

Fermi Research Alliance

Insights into Fermilab's Economic Impact:

A Comprehensive Review of Fiscal Year 2022

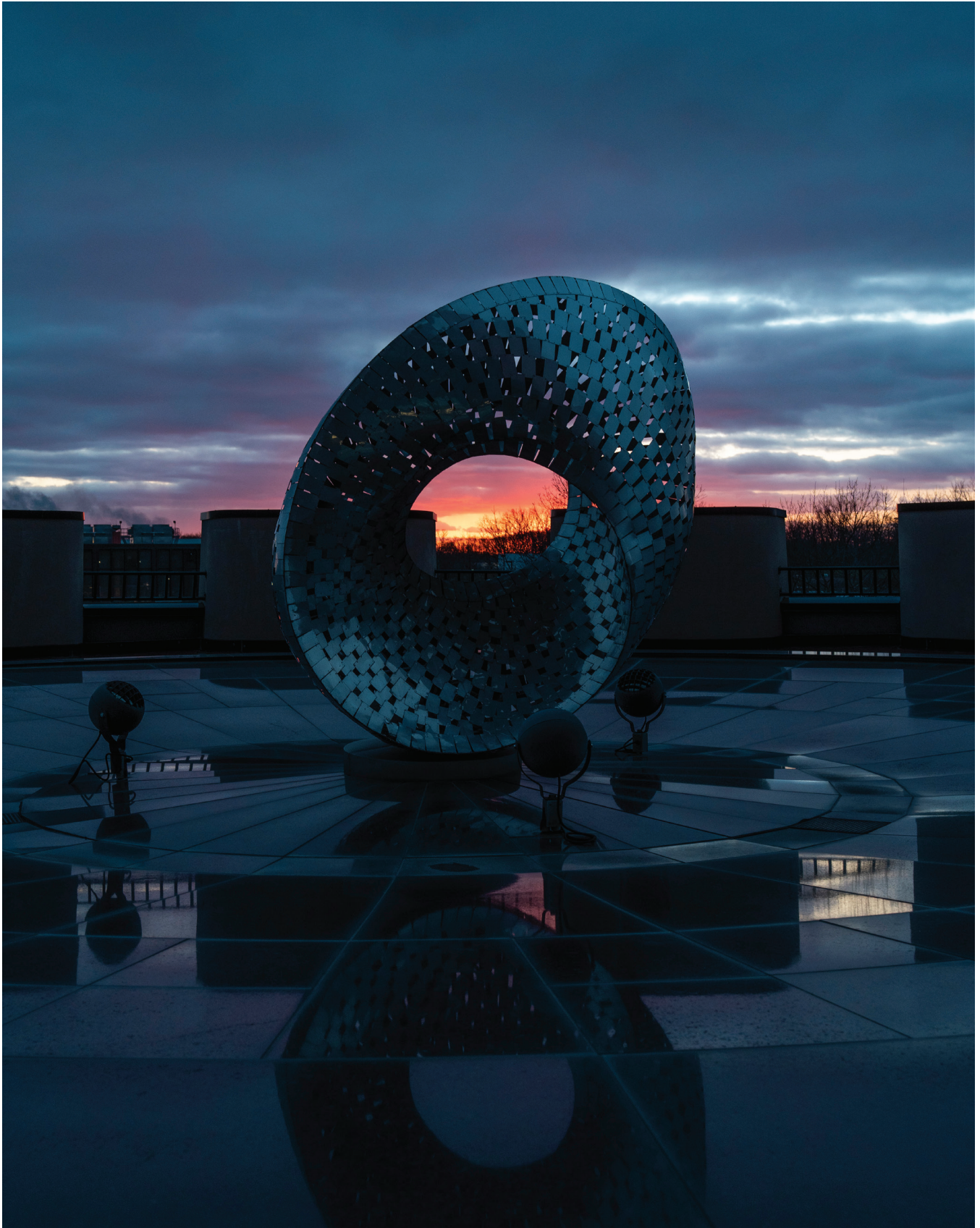


*Fermi National Accelerator Laboratory
U.S. Department of Energy
Managed by Fermi Research Alliance, LLC*

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1 | LETTER FROM FERMILAB DIRECTOR

Dear Friends of Fermilab,

Fermi National Accelerator Laboratory is America's premier particle physics and accelerator laboratory. By advancing our understanding of the smallest, most elemental parts



of our universe, we will solve the mysteries of matter, energy, space, and time for the benefit of all. We are delighted to present the results of the laboratory's economic assessment of our Fiscal Year 2022 (FY22)¹ operations.

FY22 was a year of growth and unparalleled success as we met major milestones with our projects including the Long-Baseline Neutrino Facility and the international Deep Underground Neutrino Experiment. We also achieved significant progress in finalizing a contract award for the PIP-II Linac Complex. Once complete, this complex will power beamline-based experiments. Its new 215-meter-long linear accelerator, or linac, will eventually power the high-energy neutrino beam that will send neutrinos through the earth toward the DUNE experiment in Lead, South Dakota. PIP-II is the first accelerator project to be built in the United States with significant international contributions.

This rapid expansion of Fermilab research has created a profound economic impact. We are extremely proud to contribute **\$1.6 billion in total economic output** and support 7,242 jobs in the economy.

Our impact as a laboratory is unique. Beyond just the primary economic impacts created by our operations, laboratory operations contribute to the economies of Illinois and South Dakota by expanding access to our world-class science. Last year, Fermilab welcomed more than 5,700 visitors who worked with cutting-edge physics experiments and world-renowned scientific minds. The laboratory also hosted 4,400 users and affiliates from the international scientific community who accessed our facilities to further their research.

We are committed to building a diverse and strong workforce for the future. We supported 105 undergraduate interns (increased to 316 interns in FY23) and 2,400 graduate and postdoctoral research students who worked both in person and virtually with Fermilab.

Furthermore, we are honored that some of the greatest scientific thought-leaders in the world of physics work and support the mission of Fermilab. Our scientific experts produced 522 published papers in FY22 (increased to 541 in FY23). Three of the top ten most highly cited High Energy Physics papers in FY22 have a Fermilab author. Our laboratory's ranking of highly regarded scientific content is respected worldwide and used as the building blocks for furthering education and related experiments. As such, we contribute much more than dollars—we provide cutting-edge scientific discoveries in the United States through close collaboration with our partners throughout the world.

A handwritten signature in black ink that reads "Lia". The script is fluid and cursive, with a long, sweeping underline.

1. Fiscal Year 2022 is defined as October 1, 2021 to September 30, 2022.

2 | INTRODUCTION AND PURPOSE OF REPORT



Fermi National Accelerator Laboratory (Fermilab), located in Batavia, Illinois, is America's leading particle physics and accelerator laboratory and one of 17 U.S. Department of Energy (DOE) national laboratories. The laboratory maintains and operates the largest particle accelerator complex in the United States for the investigation of the smallest measurable components of matter. Fermilab's mission is to drive discovery with its particle accelerators and detector facilities, perform pioneering research with global and national partners, and develop new scientific technologies that support United States industrial competitiveness.

The Fermilab site is an expansive 6,800 acres managed by Fermi Research Alliance (FRA) for the DOE. FRA is a partnership between the University of Chicago and Universities Research Association, Inc. At the end of FY22, FRA had 1,985 employees. Procurement spend occurred

across nearly all 50 states, most significantly in Illinois, where Fermilab's main campus is located. Additionally, a significant impact has been seen in South Dakota, where Fermilab is building the key components of the U.S. Long-Baseline Neutrino Facility (LBNF) to conduct the Deep Underground Neutrino Experiment (DUNE) in the Sanford Underground Research Facility (SURF). This \$3.3 billion project is designed to create the largest-scale cryogenic particle experiment in the world.

The portfolio of scientific research at Fermilab is expansive and focuses on answering some of the most challenging questions in physics. The laboratory's research areas and centers focus on neutrino science, cosmology, particle accelerators and detectors. Additionally, the lab has expanded into the related fields of Quantum Information Science and Technology (QIS&T), microelectronics and artificial intelligence.



This report presents an analysis of the economic impact generated by the laboratory. By examining the diverse economic contributions, this assessment aims to provide policymakers, stakeholders and the public with an understanding of the laboratory's significant role in driving regional and national economic growth.

The report quantifies national economic impact in terms of the following effects:

- **Direct** Economic impact created through operating expenses incurred.
- **Indirect** Economic impact created through business-to-business transactions.
- **Induced** Economic impact created through business-to-consumer spending.

This FY22 report provides an in-depth breakdown and statistics of these commonly accepted measurements of economic impact. Additionally, it outlines the laboratory's impact in job creation both regionally and in the area of high-energy physics and related occupations.

3 | SUMMARY OF IMPACTS

In FY22, the laboratory generated approximately \$1.6B in total economic output and was responsible for creating and sustaining more than 7,200 jobs in Illinois and South Dakota.

The economic impact in FY22 is significantly increased in comparison with its economic impact from FY18 [1] (the last time an economic impact study was conducted by the laboratory). Since FY18, the lab’s total economic output in

Illinois has increased by 188% driven largely by a more than 50% increase in procurement spend.

At the end of FY22, Fermilab’s employee headcount was 1,985.² Approximately 1,970 total employees were assigned to the Batavia campus (including 10 that were dedicated to CERN) and 15 employees were assigned to the LBNF-DUNE/US project in Lead, South Dakota (total count includes both remote and in-person work).

TABLE 1—INPUTS

MEASUREMENTS	FY18 ECONOMIC IMPACT STUDY	FY22 ECONOMIC IMPACT ASSESSMENT
Total Operating Expenses	\$485M	\$778M
Procurement Spend	\$184M	\$286M
Procurement Spend with Small Businesses in IL	\$34M	\$41M
Onsite Visitors	2,000	5,761

TABLE 2—OUTPUTS

MEASUREMENTS	FY18 ECONOMIC IMPACT STUDY	FY22 ECONOMIC IMPACT ASSESSMENT
State-Based Total Economic Employment Impact	5,300 jobs	7,242 jobs
IL Total Economic Output	\$451.8M	\$1.3B
SD Total Economic Output	NA	\$275M

2. Fermilab had less than 5% of staff working remotely during this time period; therefore, impact modeling was done only for the states of Illinois and South Dakota. Should the number of employees working remotely change significantly, future models will include other states as appropriate. This is in line with practices observed at other DOE national laboratories.

3.1 Illinois Operations

Out of the total FY22 employee population, 1,970 employees were located at the Batavia, Illinois site (including both remote and in-person work in the state of Illinois). Indirect and induced economic impact accounted for an additional 3,074 jobs and for the creation and sustainment of a total of 5,044 jobs within the state of Illinois. Furthermore, the impact of laboratory operations within the state generated additional output:

- FY22 operations in Illinois added nearly \$1.3B to Illinois' gross economic output.
 - Of the total Illinois gross economic output, employee spend created an additional \$357M of induced economic effect.
- Illinois construction activity of \$49.2M supported an estimated 361 construction jobs and an additional 216 indirect and induced jobs.
- Fermilab brought substantial federal funding into Illinois and generated additional value-added output of more than \$788M.
- Laboratory operations increased total household income in Illinois by \$529.4M.
- Nearly \$611M of the economic output was generated through suppliers and employee household spending.

3.2 South Dakota Operations

The LBNF/DUNE-US project was the largest DOE capital asset project active in FY22. This project incurred \$150M in spend associated with excavation and engineering activities in South Dakota. In FY22, the South Dakota operations generated \$275M in total economic output. Of the \$275M, \$267M came from excavation and engineering activities and \$8M came from on site staff operations in South Dakota. Many of the staff supporting this project are subcontractors and/or operating remotely from Illinois. The direct economic output generated accounts for the creation and/or sustainment of 956 jobs. In addition, the LBNF/DUNE-US project is responsible for the following economic impacts in FY22.

- 283 jobs for construction suppliers.
- 345 jobs based on construction and excavation work.
- Total job creation impact of 1,584 which results in \$98 million in new household income.
- \$125M in value add (gross state product).

4 | METHODOLOGY

4.1 Quantitative Analysis

The economic impact figures were calculated based on the FY22 spend associated with budgetary activities (employee expenses, procurement spend, capital improvements, and other incurred operating expenses) and are estimated using a regional economic analysis software application known as IMPLAN [2].

