Outline

• Deep Underground Science and Engineering Laboratory (DUSEL) at Homestake
  – Global View of Homestake DUSEL Proposal
  – Initial Laboratory Criteria and Concepts
  – Approach to Creating DUSEL
    • South Dakota’s Sanford Lab *(Snyder and Alonso)*
    • NSF’s DUSEL

• Coupling the Science to the Facility
  – Workshops
  – Center for Underground Science
DUSEL: Multidisciplinary & Synergistic

**Physics**
- Dark Matter
- Cosmology
- Astrophysics
- Neutron Oscillation

**Education & Public Outreach**

**Earth Science**
- Geo-Database
- Geo Modeling
- Geophysics
- Seismology
- Fracture Study

**Geoclimatology**
- Cloud Formation
- Lightning Physics
- Thermal History
- Coupled Processes
- Rock Mechanics
- Hydrology
- Mineral Studies
- Economic Geology

**Geomicrobiology**
- Bioprospecting
- Life at Extreme Conditions
- Geochemistry
- Ecology
- Environmental Studies

**Underground Engineering**
- Coupled Processes
- Rock Mechanics
- Hydrology
- Mineral Studies
- Economic Geology

**Homeland Security**
- Atmosphere Neutrinos
- Neutrinoless ββ Decay
- U/G Manufacturing
- Low Background Counting

**Education & Public Outreach**
- At Homestake, SD

**Homestake DUSEL**
Facility Conceptual Plans

• Conceptual Facility Plans will be refined with community-developed Initial Suite of Experiments, this process begins at this town meeting

• To estimate the Initial Suite of Experiments for the Conceptual Design
  – Winter 2005-06 Call for Letters of Interest
  – Program Advisory Committee

• Used LOIs and PAC report to estimate Facility Requirements and Timelines; coupled this with Deep Science
DUSEL Footprints

Estimates do not include MegaTon Detectors

Homestake DUSEL
DUSEL Campus Concepts

Planning to develop four primary campus locations for research:

1. Surface campus at Yates Complex
2. Near-surface campus at 300 Level
3. Mid-level campus at 4850 Level
4. Deep-level campus at 7400 Level

Infrastructure will be maintained for access to additional, selected levels for bio- and geo-sciences and for unique experiments that require specific or isolated sites.
A dedicated science facility without competition or interference from mining, transportation, etc.
Phased Approach

- To preserve the site for DUSEL, South Dakota initiated a program of rehabilitation and re-entry. Will sponsor a modest Science Program with these efforts.

- Motivated by the desire to halt the in-flow of water into the facility.

- Financed with State-controlled funds and philanthropic donations.
October 2005, State Legislature approves additional $20M funding for Homestake, total of $46M from state controlled sources.

Property Donation Agreement Completed 14 April 2006, Property transferred to S.D. May 2006, SDSTA hiring staff to oversee and operate Homestake: ~30 for rehabilitation, ~25 to 30 staff members

Banker and philanthropist T. Denny Sanford pledges $70M to develop Sanford Lab

January 2007 Rehabilitation work initiated

October 2007 SDSTA hires Jose Alonso, Lab Director; searches for Project Managers, Project Engineers, Safety Director, other Laboratory staff

Early Implementation Program at Homestake 2007 - 2012 “The Sanford Laboratory”
Approximate boundary of transferred property:
186 acres (surface) 7700 (u/g)
# Summary Schedule

## Sanford Laboratory at Homestake
- Ross Shaft Rehab and Pumping Column Commissioning
  - Gain safe access to 4850L for EIP construction start, and hold water level at 5000L
- Yates Shaft Rehab.
  - Install facility infrastructure for Davis Lab early experiments
  - Install and commission research instrumentation in Davis Lab
  - Early experiments in Davis Lab ready for operation
- Continued rehabilitation and infrastructure upgrades for Sanford Lab
- Transition from Sanford Lab to DUSEL Operations

## NSF Deep Underground Science and Engineering Laboratory at Homestake
- Homestake site selection announcement

## DUSEL Preconstruction Planning and Development (R&RA)
- Preliminary Design Phase to develop Baseline Cost and Schedule
- Preliminary Design Review and National Science Board Recommendation
- Final Design Phase
- Final Design Review and Authorization for Construction Start

## DUSEL Facility - Proposed Construction and Commissioning (MREFC)
- Proposed Construction Start

### Near-Surface Campus Construction at 300L
- 300L Labs and Education and Outreach Facilities

### Mid-Level Campus Construction at 4850 Level
- 4850L Common Facilities and Lab Module #1 (Excavation & Lab Build-out)
- 4850L Lab Modules #2, #3 and #4

### Deep-Level Campus Construction at 7400 Level
- 7400L Common Facilities and Lab Module #1 (Excavation & Lab Build-out)
- 7400L Lab Modules #2 and #3

### Surface Campus Construction
- Phase 1 Offices and Laboratories
- Phase 2 Offices and Laboratories
Yates Shaft Upgrade Plan

Improved access to the 4850 Level for personnel, equipment, and utilities

Yates Ore Hoist
Two 1,500 hp DC Motors
Skip Payload Load = 20,000 lb.

