

Soudan NUSEL Project Summary

We propose the establishment of a National Underground Science and Engineering Laboratory (NUSEL) by a downward expansion of the existing underground laboratory at Soudan MN. Soudan is the deepest, largest, most experienced and most active underground science laboratory in the United States today. The underground complex at Soudan currently consists of two fully-equipped laboratories at a depth of 710 m. One laboratory (15 m wide by 15 m high by 70 m long) houses the Cryogenic Dark Matter Search (CDMS 2) Detector and staging space for the MINOS Far Detector. The adjacent laboratory (15 m wide by 16 m high by 90 m long) contains the 5,500 tonne MINOS Detector for the Neutrinos at the Main Injector (NUMI) Neutrino Oscillation Search and a $\bar{\nu}_e$ detector prototype. A unique asset of the Soudan Laboratory is the 735 km long-baseline neutrino beam from Fermilab to Soudan, constructed at a cost of ~\$150 million and scheduled for completion in early 2005.

Several national committees have strongly recommended the establishment of NUSEL to pursue scientific and engineering initiatives in fields such as neutrino science, nucleon stability, geoscience, geomicrobiology, materials development, homeland security and energy storage. Soudan NUSEL will start with the existing facilities and the ongoing scientific programs of MINOS and CDMS 2. In phases, Soudan NUSEL will develop the world's most capable underground laboratory in the three frontiers of underground science and engineering— depth, size (of laboratories and access) and ability to use difficult detector materials, such as cryogenics and flammables. Phase 1 of the proposed plan will re-use existing, high quality, utility-equipped laboratory space for new initiatives, including a clean room, low background counting facility for prototype development and materials qualification for new detectors. Phase 2 will improve access to the current laboratories at a depth of 710 m (2,100 mwe) and extend access to new laboratory areas at depths of 1,450 m (4,290 mwe) and 2,500 m (7,400 mwe). The upgraded access to all levels would include a 1:7 decline (same as access to the Pyhäsalmi Mine in Finland) capable of handling semi-trailers loaded with 40 foot international shipping containers, a raise-bored, concrete-lined vertical shaft equipped with a 20 tonne capacity friction hoist and one or more raise-bored ventilation shafts, to facilitate safe use of difficult detector materials. The access decline will enable new geoscience and geoenvironmental investigations by exposing to short core drilling nearly a cubic kilometer of rock. Soudan NUSEL will include space for a megaton-class neutrino and proton decay detector at the 1,450 m level. A modest upgrading of current surface facilities would provide scientific visitor and administrative space and facilitate expansion of the current outreach and education program in cooperation with Minnesota State Parks. In 2002, ~6,000 people toured the Soudan Laboratory as members of the general public or school and other groups. Many more people learned about the exciting science opportunities at Soudan through the mass media.

The University of Minnesota, which has 23 years experience managing underground science projects at Soudan, proposes to manage Soudan NUSEL. The University's seven-person project management and operations team has an aggregate of more than 75 years experience in underground science and management of underground laboratories. This group has previously coordinated underground civil construction and installation of instrumentation representing a capital investment of nearly \$100 million. The University wishes to involve the national and international scientific and engineering communities in the management of NUSEL, but it needs no special insurance payments or escrow funds to fulfill its responsibilities for Soudan NUSEL.

We believe that Soudan compares favorably with other possibilities for NUSEL in the United States, for site characteristics, for existing infrastructure and for demonstrated project management capabilities. Soudan provides the highest probability of success in finally realizing results from the more than twenty-year effort to establish NUSEL in the United States.