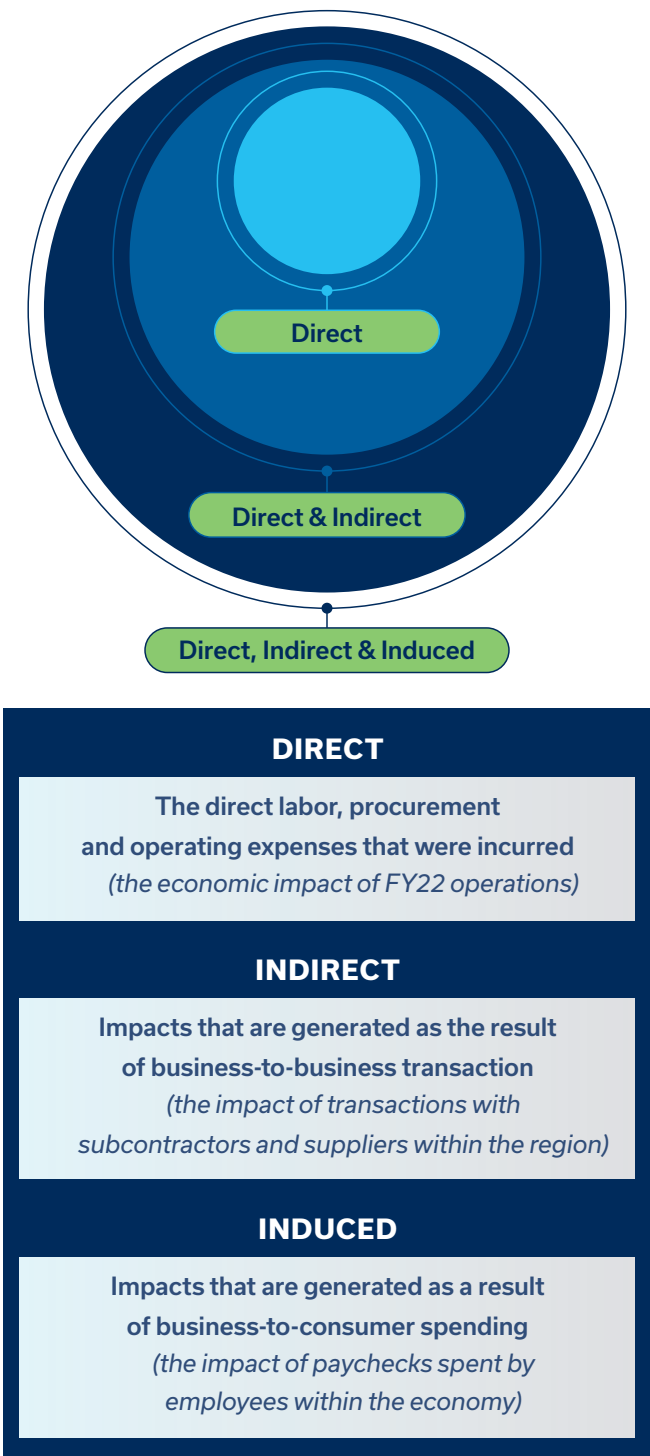
The data set of total FY22 spend was provided by the Fermilab Budget Office. The breakdown of spend allocation associated with areas of operation was segmented by industry classification using the North American Industry Classification (NAICS) 5-digit codes.

Output for South Dakota and the LBNF-DUNE/US project were calculated separately to measure the impact of \$150M of spend associated with the LBNF-DUNE/US project that included \$21M in engineering services and \$129M in excavation and construction.

4.2 Visitor Impact

An informal survey was conducted to collect information from individuals who had traveled to Fermilab and SURF during FY22. The survey consisted of ten questions and focused on gathering spend information from visitors based on their FY22 trips. Over 1,600 visitors were invited to participate in the survey, which had a response rate of 5.6% of the 1,600 who responded. Information was processed through IMPLAN to determine the aggregate impact.

FIGURE 1—UNDERSTANDING IMPACT EFFECT MEASUREMENTS



4.3 Qualitative Analysis

Target economic stakeholders were identified in March 2023 and the list of names was reviewed with Fermilab senior leadership for engagement in fact-finding/needs discussions about the economic impact during FY22. The selected stakeholder groups included: local community business leaders, local government offices, local economic development organizations, local community colleges, local school districts, and state and local government leaders. The topics discussed during these meetings focused on:

- Economic impact generated by lab/project activities,
- Impact on local businesses,
- Impact on the local workforce,
- Connection and impact with local community schools, and
- Community economic focus and direction:
 - Community strengths,
 - Community needs/focus areas for economic growth,
 - Community understanding of the lab's work, and
 - Community perception of the lab.

Observations reported during these needs/fact-finding discussions were then summarized and provided as feedback to Fermilab.



5 | INPUTS

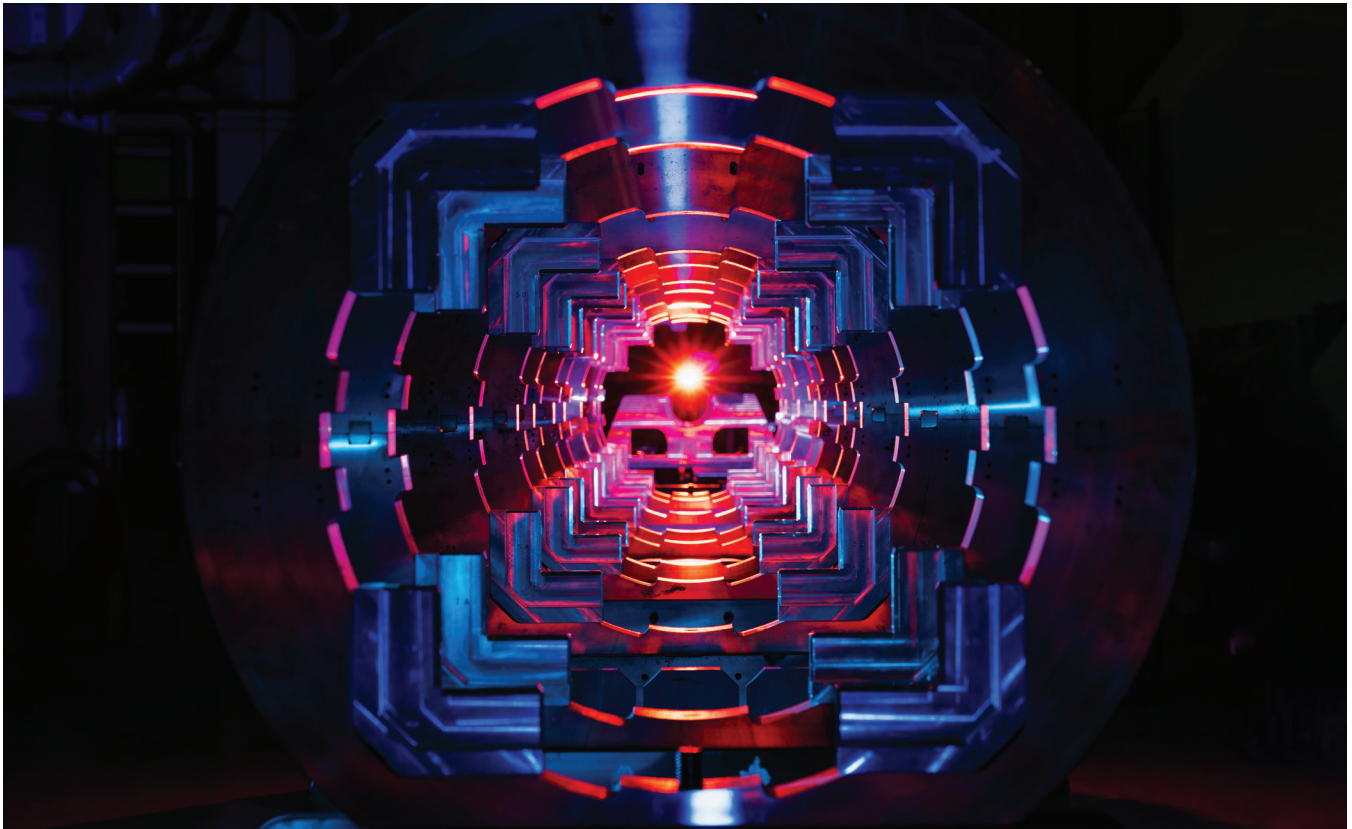
The laboratory's Budget Office provided the FY22 total operating costs committed, which was used in modeling the FY22 economic impacts generated in this assessment. The total operating expenses for FY22 were \$778,048,612. Of that, 16.4% of the total operating cost was attributed to research and national programs, and 19.6% was associated with experiment support and facilities operating expenses.

Fermilab's major capital asset projects were also a significant expense category for the fiscal year accounting for \$256.6M, or 33% of the total operating costs. Of the \$256M, \$150M was associated with the LBNF/DUNE-US in which primary FY22 operations occurred at the Sanford Underground Research Facility (SURF) in Lead,

South Dakota. In FY22, the LBNF/DUNE-US project was engaged in complex excavation activities to prepare the site for future operations. Some of the FY22 spend was also related to engineering work.

The Laboratory's operating contractor, paid approximately \$15.58M in employer taxes (FICA/Medicare/UC). Additionally, employees working at Fermilab paid approximately \$24.93M in federal and state taxes. The lab's operation contributed \$35.35M in employee healthcare expenses and \$238K in employee education assistance.

In FY22, procurement staff obligated \$285,713,772 for new subcontract awards. Of that, 32.6% was with businesses in Illinois and 3.9% in South Dakota.

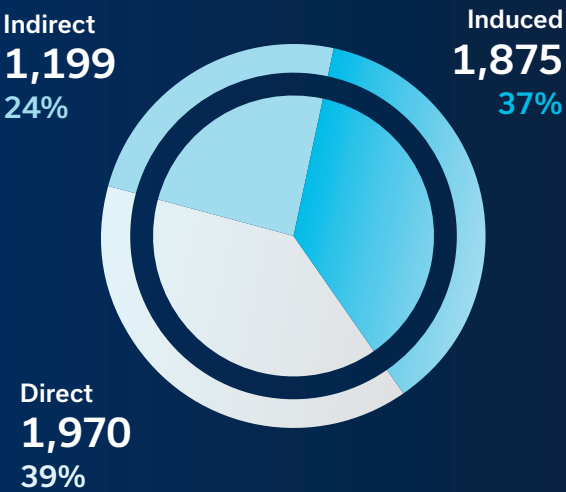


6 | IMPACT OF EMPLOYMENT

In FY22, Fermilab’s payroll (domestic and international) was \$223M. The FY22 benefits program paid an average of \$2,482 per employee in retirement costs and approximately \$12,777 per employee in healthcare costs. Employees contributed on average³ \$4,059 to their employee medical plans. The laboratory contributed on average \$362 per employee to dental coverage and employees contributed \$490. Fermilab also paid approximately \$122 per employee for vision plans.

In FY22, the laboratory employed approximately 1,985 employees (1970 in IL). An additional 1,199 jobs were created or sustained by the industries supporting operations. Employee spending in Illinois supports another 1,875 jobs within the state. In total, the economic impact in Illinois accounts for 5,044 jobs.

FIGURE 2—FOR EVERY 100 FERMILAB JOBS THAT ARE CREATED, AN ADDITIONAL 156 JOBS ARE CREATED OR SUSTAINED THROUGHOUT ILLINOIS.⁴



3. The average employee contribution was generated using the total employee headcount including both those who elected and did not elect coverage.

4. IMPLAN output modeling produces multipliers based on the extent of impact generated to describe rates of changes for several different variables including output, employment and household income. This statement is built on the Illinois multiplier of 2.56 for employment.

