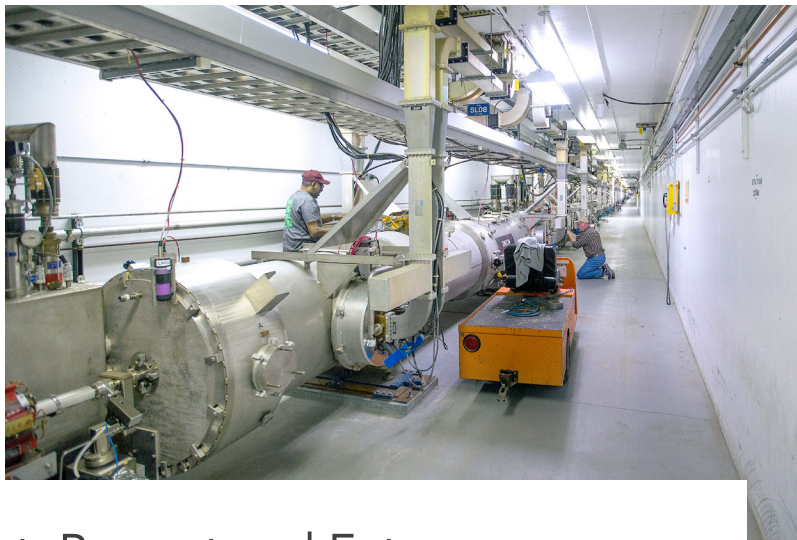


CAMPUS PLAN

A modern, flexible user facility to enable world-class science



TJNAF Scientific Leadership – Past, Present and Future

Thomas Jefferson National Accelerator Facility is a U.S. Department of Energy Office of Science national laboratory located in Newport News, Virginia and is managed by Jefferson Science Associates, LLC. Scientists from around the world depend on TJNAF’s unique particle accelerator, known as the Continuous Electron Beam Accelerator Facility to probe the basic building blocks of matter – helping us better understand these particles and the forces that bind them – and ultimately our world.

The recently upgraded CEBAF serves a 1600+ member strong scientific User community as the world’s principal scientific facility devoted to fundamental nuclear physics using electron beams.

