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C1Or4B-01: LBNF/DUNE Liquid Argon Roadmap

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The Deep Underground Neutrino Experiment (DUNE) is an international flagship venture to unlock the mysteries of neutrinos. Hosted at the Sanford Underground Research Facility (SURF) and supported by the Long-Baseline Neutrino Facility (LBNF), DUNE relies on nearly 70,000 tonnes of ultrapure liquid argon (LAr) housed in state-of-the-art cryostats. Transporting such vast quantities of LAr to its destination a mile underground in Lead, SD, is a logistical and engineering challenge. The process begins with securing large quantities of liquid argon from suppliers located far from the site, with major sources situated near Houston, TX and Chicago, IL. The receiving facility, located atop a mountain with steep, often snow-covered access roads, provides limited maneuverability for trucks and can only handle two deliveries simultaneously. The facility serves as an entry point for argon to the greater LBNF cryogenic system. It is furnished with truck unloading stations, limited buffer storage of some 260 tonnes capacity, and vaporizers. The last are crucial for converting liquid argon into gas for transfer down the Ross Shaft, eliminating the need for cryogens in the vertical pipeline. These constraints, along with other operational factors, cap the delivery rate at 70 tonnes per day. Once underground, the argon is purified and recondensed before filling the cryostats. This roadmap outlines the integrated supply chain and cryogenic systems that enable the delivery of LAr to support DUNE's groundbreaking physics research.

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