7 | PROCUREMENT SPENDING AND 50-STATE IMPACT

7.1 Procurement Spend Summary

In FY22, the Procurement Department issued \$285,713,772 in domestic subcontract awards with \$70,872,744 awarded to small and HUBZone businesses, accounting for approximately 25% of all domestic transactions. There were over 900 small businesses that were recipients of the \$70,872,744 obligated small business dollars. Almost 400 of the 900 small businesses were in Illinois and approximately 10 were small businesses in South Dakota. The small businesses receiving FY22 obligated funding represent nearly 270 individual NAICS codes. The highest concentration of spend appeared in the following three NAICS codes:

- 236220—Commercial and Institutional Building Construction: approximately 10%;

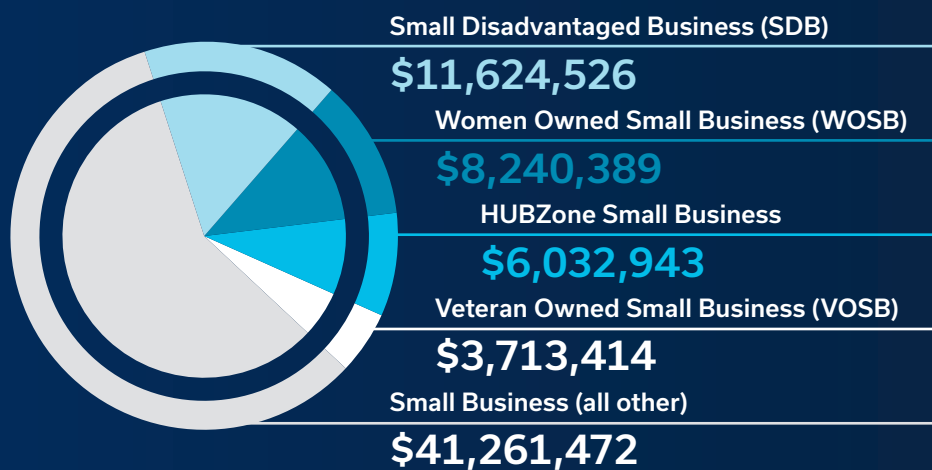
- 518210—Computing Infrastructure Providers, Data Processing, Web Hosting, and Related Services: approximately 8%;
- 334111—Electronic Computing Manufacturing: approximately 7%.

The breakdown of small business procurement is:

- 16% to small-disadvantaged businesses;
- 12% to women-owned small businesses;
- 9% to HUBZone businesses;
- 5% to veteran-owned small businesses;
- 58% to small businesses not captured in any of the categories above.

See figure below for additional details.

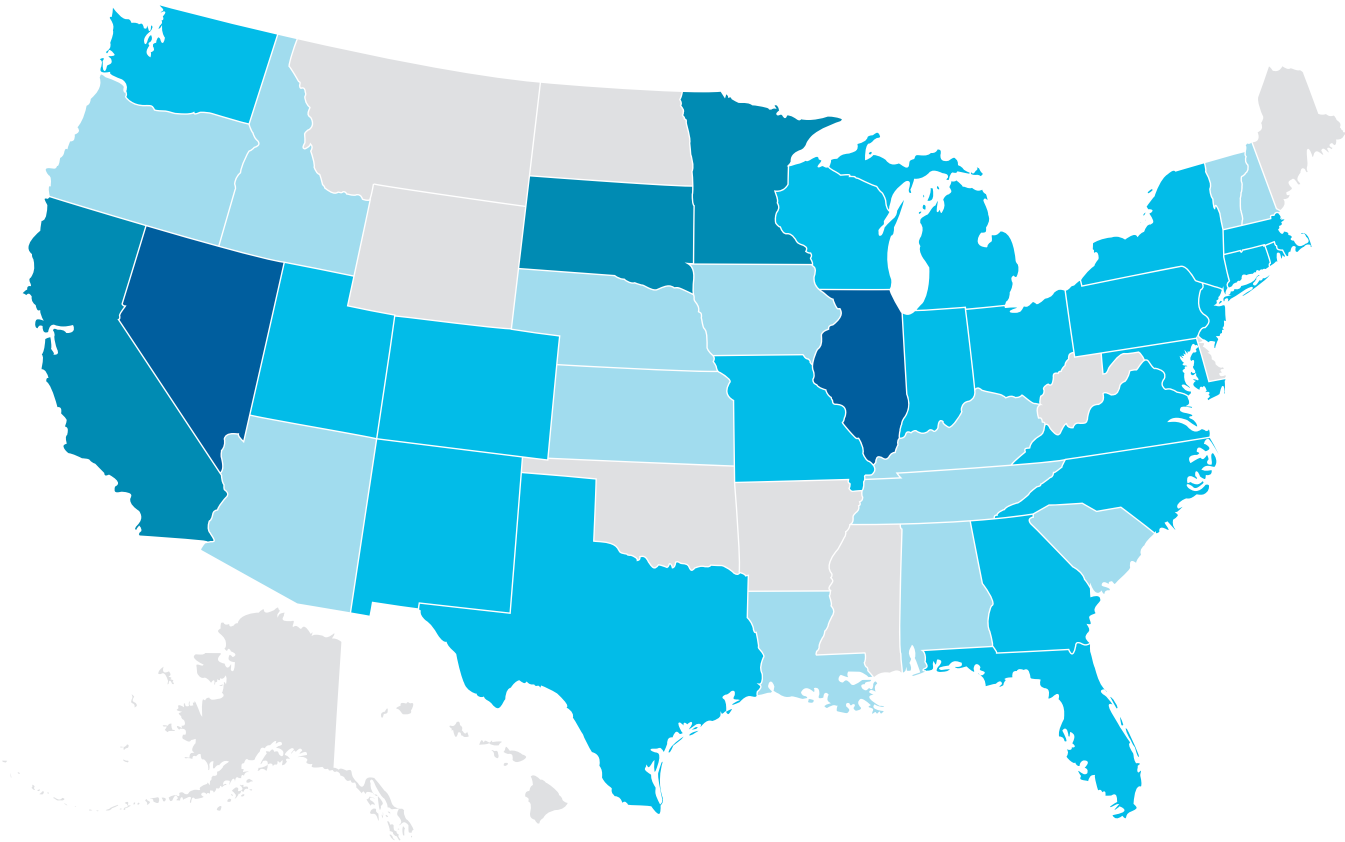
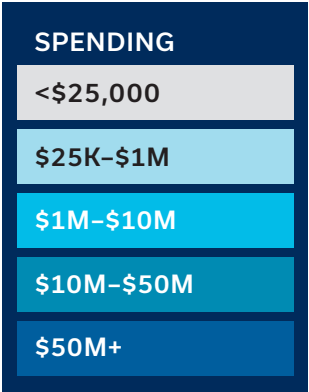
FIGURE 3—PROCUREMENT AWARDED TO SMALL BUSINESSES



7.2 Procurement Spend within 50 States

The map below provides a breakdown of new procurements in FY22 across the 50 states. A more detailed summary of economic impacts associated with individual states is outlined in a separate report titled, *"Fermilab's National Economic Impact—A State-By-State Analysis of Fermilab's Economic Impact in FY22."*

FIGURE 4



8 | MENTOR PROTÉGÉ



Photo: CERN

The DOE Mentor-Protégé program encourages DOE prime contractors to partner with small businesses. The program is designed to increase the overall number of small business prime and subcontract awards and help build long-term relationships between small businesses and DOE prime contractors [3]. Fermilab participates in this program and currently supports a local small business in Elgin, Illinois.

FIGURE 5—TOTAL SPEND

Nov 15, 2021–March 30, 2022

\$274,322

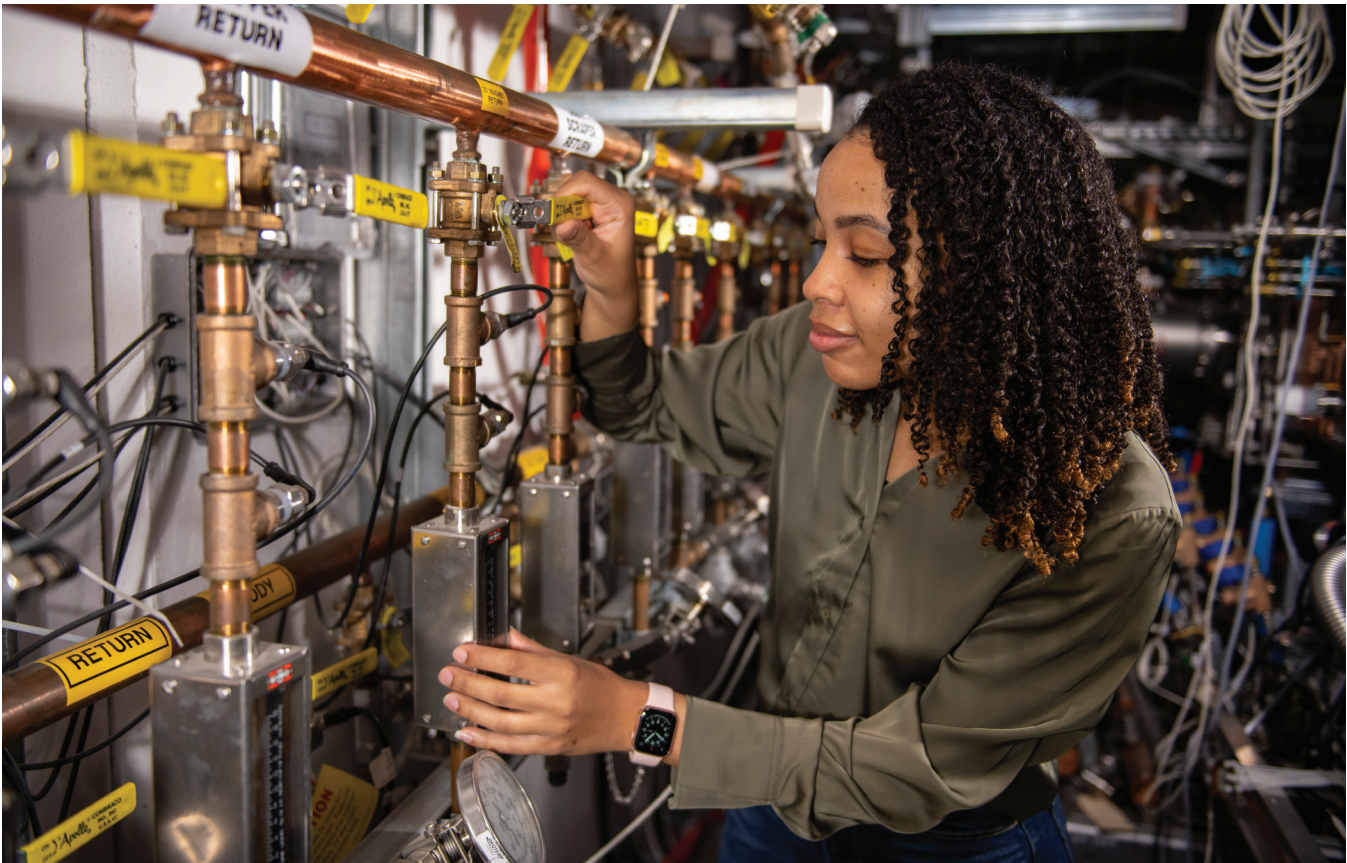
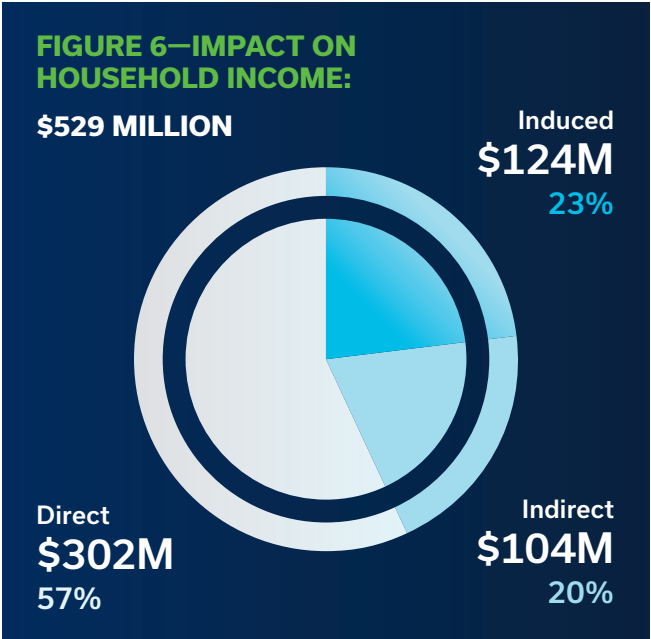
April 12, 2022–September 27, 2022

\$506,801

In November of 2021, a mentor-protégé agreement was executed with WPA Works, LLC, a small business specializing in metal fabrication. WPA Works provides Fermilab with small-scale metal fabrication for lab experiments. Over FY22, Procurement partnered with WPA Works to both improve their performance and expand their ability to execute work for Fermilab. Through hands-on mentoring, the procurement team was able to identify opportunities to improve on-time delivery and provide supply chain advisory services to the mentor protégé, which resulted in the company lowering their overall production costs. As a result of this mentoring, WPA Works was able to improve its award rate by approximately 85% for Fermilab procurements and improve its ability to meet deadlines.