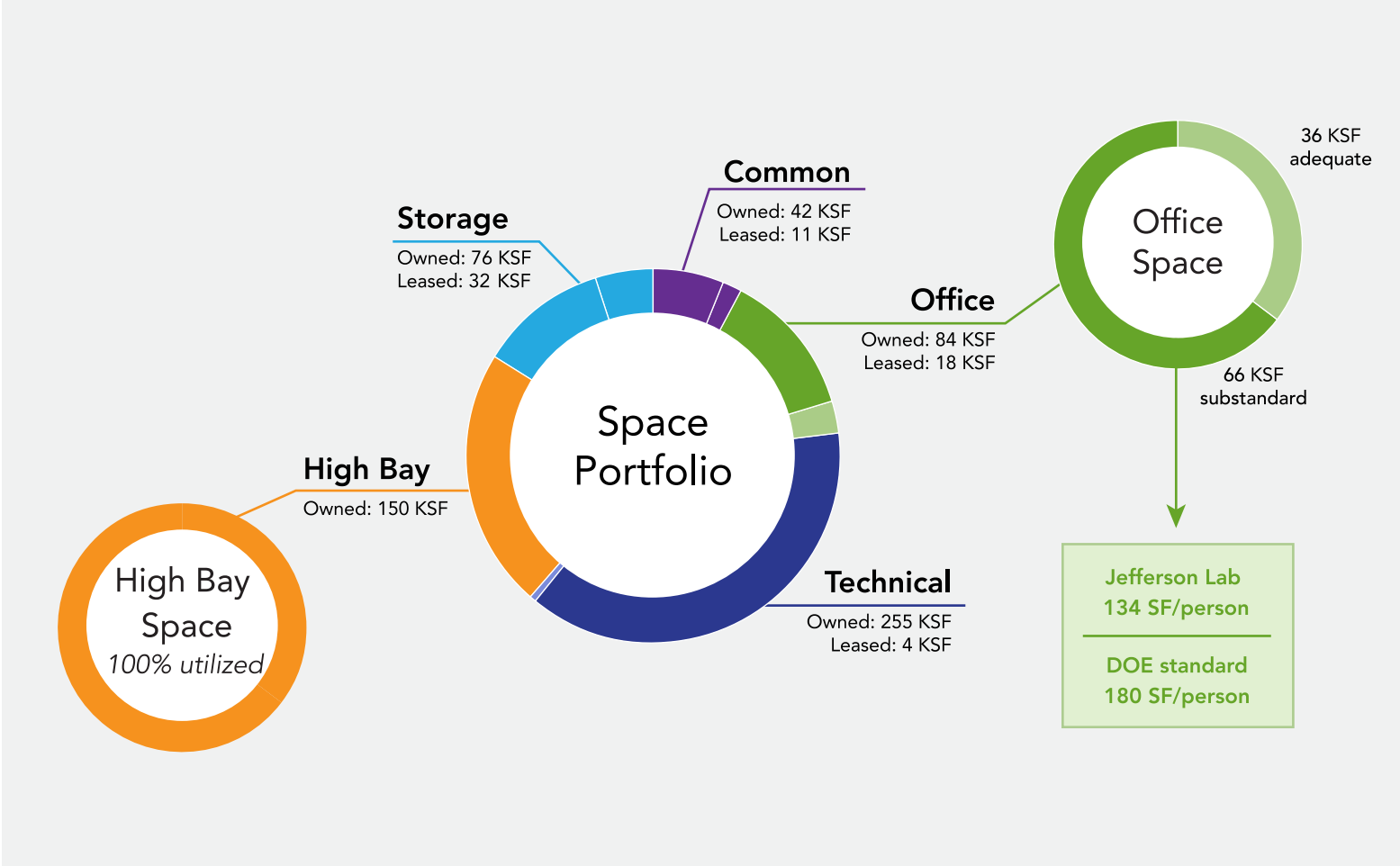
The lab’s vibrant research and development program also prepares the next generation of nuclear physicists with one third of all nuclear physics Ph.D.s granted in the United States based on research completed at TJNAF.

Leveraging our CEBAF experience, JSA staff are leaders in the development of superconducting radio-frequency accelerators, advanced detectors and computational technologies for an expanding array of scientific and commercial applications. This work feeds back into improved designs for CEBAF leading to continuous improvement of the TJNAF User facility.

Building an Infrastructure for World-Class Science and Technology

As stewards of this unique national asset, we are devoted to maintaining a reliable and cost-effective infrastructure for nuclear physics research while simultaneously preparing for future opportunities. Through this process we identify and anticipate infrastructure gaps in concert with our sponsor, Users, industry and community partners.

The TJNAF Laboratory Complex Today:



Looking toward the future, TJNAF faces three immediate infrastructure needs:

- Cryogenic infrastructure with adequate capacity and reliability to deliver liquid helium to the accelerator, four experimental halls and our advanced development and test facilities.
- Sufficient high bay space to meet the growing demand for assembly, testing and modification of superconducting radio frequency accelerator components, detectors and target systems for our experimental program, and DOE projects.
- Modern and efficient office space for staff and a growing scientific User community.



720 employees- scientists, engineers and support personnel



1630-member international user community



183 completed experiments



600 PhDs earned; 1/3 of all nuclear physics Ph.D.s awarded in U.S. based on JLab science



8-year backlog of approved experiments



1461 refereed publications



450 invention disclosures; 169 patents awarded; 24 technologies licensed to industry

TJNAF Campus
Proposed Campus Plan



Office Workspace Upgrade – Obtain ARC (option – CRE)



Office Workspace Upgrade – Wing E Addition (option – CRE)



Office Workspace Upgrade – CEBAF Center Renovation (CRE)



