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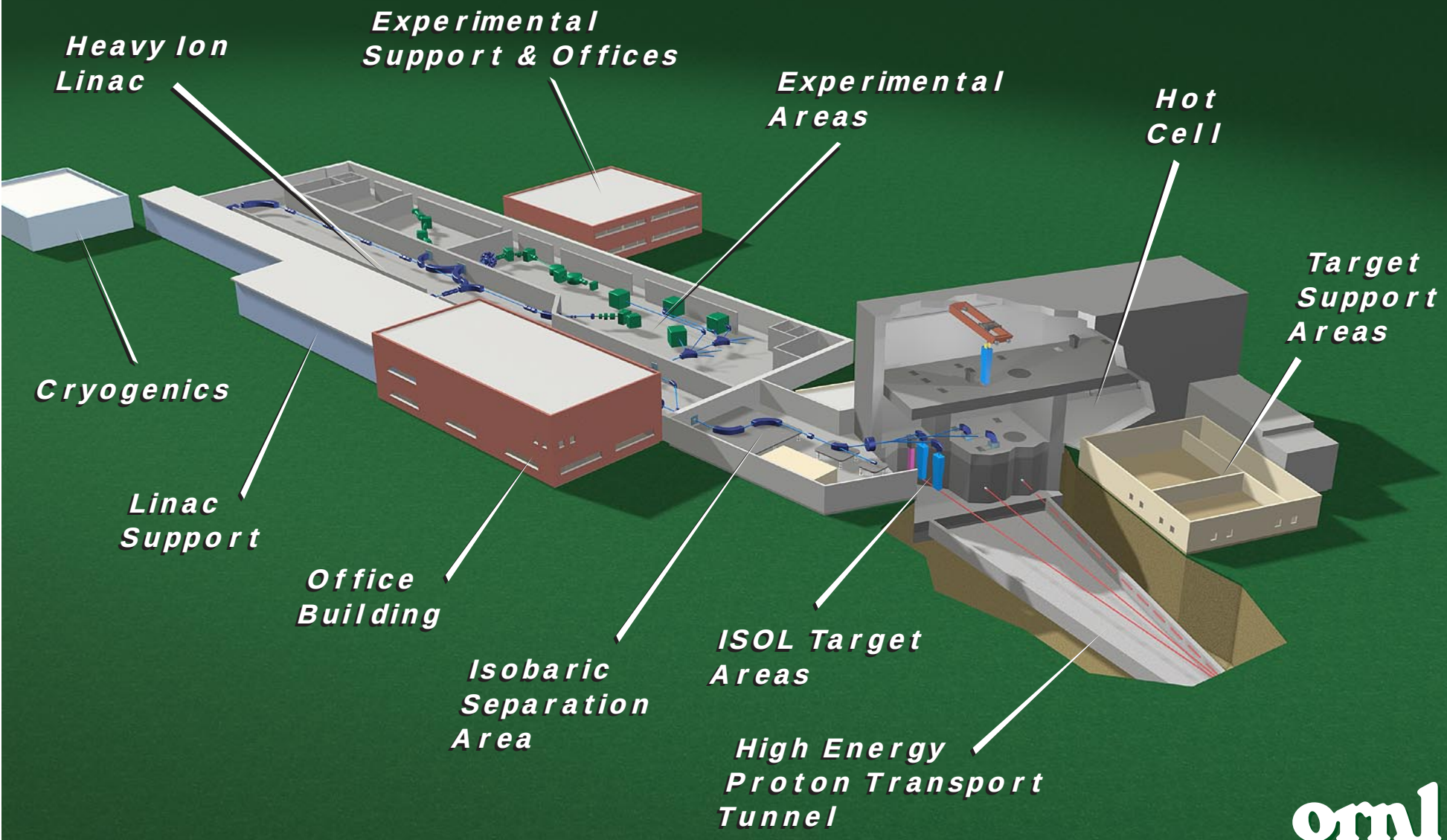
Next Generation ISOL Facility



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localization of the radioactivity in the lower portions of this assembly. The whole target ion source assembly together with the three stage vacuum envelopes (and perhaps the low-resolution separator magnet) would be removed as a unit for service. This assembly would be removed vertically by a crane which would insert it into shielded hot cells for servicing the target and ion source assemblies. Target and ion source assembly, servicing, testing, and storage areas would be located near the RIB production target areas.

Ion sources under consideration for the NISOL facility include electron cyclotron resonance (ECR), electron beam plasma (EBP) (i.e., modifications of the sources used for the ISOLDE and the HRIBF), and laser sources. An ion source for providing test beams of stable ions also is planned.

The isotope selection would be accomplished using a three-stage isobar separation system with a resolution of $\Delta m/m$ ~1/20,000. The low-resolution vertical-to-horizontal bending preseparator (described above) is the first stage of this system. The second and third stages are an improved version of the present HRIBF isobaric analysis system with a single-magnet second stage ($\Delta m/m$ ~1/2500) and a double-bend third stage ($\Delta m/m$ ~1/20,000). To provide maximum flexibility for a wide variety of masses and charge states all these magnets will be maintained at high voltage as will the RFQ's. Space will be left between the last stage of the isobaric analyzer and the RFQ for the installation of beam cooling.

The heavy ion acceleration would be accomplished using a two-stage RFQ and a four-stage superconducting heavy-ion linac, capable of accelerating single charged ions of $A \approx 140$ to 10-15 MeV/A. The heavy ions would be stripped to an equilibrium charge state after the first two stages of the heavy-ion linac. The RFQ will probably be of the split coaxial type (SCRFQ) now operating at the KEK/Tanashi Facility in Tokyo. To achieve the very low charge-to-mass ratios ($\approx 1/140$) the SCRFQ would operate at about 12 MHz.

A large, versatile experimental area (23,600 sq. ft.), allowing a very large range of beam energies (from ≈100 keV to 10-15 MeV/A) to be directed to a variety of experimental apparatus is planned. A workshop considering the experimental equipment for such an ISOL facility was held at Lawrence Berkeley National Laboratory in August 1998. ORNL would provide substantial experimental apparatus [e.g., the recoil mass separator (RMS) and the Daresbury recoil separator (DRS) from the HRIBF] to help instrument this new facility.

To take advantage of the "green" field approach available at the SNS site the area at the high-energy end of the heavy-ion linac is reserved for future upgrades as are areas adjacent to the experimental hall. Likewise additional space is provided for an upgraded RIB target station, since targets and ion sources are considered to be the area that future technical break through is most likely to occur. Space also is available for adding a second driver accelerator of an unspecified type, if that should become desirable at a future time.

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