9 | IMPACT ON HOUSEHOLD INCOME

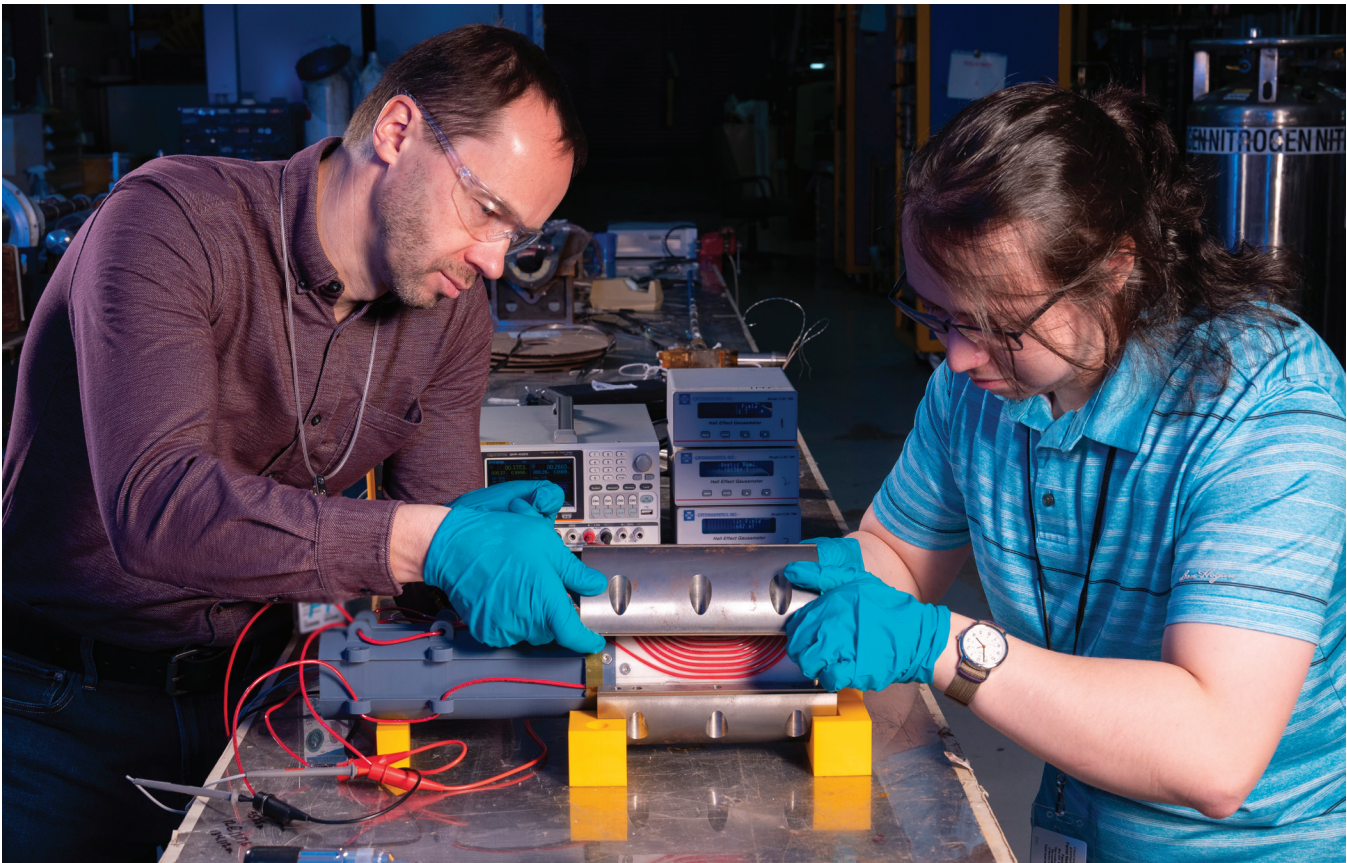
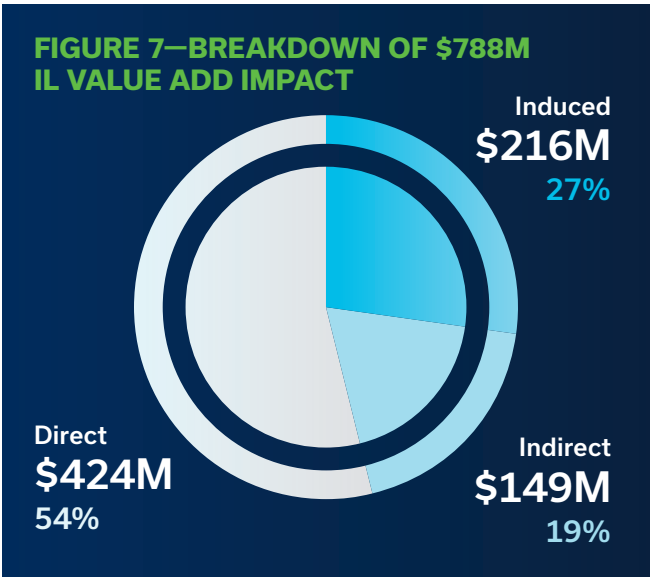
Providing appropriate compensation for a workforce of nearly 2,000 employees creates a substantial impact on the economy. In measuring the elements of economic impact, Fermilab directly contributed over \$302M related to employment costs (payroll, benefits, taxes, etc.). That investment in employees generated ripple effects amplifying the economic impact for subcontractors and suppliers (indirect) as well as for the investment employees made in the local economies as consumers (induced). These effects generated an additional \$227.4M of economic activity with a net result of creating \$529.4M in economic impact from labor/household income.



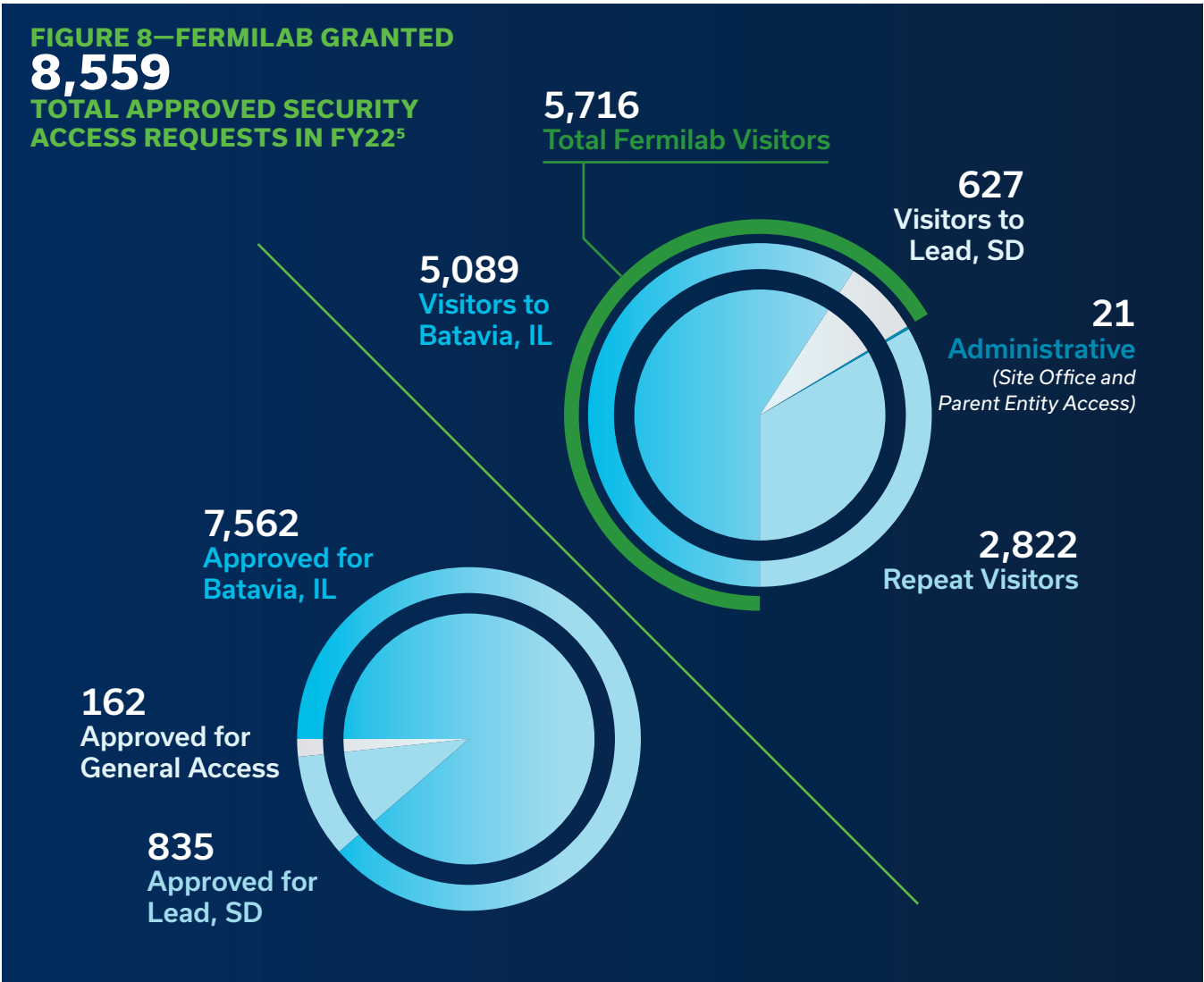
10 | IMPACT OF VALUE ADDED

In the context of economic impact, the concept of “value added” is the combination of innovation and improvement made as basic materials, goods and services are processed and transformed into final products used in business transactions. This is also commonly referred to as gross state product (GSP) in this assessment.

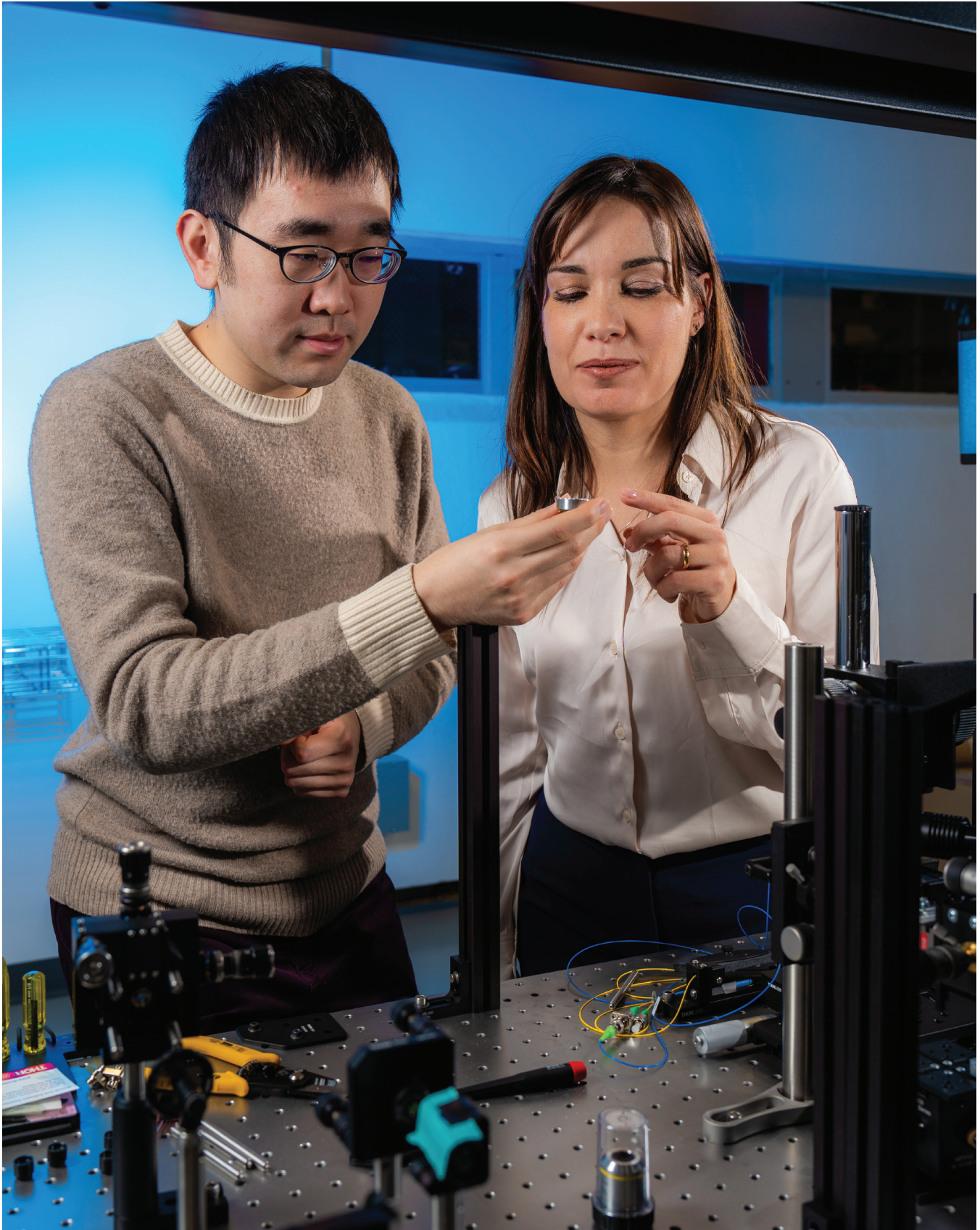
The value-added impact generated in two states was \$973M (\$788M in Illinois and \$185M in South Dakota). A breakdown of the value added impact is provided in Figure 7.