Cryogenic Infrastructure Improvements – CTF



Increased High Bay Space – Test Lab High Bay Annex



Cryogenic Infrastructure Improvements – ESR2



Cryogenic Infrastructure Improvements – CHL 2K Cold Box



2029

Erosion Control Structures
Expand Laydown Area



2028

Potable Water Loop Expansion
Parking Improvements



2027

Sustainability Improvements



2026

Stormwater Improvements



2025

Replace Test Lab Basement Chillers



2024

CD-4 CEBAF Renovation & Expansion (CRE)
Experimental Equipment Lab (EEL) Modernization
RADCON Calibration Lab & Waste Processing



2022

Equipment Storage Building



2021

CD-3 CEBAF Renovation & Expansion (CRE)
Main Entrance & Site Signage
Cooling Tower Water Reuse



2020

CD-2 CEBAF Renovation & Expansion (CRE)
End Station Refrigerator 2 (ESR2)
Test Lab High Bay Annex



2019

CD-1 CEBAF Renovation & Expansion (CRE)
Cryo Engineering Office Refurbishment
Central Utility Plant (CUP) Power Diversity
Road & Sidewalk Improvements



2018

CHL 2K Cold Box
CTF Recapitalization

Cryogenic Infrastructure Improvements

Creating Reliable Cryogenics Capabilities for CEBAF Operations and Advanced R&D

Central Helium Liquefier (CHL)

Current State – Running CEBAF at 12 GeV requires simultaneous operation of both CHL 1 and 2. CHL 2 was added with the 12 GeV upgrade and has been in operation since 2014. CHL 1, however, was commissioned with the original 4 GeV CEBAF in 1991 and has been in nearly continuous operation since 1994. Major components of CHL 1 are at end-of-life or no longer supportable increasing the frequency of unplanned service outages and lost experiment time.

Path Forward – An \$8M SLI GPP project is underway to replace the highest risk component, the CHL 1 2K Cold Box. That project is on track and scheduled for completion in FY21.



End Station Refrigerator (ESR)

Current State – The ESR maintains cryogenic supply to targets and detectors in Experimental Halls A, B and C. The current ESR began service at the Lawrence Berkeley National Laboratory in 1977, was later moved to TJNAF and reactivated here in 1993, and has been in nearly continuous service since then. The ESR is well past its design life, is no longer supportable and presents the highest risk to reliable facility operation. The ESR is also unable to deliver the cooling capacity needed for upcoming experiments.

Path Forward – ESR replacement has been a top priority of TJNAF for many years. A new building to house the ESR replacement was completed in 2012 and major components were acquired from the Superconducting Super Collider project and stored here awaiting integration. Conceptual design of the replacement system is underway in anticipation of project funding in FY20.



Cryogenics Test Facility (CTF)

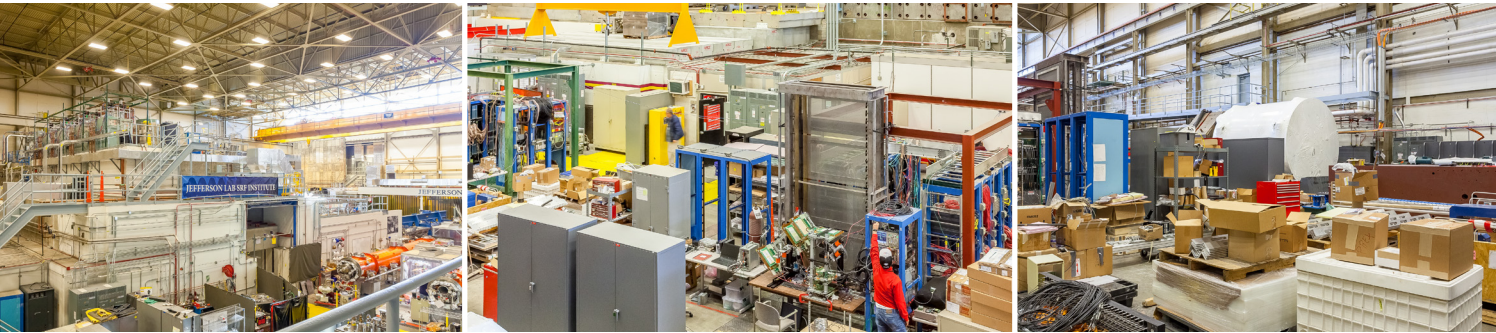
Current State – The CTF is the oldest cryogenic plant at TJNAF. It was first activated at the Test Lab in 1989 to support CEBAF development and has undergone a series of upgrades and sustainment actions since. The increasing tempo and scope of SRF R&D for long-term CEBAF operation and work for other DOE institutions requires additional CTF capacity and reliability.