Yates Cage Hoist
Two 1,250 hp DC Motors
Normal Cage Load = 12,000 lb.
Max Cage Load = 13,400 lb
Dark Matter: Gaitskell, Shutt and collaboration
Geo/seismic array: Glaser, Johnson, Roggenthen
Low Background Counting: Mei and collaboration
Dark Matter: Hime, McKinsey and collaboration
Dark Matter: Mei, Hime and collaboration
Geo/Bio Sampling: Bang, Conrad & collaboration
Neutrinoless $\beta\beta$: Elliott, Wilkerson, and collaboration
Large Cavities, LBL vs: Lande, Diwan and collaboration
Carbon Sequestration: Wang and collaboration
Organization Prior to MREFC Construction

Homestake Interim Laboratory and DUSEL Preconstruction & Development Phase: FY07 to FY10

DUSEL R&D Joint Consideration

Sanford Laboratory
J. Alonso

Integrated Safety Management Oversight Committee

Sanford Laboratory J. Alonso

Regional Partnerships & University Liaison D. Farrington

Director for Environment, Health, Safety and Quality (Current Job Posting)

Communication Office, Regional and State Liaison

Homestake Interim Lab Project Manager (Current Job Posting)

Project Controls and Admin. Support

User Liaison and Support

SDSTA Human Resources and Admin. Support T. Severson

SDSTA Business Office L. Gehner

Homestake Interim Lab Project Manager (Current Job Posting)

Project Engineer for Surface Infrastructure Development

Project Engineer for Underground Infrastructure and Facilities G. King

Project Engineer for Underground Excavation (Current Job Posting)

Facility Maintenance and Site Services Group

Staff or Consulting Architect

Homestake DUSEL Principal Investigator K. Lesko
Homestake DUSEL Co-PI W. Roggenthen

Integrated Safety Management Oversight Committee

DUSEL Planning

Sanford Lab Planning and Operations

Organization Being Developed Now

Board of Overseers

Lawrence Berkeley National Laboratory

University of California, Berkeley

South Dakota School of Mines and Technology

Barrick Corporation Property Donation Agreement

South Dakota Science and Technology Authority Board of Directors

T. Denny Sanford Donation

Cooperative Agreement

Department of Energy

National Science Foundation Program Manager for DUSEL
We are moving into the MREFC Readiness Stage to develop a Preliminary Design including:

**Content:**
- Scientific research objectives and priorities (*to be updated to reflect ISE*)
- Site-specific preliminary design
- Resource-loaded Schedule
- Bottoms-up Preliminary Cost Estimate
- Integrated Risk Analysis and Contingency Estimates
- Preliminary Operations Cost Estimate
- Environmental Assessments

**Process:**
- Project Execution Plan
- Project Management Control System
- Systems Engineering
## Summary Schedule

<table>
<thead>
<tr>
<th>Proposed Timeline for Sanford Laboratory and DUSEL</th>
<th>Fiscal Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sanford Laboratory at Homestake</strong></td>
<td>2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017</td>
</tr>
<tr>
<td>Ross Shaft Rehab and Pumping Column Commissioning</td>
<td>![Timeline Icon]</td>
</tr>
<tr>
<td>Yates Shaft Rehab.</td>
<td>![Timeline Icon]</td>
</tr>
<tr>
<td>Gain safe access to 4850L for EIP construction start, and hold water level at 5000L</td>
<td>![Timeline Icon]</td>
</tr>
<tr>
<td>Install facility infrastructure for Davis Lab early experiments</td>
<td>![Timeline Icon]</td>
</tr>
<tr>
<td>Install and commission research instrumentation in Davis Lab</td>
<td>![Timeline Icon]</td>
</tr>
<tr>
<td>Early experiments in Davis Lab ready for operation</td>
<td>![Timeline Icon]</td>
</tr>
<tr>
<td>Continued rehabilitation and infrastructure upgrades for Sanford Lab</td>
<td>![Timeline Icon]</td>
</tr>
<tr>
<td>Transition from Sanford Lab to DUSEL Operations</td>
<td>![Timeline Icon]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>NSF Deep Underground Science and Engineering Laboratory at Homestake</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Homestake site selection announcement</td>
</tr>
</tbody>
</table>