11 | IMPACT FROM VISITORS



5. The total for access requests includes business visitors, users, affiliates, students and contractors. It also included duplicate visits from the same individual. Visitor data was collected through Fermilab's onsite access system that tracks all individuals who pass through security and receive a badge.



11.1 Understanding Fermilab Visitors

Below is a breakdown of key metrics associated with the 5,716 individual visitors to Fermilab and SURF in FY22.

FIGURE 9—KEY VISITOR GROUPS



FERMILAB—BATAVIA 5,089 Visitors

- Visitors stayed an average of 5 nights and 6 days⁶
- Average of 170 visitors per week

11.2 Spending Trends for Visitors

Visitors to the lab have an indirect economic impact on the local economies, largely through travel, hotel and lodging costs, and dining expenditures. A survey was conducted to better understand the impact created through the number of visitors in FY22. The following is a breakdown of the economic impact generated by visitors who traveled to Fermilab in Illinois based on the survey results from nearly 90 survey respondents.⁷

FIGURE 10—AVERAGE DAILY SPEND
(Per Organization Type)

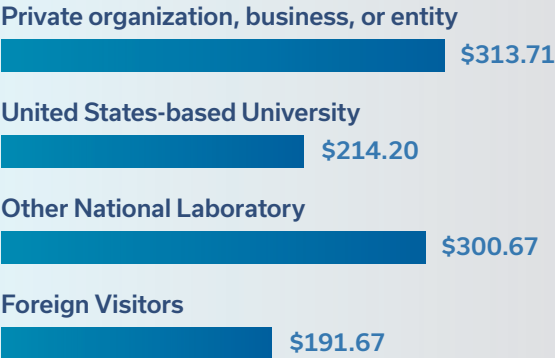


FIGURE 11—AVERAGE DAILY SPENDING
IN EXPENSE CATEGORIES
(Weighted)



Total Average Daily Spending: \$223.54

6. The average stay was calculated based on responses received on the ten-question survey.

7. Fermilab considered calculating rates using GSA per diem and other flat rates, however, it was determined that the responses to the survey would provide more accurate information on actual spending habits as some visitors may not be subject to GSA per diem rates. Additionally, the sample size was considered acceptable given the type of survey and data being used to shape spending habits in specific travel categories.

11.3 Illinois Visitor Economic Impact

The total economic impact of Illinois visitors created and/or sustained nearly 120 jobs, generating \$5.9M in labor/household income. Visitors spend contributed nearly

\$10.6M to the gross state product through value-added impacts and in total generated nearly \$17M in total economic output. A detailed breakdown is provided below.

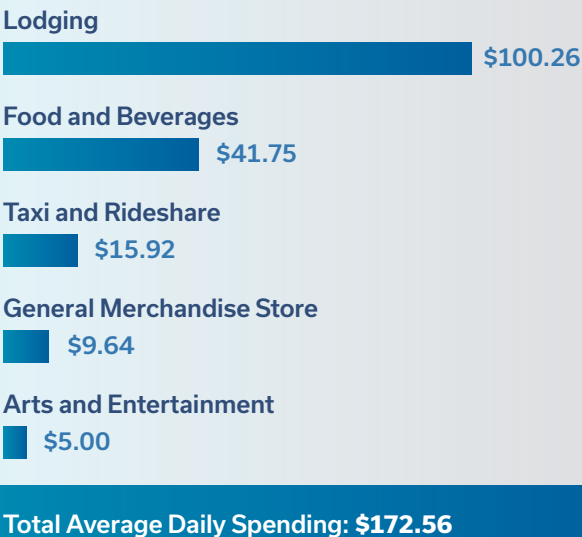
TABLE 3—ILLINOIS VISITOR IMPACTS

IMPACT TYPE	EMPLOYMENT	HOUSEHOLD INCOME	VALUE ADDED	OUTPUT
Direct	82	\$3,194,600	\$6,182,973	\$9,395,638
Indirect	16	\$1,311,346	\$2,028,199	\$3,641,774
Induced	21	\$1,378,749	\$2,401,647	\$3,958,606
Total Impact	119	\$5,884,695	\$10,612,820	\$16,996,017

11.4 South Dakota Visitor Economic Impact

South Dakota operations attracted 607 out-of-state visitors in FY22. Based on survey responses received, the average daily spend in South Dakota was 23% lower than what was observed in Illinois. Based on available data, the average daily spend per category is approximated in the accompanying chart.

FIGURE 12—AVERAGE DAILY SPENDING IN EXPENSE CATEGORIES
(Weighted)



12 | OUTPUT IMPACT

12.1 Illinois Impact

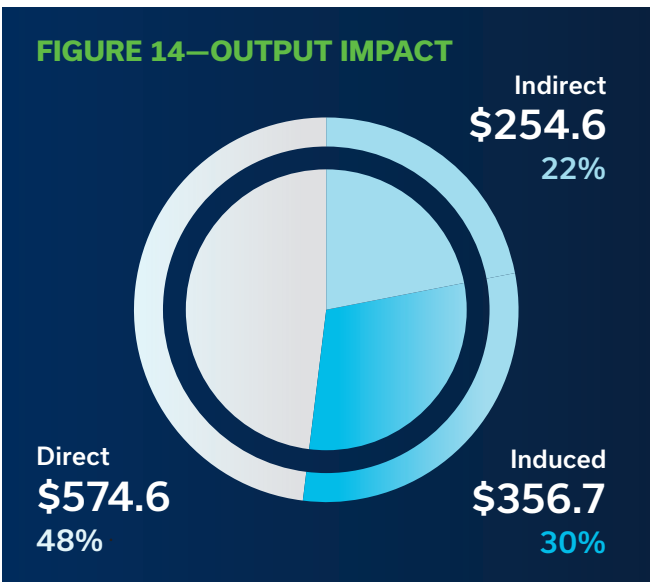
The direct effect of laboratory operations to the economy (indirect and induced) combined with direct economic activity created a total gross economic output for Illinois of approximately \$1.3B. This includes (indirect) business to business spending of \$254.6M and \$356.7M (induced) spending by laboratory employees mainly located within the state as well as \$95.8M in economic output from Illinois construction activity.

Illinois employment for FY22 was 1,985 jobs. An additional 1,200 jobs were created or sustained by industries/subcontractors who supported activities for operating the lab. Employee spending created and/or sustained an additional 1,875 jobs in the state. In FY22, Illinois saw 5,044 jobs created or sustained based on the economic activity generated by the lab.

FIGURE 13—ILLINOIS JOBS IMPACT (FY22)



8. This calculation is based on the output multiplier from the IMPLAN model that presents the additive impact that would occur to changes in input.



12.2 South Dakota Impact

South Dakota economic impacts are due solely to the LBNF/DUNE program, which includes the LBNF/DUNE-US project and other nations' projects that contribute to LBNF or DUNE. In FY22, the LBNF portion of the project was in the process of excavating the two DUNE detector caverns and the central utility cavern. The caverns to house the detector modules will each be three stories high and 145 m long, and a central cavern 190 m long that will house utilities. The total volume to be excavated is around 250,000 cubic meters, roughly the equivalent of 100 Olympic-size swimming pools. The excavation work is scheduled to finish in FY24, at which point the Building and Site Infrastructure (BSI) phase of work will begin. After the completion of the BSI in FY25, detector installation will begin. Science operations will start in 2028 with the first far detector module, and a year later with the second.

In FY22, Fermilab's LBNF/DUNE-US project spent \$150M in South Dakota which included \$129M associated with excavation and \$21M associated with detector engineering and design work.

The economic activity in FY22 was responsible for creating or sustaining 1,584 total jobs, of which 956 are directly connected with the project operations; 283 were indirect jobs created or sustained through subcontractor spend; and 345 jobs were induced based on employee spend.

The project is expected to increase employment in future years. There were 15 direct employees on this project in FY22. The majority of FY22 direct economic activity is associated with subcontractor operations.

The LBNF/DUNE program generated nearly \$275M in economic output during FY22 (\$267M excavation and engineering and \$8M from on site operations). This includes \$99M of economic impact generated in household income and \$125M in value-add to the state's economy. Fermilab spent over \$11M with South Dakota-based businesses and \$59M of indirect economic activity was generated from employee and subcontractor housing.

FIGURE 15—SOUTH DAKOTA JOBS (FY22)

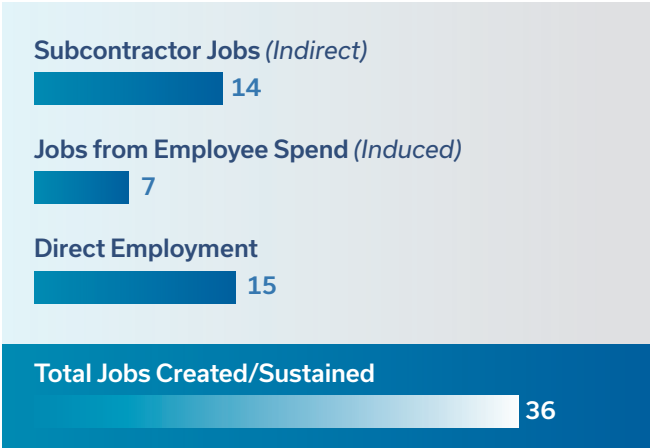
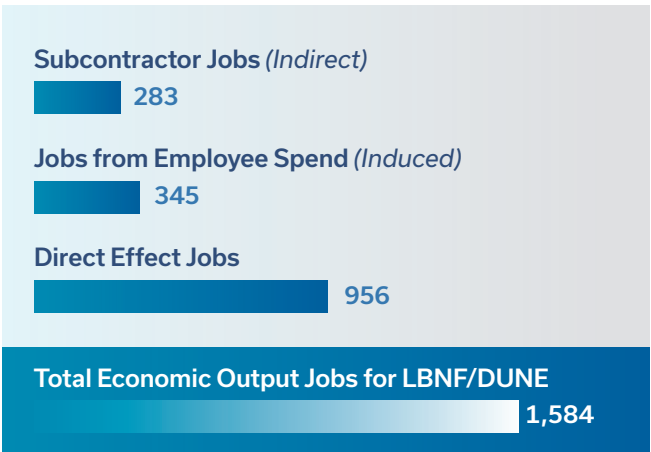


FIGURE 16—LBNF/DUNE DUNE-US PROJECT GENERATED JOBS (FY22)



13 | CONSTRUCTION IMPACT

13.1 Illinois Construction Impact

In FY22, general construction expenses for facility improvements at the Illinois site totaled \$49.2M and accounted for 361 jobs. An additional 217 indirect and induced jobs were generated or sustained for a total of 578 jobs. Total economic output from Illinois construction

activities is estimated at \$96M, with \$42M in increased household/labor income and \$55M in contributions to gross state product. Table 4 below is a breakdown of the relevant economic impact data associated with Illinois construction impacts for FY22.

TABLE 4—ILLINOIS CONSTRUCTION IMPACTS

Dollar Values in Millions

IMPACT TYPE	EMPLOYMENT ^A	HOUSEHOLD INCOME ^B	VALUE ADDED ^C	OUTPUT ^D
Direct Effect	361	\$25.8	\$27.5	\$49.2
Indirect Effect	69	\$6.1	\$10.0	\$18.5
Induced Effect	148	\$9.8	\$17.0	\$28.1
Total Impact	578	\$41.7	\$54.5	\$95.8
Multiplier ^E	1.6	1.62	1.98	1.95

^A **EMPLOYMENT** — The number of jobs created or sustained.

^B **HOUSEHOLD INCOME** — The amount of income including employee compensation (wages and benefits) and proprietor income.

^C **VALUE ADDED** — The value of a combination of innovation and improvements made as basic resources and intermediate goods are processed into final goods.

^D **OUTPUT** — The value of industry output or contributions to state gross domestic output.

