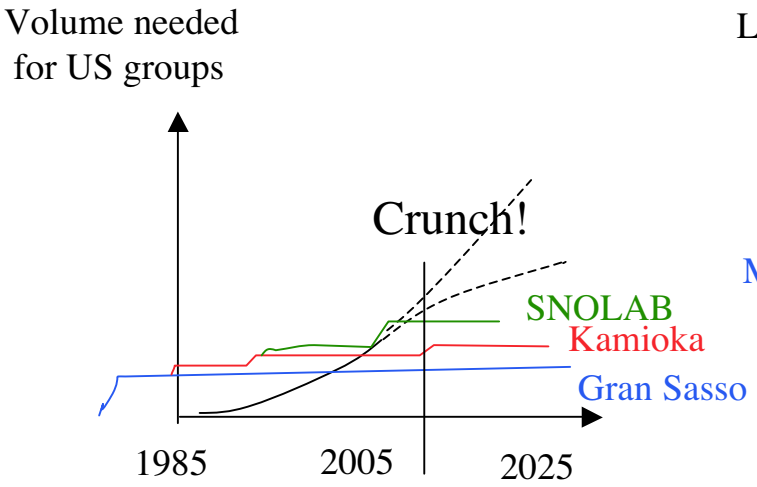
From each physics working group

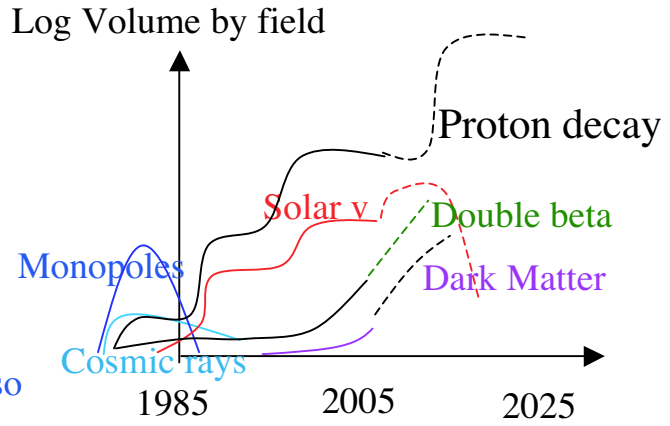






Physics overall





Relationship between S1 and S2

S1 has to be independent

PIs are independent from any site, rigorous symmetry
Unity of the community
Excitement of the science : Sell the project in Washington
Define what is needed for the 3 missions of DUSEL

Does not mean that S1 and S2

S1 output should be useful to S2
we welcome feedback
S2 input: we do not want to impose requirements which uselessly increase the costs