

9 Summary and Conclusions

The Homestake site is the best location for DUSEL: outstanding opportunities for multiple sciences (and the resulting synergies); freedom from competing commercial priorities; existing infrastructure; and a receptive community, which includes not only good will but also a remarkable financial commitment from the state and from a philanthropic donor.

Uncompromising Opportunities: Homestake means access to the deep underground under near-ideal circumstances for science. It combines depth, low background environments, and the structural integrity to support large cavities, and it is completely dedicated to research.

This is an opportunity unique in all the world, and a large, multidisciplinary team of scientists, with a core of nationally recognized physicists and leaders in biology, geology, and engineering in the underground environment is poised to take advantage of it. Our phased approach begins with an Early Implementation Program (EIP) and is already underway under the auspices of the Homestake Interim Laboratory using South Dakota Science and Technology Authority funds. The EIP represents rapid access for science, education and engineering and assures that facilities will be available for experiments. Deeper levels will be developed as needed, thereby matching facility development with experimental requirements. Throughout its phased development, Homestake DUSEL will support an extremely diverse and comprehensive suite of experiments.

Homestake DUSEL will address many of today's most important scientific challenges, including the origin, evolution, and fate of the universe; a vast array of earth sciences and geoengineering research; and biology under extreme conditions. Many of these questions are relevant to high-profile societal issues, including ground water, carbon sequestration, and geothermal energy.

Built into the plans are education and outreach (including an ambitious science education center). These plans serve the community—particularly through K-12 and collegiate educational systems—and also visitors to the Black Hills. The E&O opportunities are seen by state and local governments as a major asset, and enjoy encouragement at every level.

A Running Start on a Safe and Productive User Facility: Approximately \$116M is available through state funding and private donations to support the construction of the Homestake Interim Laboratory and its Early Implementation Program. This commitment represents a significant portion of the DUSEL facility construction costs. Leveraging this investment will make Homestake DUSEL a leader in cost-effectiveness and “time to science” as well as in results.

The Interim Laboratory's management and operational structures, including a customized safety program that integrates the requirements of an underground environment and multidisciplinary research (informed by extensive experience with large user facilities), will phase into DUSEL.

The preliminary cost estimate (\$FY07 without contingency) for the MREFC application is \$410M (including \$225M in experiments and \$91M in design and outfitting for underground laboratories). Other funding totaling \$180M, including the Authority-controlled funds, will provide nine years of pre-operations support and underground lab preparation.

Room to Grow, and a Knowledge Base to Grow On: The design provides >100,000 ft² of underground lab space, and the site readily accommodates future expansions, including extending to greater depths and providing additional above- and below-ground infrastructure. Preliminary risk evaluations and geotechnical studies show that risks are manageable; there are no show stoppers. Earth science, geomicrobiology and several physics experiments, in particular, can be established expediently due to excellent underground access and existing documentation.

The result will be the world's largest, deepest, and most comprehensive underground laboratory.