^E **MULTIPLIER** — The rate of change in output per unit of input.

13.2 South Dakota Construction Impact

Laboratory operations in South Dakota are primarily responsible for oversight and support of construction efforts. The economic impact of the 15 staff positions and associated work is responsible for creating or sustaining 21 additional jobs through subcontractor and employee spend, totaling 36 jobs created or sustained within the economy. Operations in South Dakota also contributed \$4.1M to the state's household income. The total economic output from South Dakota employment is nearly \$8M. Table 5 below provides the detailed impacts associated with FY22 operations.

TABLE 5—SOUTH DAKOTA OPERATIONS IMPACTS

Dollar Values in Millions

IMPACT TYPE	EMPLOYMENT ^A	HOUSEHOLD INCOME ^B	VALUE ADDED ^C	OUTPUT ^D
Direct Effect	15	\$3.0	\$3.2	\$4.2
Indirect Effect	7	\$0.4	\$0.7	\$1.3
Induced Effect	14	\$0.8	\$1.3	\$2.4
Total Impact	36	\$4.1	\$5.3	\$7.9
Multiplier	2.40	1.39	1.62	1.88

Direct construction spending totaled \$150M, which is estimated to create or sustain 956 jobs, as well as 283 jobs among construction suppliers, and 345 jobs due to employee spending. These 1,584 jobs resulted in over \$99M in new household income and contributed \$125M to the gross state product. Table 6 below provides the detailed impacts associated with the FY22 South Dakota construction activity.

TABLE 6—SOUTH DAKOTA CONSTRUCTION IMPACTS

Dollar Values in Millions

IMPACT TYPE	EMPLOYMENT ^A	HOUSEHOLD INCOME ^B	VALUE ADDED ^C	OUTPUT ^D
Direct Effect	956	\$61.7	\$63.1	\$150.0
Indirect Effect	283	\$18.8	\$29.9	\$59.2
Induced Effect	345	\$18.5	\$31.8	\$57.4
Total Impact	1,584	\$98.5	\$124.8	\$266.6
Multiplier	1.66	1.60	1.98	1.78

14 | PROJECTED FUTURE IMPACT OF FERMILAB FLAGSHIP PROJECTS

LBNF-DUNE/US and the Proton Improvement Plan (PIP-II) are flagship projects that will further advance the future of high-energy physics and accelerator science for decades to come. Although significant progress has been made on these projects, both LBNF/DUNE-US and PIP-II are still many years away from their expected completion dates. Based on the FY22 total economic output for these projects and current project funding profiles, Fermilab estimates that they will be significant economic drivers for the remaining fiscal years of each project.

14.1 LBNF/DUNE-US

The LBNF construction (the facilities portion of the LBNF/DUNE-US project) to be done in preparation for the DUNE experiment will contribute to economic activity through 2029 (FY30), with its impact expanding as the project matures into the later phases of build-out. From FY22 to FY30, the average estimated economic output for LBNF/DUNE-US is \$478M per year. See chart for details. LBNF/DUNE-US is also estimated to generate an average of \$217.3M in gross state product for South Dakota from FY22–FY30. Estimates indicate that the project will sustain approximately 2,750 jobs each year from FY22–FY30. This is a 74% increase from FY22 operations.

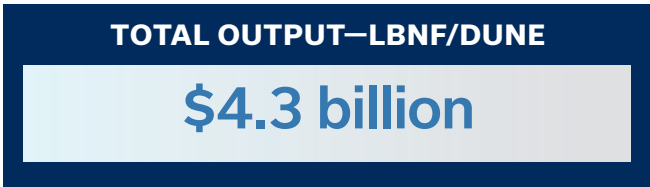
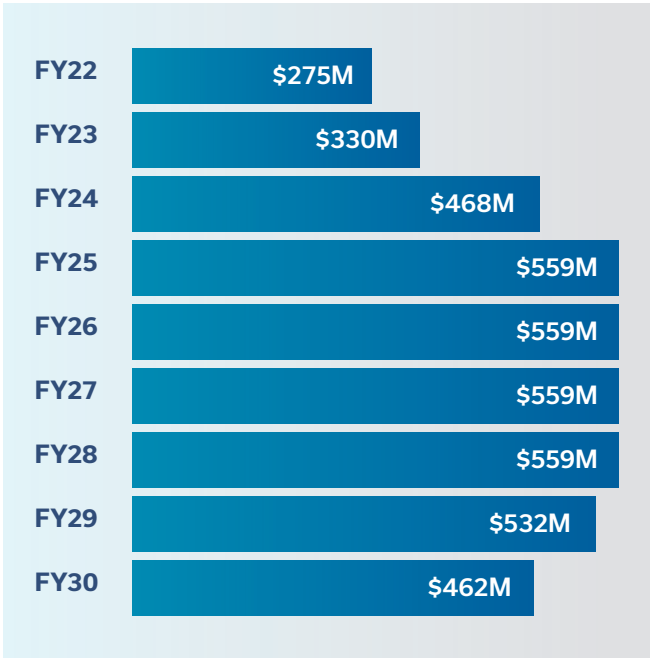


FIGURE 17—ESTIMATED TOTAL OUTPUT OF LBNF/DUNE (in Millions)



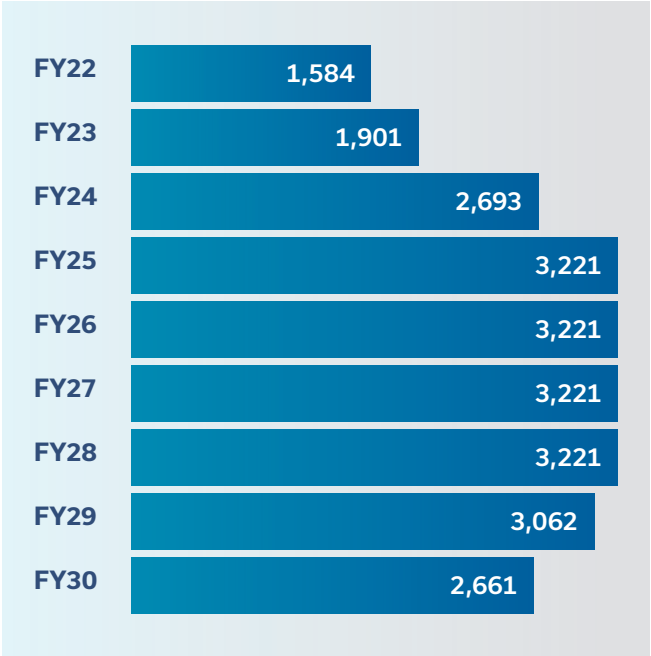
According to the SURF Economic and Fiscal Impact of the Sanford Underground Research Facility from 2021, “The SDSTA (South Dakota Science and Technology Authority⁹) and Fermilab efforts on purchasing from South Dakota businesses, as well as the spending of SURF visitors, will increase sales by western South Dakota businesses by \$891M between Fiscal Years 2020 and 2029.” The study also projects that spending by both laboratories during that period is anticipated to generate \$7M in state excise tax revenue and 4.7% in direct sales tax revenue [4].

9. The South Dakota Science and Technology Authority (SDSTA) is the entity that manages and operates the SURF facility in Lead, South Dakota.



As the project advances, the number of jobs created or sustained is expected to increase 200% from FY22 to FY25. The number of jobs created or sustained is expected to be maintained through FY28. As the development of the experiment nears completion, job numbers are expected to decrease gradually through FY30.

FIGURE 18—TOTAL PROJECTED JOBS GENERATED BY LBNF/DUNE



14.2 PIP-II

The PIP-II accelerator will be the heart of the Fermilab Accelerator Complex in Batavia, Illinois. An essential enhancement to Fermilab’s accelerator operations, it will provide the initial stream of protons to the LBNF beamline that in turn will generate the high-intensity beam of neutrinos for the DUNE experiment. The PIP-II project is scheduled to be completed in FY28 and is expected to generate an average economic output of \$180.2M per year from FY22 to FY28. In aggregate, Fermilab estimates that the total economic output from FY22 to the completion of the project will generate \$1.26B in economic output in Illinois. During this period, Fermilab estimates that the average contributions to the Illinois gross state product will be \$70.7M, and the number of jobs being created or sustained is estimated at 466 per year.

FIGURE 19—TOTAL ESTIMATED ECONOMIC OUTPUT GENERATED BY PIP-II *(in millions)*

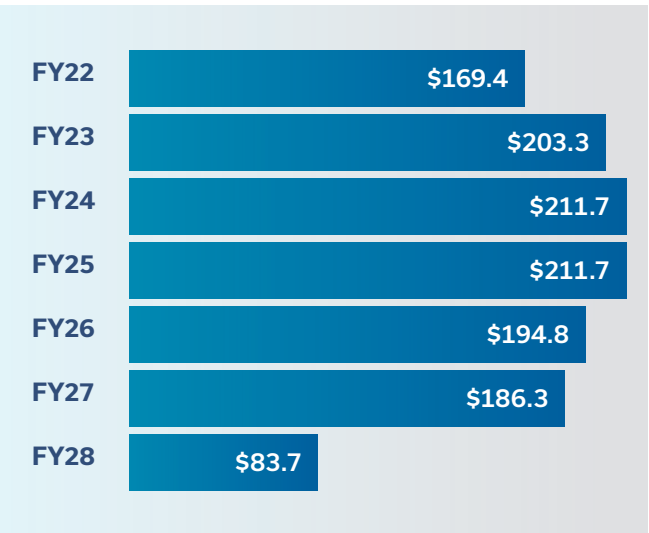
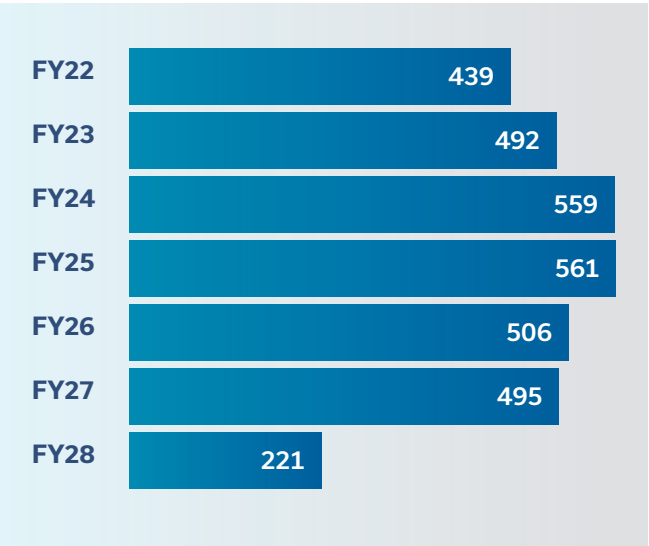


FIGURE 20—TOTAL PROJECTED JOBS GENERATED BY PIP-II



15 | VALUE GENERATED THROUGH INTERNATIONAL PARTNERSHIPS

Fermilab and the projects managed by the laboratory have benefited from the support of international partners. Through international partnerships, Fermilab can access world-leading experts, funding, and the most sophisticated technology to support the DOE projects that it manages.

Fermilab facilitates and supports, in coordination with DOE, a portfolio of over \$1.15B of in-kind contributions generated through international partnerships. This portfolio encompasses scientific equipment and technical expertise sourced through the international scientific community. International partnership agreements are generated with the approval and support of the DOE.

Although the value is stated in the international partnership agreement, in-kind contributions add multi-dimensional value to the lab and the local economy, which is difficult to fully quantify.

- The partnerships drive additional procurement activities for domestic transport from the port of entry to Fermilab or SURF as well as contracted work to support warehousing and installation of components received from international partners.
- The in-kind contributions created through international partnerships foster STEM education across the world which helps to build the scientific workforce of the future.
- International partnerships help fuel worldwide interest in internships and postdoctoral positions at Fermilab.

President Biden and Prime Minister Modi hailed our deepening bilateral cooperation on cutting-edge scientific infrastructure, including a \$140 million in-kind contribution from the Indian Department of Atomic Energy to the U.S. Department of Energy’s Fermi National Laboratory toward collaborative development of the Proton Improvement Plan-II Accelerator, for the Long Baseline Neutrino Facility — the first and largest international research facility on U.S. soil.

