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## Epitome

This document has presented a compelling scientific case for the construction of a new Isotope Science Facility (ISF) at Michigan State University that will replace the NSCL's current Coupled Cyclotron Facility (CCF). The ISF will make it possible to produce broad swaths of unknown nuclei that offer the potential for a wide range of new discoveries. Detailed technical assessments have been made of how one can produce the most intense primary heavy-ion beams and deliver them to production targets, and of how the secondary beams of rare isotopes can be rapidly yet cleanly separated and used for nuclear science research.

A new concept for rapid and efficient thermalization of the fast-ion beams has been presented that will allow precision experiments in traps as well as efficient reacceleration. With this reacceleration capability, additional important and complementary studies will be possible that are not feasible with the powerful fast beam techniques currently employed at the NSCL and leading laboratories around the world. The ISF will allow experimentation over the entire gamut of energies from rest to 200 MeV/nucleon and with the highest intensities possible – a capability that does not exist and is not currently planned anywhere else in the world.

Detailed simulations, successful prototypes, forefront experimental techniques, and cutting-edge equipment extant and under development at MSU and in the U.S. rare isotope science community all indicate that the ISF will have a high likelihood of success. Construction of the ISF on the MSU campus will build on the existing experience and strength of NSCL faculty and staff and reuse existing NSCL equipment to provide significant cost savings and a rapid start to the experimental program.

For due diligence, two options have been explored in significant technical detail, and their costs have been carefully outlined and evaluated. One option is construction on a large new site on the southern part of the MSU campus. The other option is construction on the current NSCL site. In the short term, either site can accommodate the most important science of the proposed baseline facility, but a new site will be able to accommodate a large variety of upgrades as science advances. Construction on a new site offers the additional advantage of negligible interference with the ongoing nuclear science program, allowing continued optimal access to the CCF to more than 700 registered NSCL users and a seamless transition from CCF-based to ISF-based research and education activities with about six months interruption. Construction of the ISF on the present NSCL site will require a much longer shutdown of the research program – about 18 months. Ongoing excavation and construction activities on the NSCL site will unavoidably interfere with the concurrent user program in ways that cannot yet be fully foreseen.

The table below compares the two site options. NSCL faculty and staff believe that the significant advantages of the south campus site outweigh its initially higher cost and that the nation will be better served in the long-run with this option. In the presence of extremely tight budget constraints, however, the NSCL site offers a viable option to carry out a world-class rare isotope science program.