Path Forward – Continue to execute the CTF recapitalization plan and improve capacity and reliability to meet the current and forecast SRF R&D and project workload.



Increased High Bay Fabrication Space

High Bay Space Needed to Build and Test Experimental Equipment, for SRF Production and Cryo Fabrication



Current State

Due to the growth in SRF production work, high bay space is oversubscribed and additional off-site leased space is required to meet the demand. The lack of sufficient space is a limiting factor for future projects and poses an increased safety risk to staff and visiting scientists.

Path Forward

Construct a new 45,000 SF high bay facility, which will consolidate large-scale assembly and testing activities, as well as eliminate overcrowding in the Test Lab and Technology and Engineering Development Facility.

Office Workspace Upgrade

Adequate Office and Collaborative Space for Laboratory Staff and Users



Current State

TJNAF office space is approaching full capacity and falling far behind the attractive and effective work environment our current and future staff expect. The existing 128,000 SF CEBAF Center is classified as substandard and is becoming increasingly expensive to maintain due to aging mechanical systems. Leased space is needed to house support staff, existing conference space is heavily utilized, collaboration space is limited and existing facility designs don't permit effective portioning of sensitive work from the areas needed for open meetings, conferences and a vibrant STEM engagement program.

Path Forward

Build, rehabilitate or acquire 210,000 SF of space for lab staff, Users and students that inspires scientific discovery, fosters collaboration and meets DOE high performance building standards. Various alternatives are under study to include new construction, renovation and expansion of CEBAF Center, or a combination of renovation and expansion of CEBAF Center with acquisition and renovation of the adjacent and underutilized Applied Research Center (ARC). The ARC option is particularly attractive since it provides a compelling connection to the community through an expanded STEM Education and Visitors Center.

TJNAF – A Smart Investment for the Future

Modest investment in TJNAF's campus infrastructure offers a clear return in current mission effectiveness while positioning the lab to respond decisively to new science and technology opportunities that benefit the DOE Office of Science, the nuclear physics community and the Commonwealth of Virginia. These investments will keep TJNAF at the forefront of nuclear physics research and contribute to advances in medicine, health, environmental remediation and other national and global imperatives we are just beginning to envision.

The lab offers multiple advantages as a science and technology research and development center, including:



An established track record of building and renovating facilities at the lowest cost of any DOE site (Examples – TEDF construction \$387/SF, ESH&Q Building \$345/SF)



A strong program management culture that delivers large and complex projects on time and on budget (Examples – 12 GeV Upgrade and Utility Infrastructure Modernization)



An efficient organization and operations model that achieves the lowest overhead rate of any DOE M&O contractor extending the buying power of each direct dollar



A ready supply of specialized talent in the Hampton Roads region making it possible to fill labor needs quickly



An attractive and diverse region with low cost of living that makes it possible to attract and retain scientists and engineers from around the world



A growing commercial technology center immediately adjacent to the lab attracting entrepreneurs and start-ups anxious to leverage lab-born technology



A strong and supportive partnership with the local community, Hampton Roads region and the Commonwealth of Virginia



An easily accessible site only 120 miles from Washington D.C. with excellent sea, air, and land transportation



A benign environment with low risk of major climatic or geologic disturbance

THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY

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Jefferson Lab is managed and operated by Jefferson Science Associates, LLC, a joint venture between Southeastern Universities Research Association, Inc., and PAE.