SOURCE: White House briefing—Whitehouse.gov. [5]

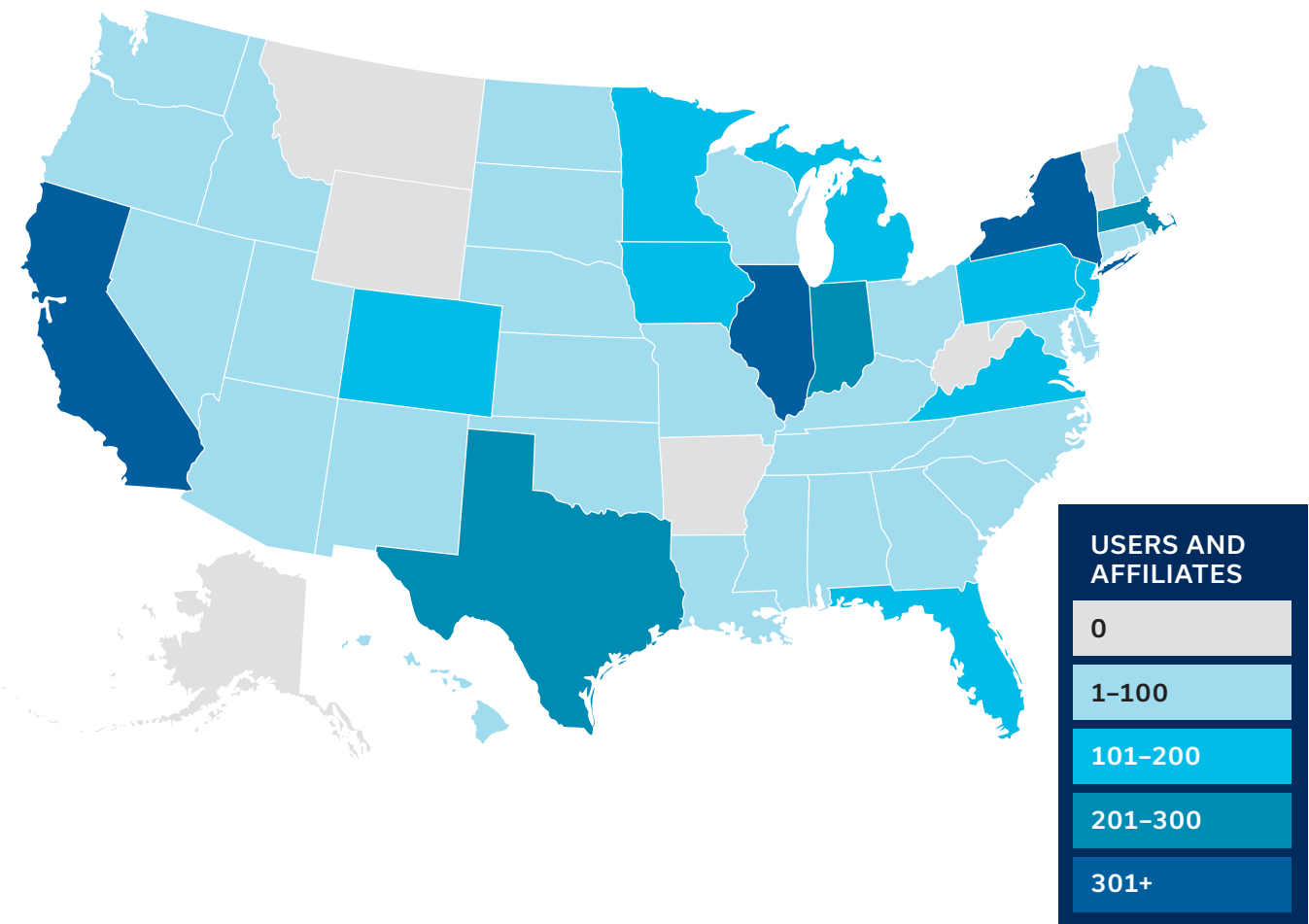
TABLE 7—DOE IN-KIND PORTFOLIO FOR FERMILAB MANAGED PROJECTS	
LBNF	\$262.57M
PIP-II	\$310.00M
DUNE	\$310.00M
ProtoDUNE	\$83.75M
SBN	\$22.01M
Private Investment	\$70.00M
SD State	\$93.00M
TOTAL	\$1.15B

- These partnerships generate support and tap into the best talent and expert craftsmanship from around the world. This brings immediate value to the U.S. government by benefiting from skills and knowledge that can’t be replicated within the domestic market.

16 | USERS AND AFFILIATES MAP

Fermilab’s users and affiliates are the cornerstone of Fermilab operations. They collaborate with laboratory researchers on a multitude of high-energy physics projects and experiments. Their contribution to the laboratory’s groundbreaking results is invaluable. The map below identifies the location and number of domestic users and affiliates that supported the lab’s operations in FY22.

FIGURE 21



USERS — Visiting scientists associated with the Fermilab Accelerator Complex.
AFFILIATES — Visiting scientists associated with other DOE-authorized experiments and collaborations.

17 | GOING BEYOND THE DOLLARS

Fermilab provides a unique capability to the U.S. economy as an engine for furthering national competitiveness that goes beyond quantifiable economic output. This section will explore the intangible impacts generated through lab operations.

17.1 Physics as a Driver of Economics

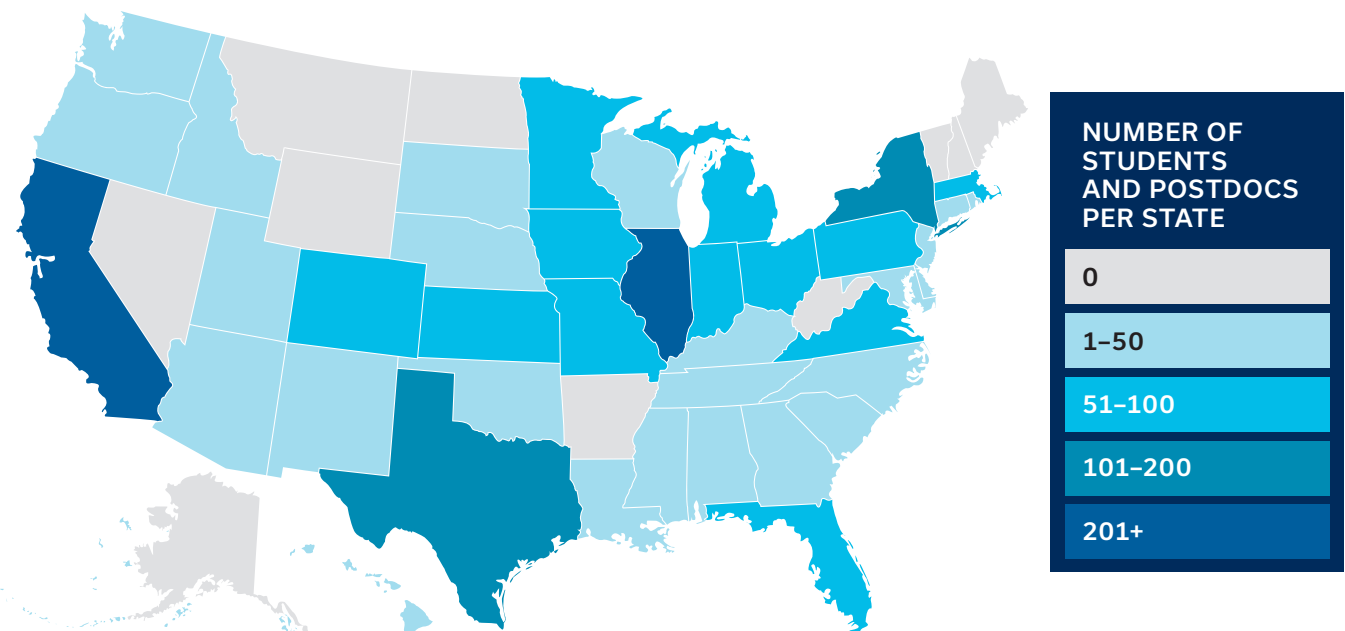
The U.S. economy, as well as other economically advanced countries, is largely based on scientific discovery and innovation. Because physics has such a wide and significant potential for creating economic impact, it is a major contributor to both the U.S. and the world's economies. Below are some examples of the significant role physics plays in world economies.

- Physics raises awareness with international students, fueling interest to participate in internships and apply for postdoctoral positions at Fermilab.

- Physics represents 10% of the United Kingdom's GDP [6].
- According to the Institute of Physics website, physics represents \$2.3 trillion to the U.S. GDP, or the equivalent of 12.6% of the total U.S. GDP.
- In 2016, more than 11.5 million people in the U.S. worked in physics-based industries.
- From 2003-2016, 70,000 newly degreed physicists joined U.S. private industry; 58% of them graduated from U.S. colleges or universities [7]

Fermilab is a workforce engine for physicists in the U.S. The laboratory helps early-stage scientists increase their knowledge and skills. As students, Fermilab supports their growth and provides access to cutting-edge experiments and unparalleled scientific leaders. In FY22, Fermilab supported more than 2,500 students and postdoctoral candidates. A breakdown of the students and postdoctoral candidates by state is shown below.

FIGURE 22



17.2 Impact of Fermilab Internships

Future scientific leaders have chosen Fermilab as a part of their educational experience to propel them into their future careers. The lab has 28 different graduate, postgraduate, and professional internship programs.

Internships at Fermilab provide valuable opportunities for aspiring scientists and researchers to gain hands-on experience in cutting-edge scientific projects. By working alongside leading experts in their respective fields, interns are exposed to the intricacies of particle physics, accelerator technologies, and advanced scientific methodologies. This exposure nurtures their scientific exploration, which can have long-lasting effects on their careers.

Fermilab's internships serve as a bridge between academic learning and real-world applications. By working with the laboratory's state-of-the-art facilities, interns can apply theoretical knowledge gained in the classrooms to practical research projects. This connection between academia and industry not only enhances interns' educational experience but also facilitates knowledge transfer and collaboration between Fermilab and academic institutions, contributing to the advancement of scientific knowledge.

Internships at the lab often involve active participation in ongoing research projects and collaborations. Interns work closely with scientists and researchers, contributing to the scientific community's collective knowledge and pushing the boundaries of discovery. Through their contributions, interns bring fresh perspectives, innovative ideas, and novel approaches to problem-solving, enriching the research environment at Fermilab and fostering a culture of collaboration and innovation.

Fermilab is committed to promoting diversity and inclusion in scientific research. Internships provide an avenue for attracting a diverse pool of talented individuals, ensuring a broad range of perspectives and experiences. By welcoming interns from different backgrounds, cultures, and disciplines, the laboratory has benefited from increased creativity, varied insights, and cross-disciplinary collaborations. This diversity not only enriches the scientific community at Fermilab but also contributes to a more inclusive and equitable scientific landscape.

17.3 Measuring Career Impact

Fermilab has begun collecting metrics on the interns we welcome each year. Using this data, we can build an understanding of the impact that is generated for the interns and learn how our internship programs support the field of high-energy physics in the U.S.