**DUSEL Preconstruction Planning and Development (R&RA)**
- Preliminary Design Phase to develop Baseline Cost and Schedule
- Preliminary Design Review and National Science Board Recommendation
- Final Design Phase
- Final Design Review and Authorization for Construction Start

**DUSEL Facility - Proposed Construction and Commissioning (MREFC)**
- Proposed Construction Start
- Near-Surface Campus Construction at 300L
  - 300L Labs and Education and Outreach Facilities
- Mid-Level Campus Construction at 4850 Level
  - 4850L Common Facilities and Lab Module #1 (Excavation & Lab Build-out)
  - 4850L Lab Modules #2, #3 and #4
- Deep-Level Campus Construction at 7400 Level
  - 7400L Common Facilities and Lab Module #1 (Excavation & Lab Build-out)
  - 7400L Lab Modules #2 and #3
- Surface Campus Construction
  - Phase 1 Offices and Laboratories
  - Phase 2 Offices and Laboratories

**DUSEL Design**

**DUSEL Construction**
### References, Personnel, Documentation

- **Michael Barnett**, LBNL (E+O)
- **Yuen-dat Chan**, LBNL (Other uses)
- **Milind Diwan**, BNL (lbl, pdk)
  - Reyco Henning, UNC (0vdbd, dm)
- **Ken Lande**, Penn (lbl, pdk, geo-neutrinos)
- **Bob Lanou**, Brown (neutrinos, solar neutrinos)
  - Chris Laughton, FNAL (engineering)
- **Kevin T. Lesko**, UCB (physics) PI
  - Stu Loken, LBNL (E+O)
- **Hitoshi Murayama**, UCB (physics theory, neutrinos)
  - Tommy Phelps, ORNL (geomicro)
- **Bill Roggenthen**, SDSM&T (geophysics) coPI
- **Ben Sayler**, BHSU (E+O)
- **Tom Shutt**, Case Western (low backgrounds)
- **Nikolai Tolich**, U.W. (geonus)
- **Bruce Vogelaar**, Virginia Tech (solar nus)
- **Herb Wang**, U Wisc. (geology, rock mechanics)
- **Joe Wang**, LBNL (earth science, geophysics)
- **Richard DiGennaro**, LBNL, Project Manager and Systems Engineer
- **Dianna Jacobs**, LBNL, Project Office
- **Dave Plate**, LBNL, Project Engineer
- **Mark Laurenti**, Mining Engineer
- **Syd DeVries**, Mining Engineer
- **Dave Snyder**, SDSTA Exec. Director
- **Jose Alonso**, Sanford Lab Director
- **Trudy Severson**, Laurie Gehner SDSTA
  - SDSTA Engineering and Safety Personnel
- **Ms. Melissa Barclay & Cathy Thompson**

- [http://www.lbl.gov/nsd/homestake](http://www.lbl.gov/nsd/homestake)
- [http://neutrino.lbl.gov/Homestake/LOI](http://neutrino.lbl.gov/Homestake/LOI)
- [http://neutrino.lbl.gov/Homestake/FebWS](http://neutrino.lbl.gov/Homestake/FebWS)
- [http://homestake.sdsmt.edu/HRB/Refer.htm](http://homestake.sdsmt.edu/HRB/Refer.htm)
- [http://neutrino.lbl.gov/Homestake](http://neutrino.lbl.gov/Homestake)
- [http://www.dusel.org](http://www.dusel.org)
Workshops in South Dakota

• Homestake is arranging to host a series of comprehensive workshops at Lead, SD

• 21-28 April 2008

• Details to be forthcoming, but along the lines of our previous workshops:
  – physics
  – biology
  – earth science & engineering
  – common facilities and cross-cutting research
  – education and public outreach
Center for Underground Science

• To facilitate interactions between the Homestake Facility we are proposing a “Center” initially at Berkeley,
  – host “sabbatical leave” & short-term visits
  – develop collaborations
  – develop experimental plans
  – work with engineers to develop facility requirements and criteria for DUSEL plans

• To begin ~ January 2008, coordinate by topics

• Arranging sponsorship from various sources