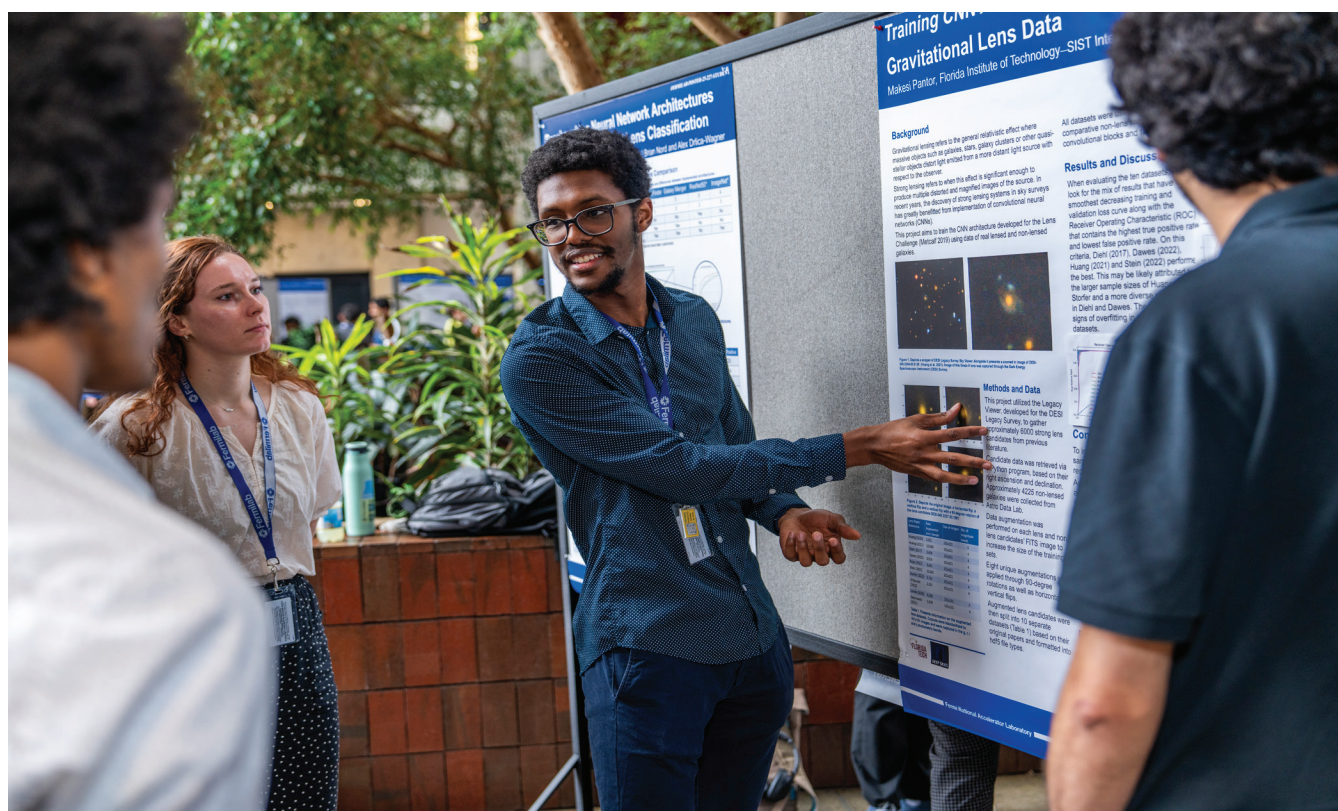
Fermilab has been providing a directory for former interns to voluntarily join, known as the Fermilab Alumni Network (FAN). The directory summarized their internship experiences and area of work as well as providing links for social media profiles. LinkedIn profiles for former interns were reviewed to understand the impact that the lab may have had on their career progression. Table 8 on page 34 breaks down the observed results across two time periods.

TABLE 8—ANALYSIS OF INTERSHIP IMPACT

TIME PERIOD	SAMPLE SIZE	EMPLOYED IN A SCIENCE FIELD	CONTINUING EDUCATION	EMPLOYED IN A NON-STEM FIELD	SELF-EMPLOYED
FY22	57	47%	46%	5%	2%
FY19–22	242	53%	36%	10%	1%

The results of this analysis show that approximately half of the former interns whose social media profiles were reviewed had obtained employment in a science field the year following their internship. Most of the remaining population focused on continuing education. Only 7% of the FY22 interns reviewed sought employment in a non-STEM field.

The larger sample (going back to FY19) demonstrated similar results with a 6% increase in employment in a science field and a 10% decline in those pursuing continuing education.



18 | TECHNOLOGY TRANSFER AND PARTNERSHIPS

Developing partnerships and empowering U.S. innovation through technology transfer is a critical objective of all DOE national laboratories. Each lab builds a portfolio of partnership agreements and technology transfer strategies for their assigned missions.

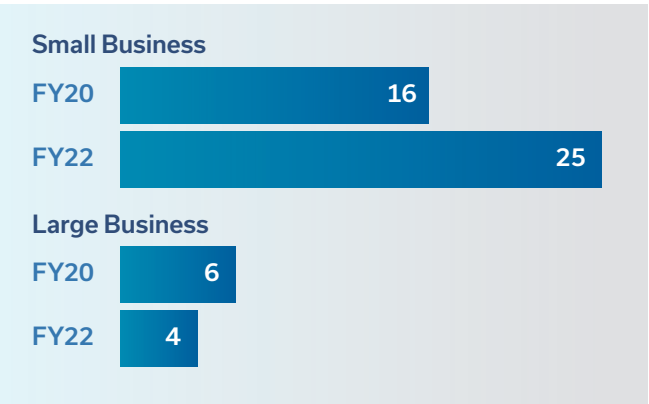
In the pursuit of its basic science mission, Fermilab drives the development of new technologies, often far in advance of the needs of the private sector. While the breakthroughs are significant, the commercial applications are often not immediately obvious. Companies that base their business models on high-tech innovation or significant scientific advances are referred to as “deep tech.” For many of these technologies, it can take several years to transition them from basic science to commercial applications. It also takes substantial capital – and very patient capital—to develop and demonstrate these technologies for other uses. Historically, this has limited the number of industry engagements at Fermilab, such as licensing agreements, Cooperative Research and Development Agreements (CRADAs), and Strategic Partnership Projects (SPPs), that lead to new industries, new companies, and new jobs.

Fermilab is now at a turning point in laboratory operations as we expand into new areas of scientific discovery such as quantum information science and technology, microelectronics, artificial intelligence, and machine learning. These expanded areas of research will open new opportunities to engage in partnerships with the private sector that will more immediately impact U.S. economic growth and security.

18.1 Industry Engagement

Over the last several years, Fermilab has worked to expand the portfolio of industry partners and has increased the total active partnership portfolio by more than 30%. The total active partnership agreements with small businesses has increased by more than 56%. See chart below for details.

FIGURE 23—SPP AND CRADA GROWTH

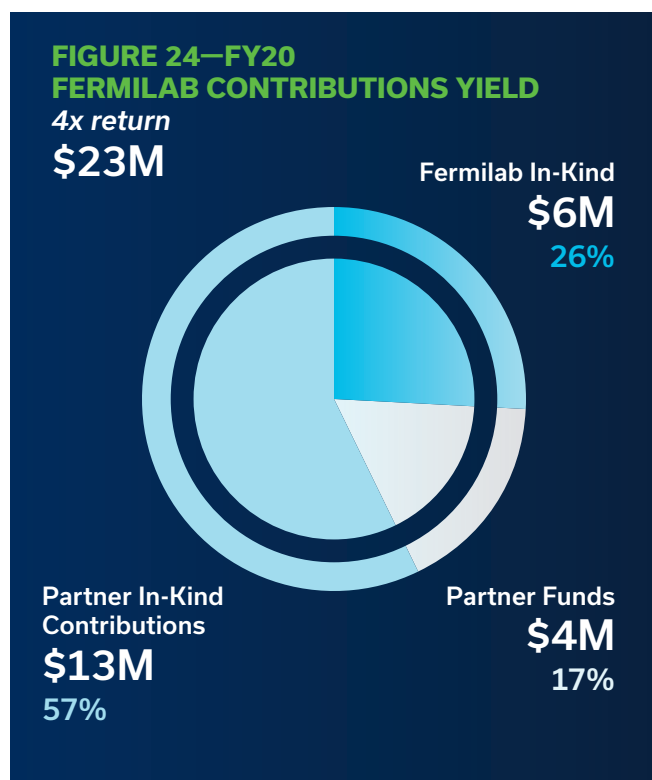


The laboratory has developed strategic partnerships with industry-leading companies to help our scientific operation advance into emerging areas of scientific research. Some examples include:

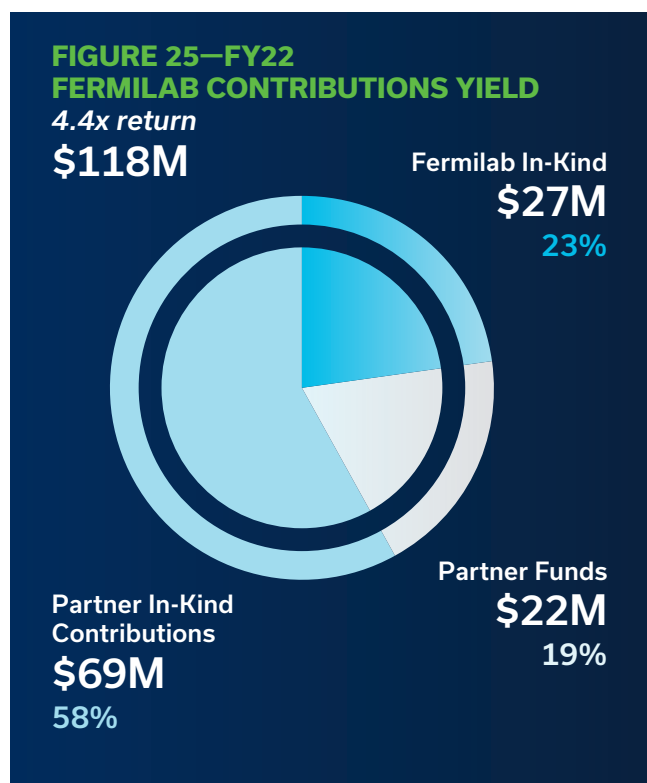
- **Partnership developed through a collaborative cost-share subcontract with a quantum computing industry-leading small business.** Through this agreement, Fermilab’s Superconducting Quantum Materials and Systems (SQMS) Center, and the small business partner will conduct research that should translate to a scalable superconducting quantum computer and provide private sector capabilities for driving innovation.

- **Partnership with a major U.S. developer of graphic processors and computing solutions.** This partnership is supporting DUNE and ProtoDUNE by helping Fermilab optimize data processing for the future experiment. [8]

Return on investment is a helpful concept in understanding the positive impact generated by these strategic agreements. The accompanying charts demonstrate ROI generated.

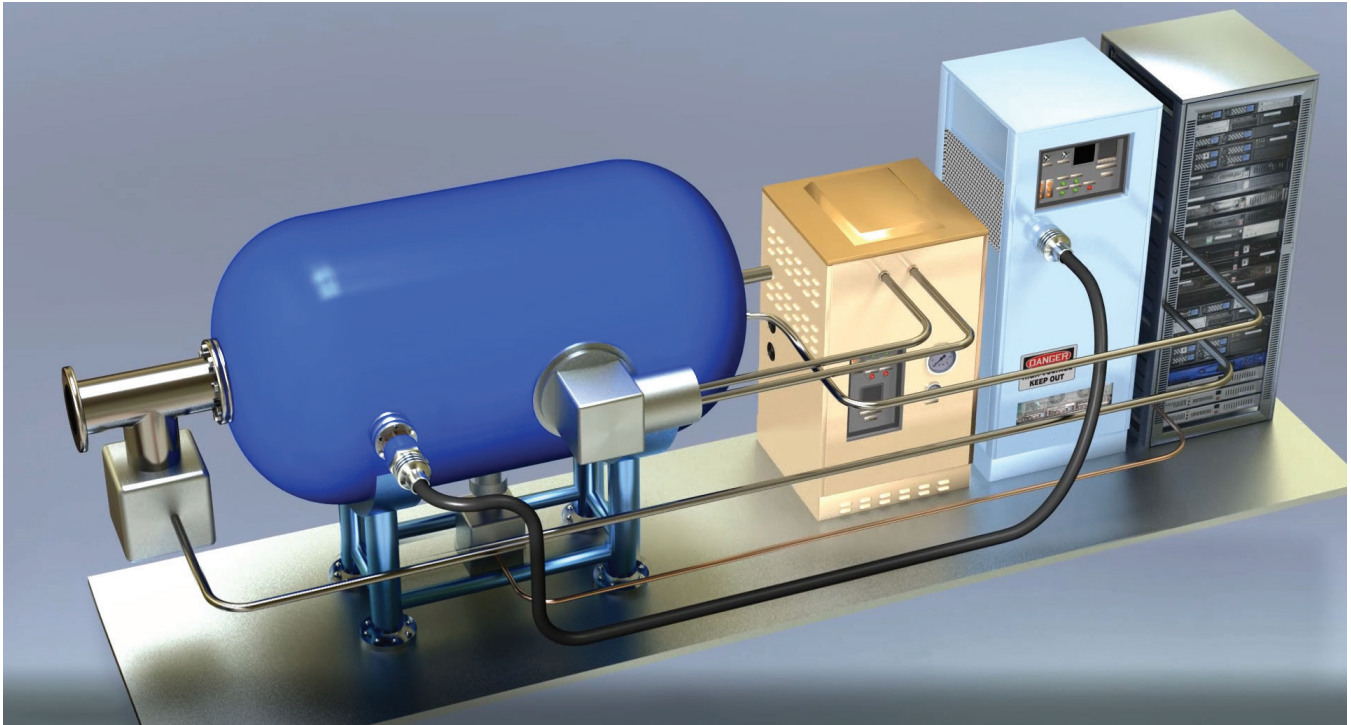


Although the time required to transition research and technology to industry can be extensive, the outcome of commercialization efforts can have a profound impact on society.



EXAMPLE OF SUCCESS

Fermilab's Tevatron, developed in the 1970s, found a commercial application in the 1980s to deliver the first MRI machine.

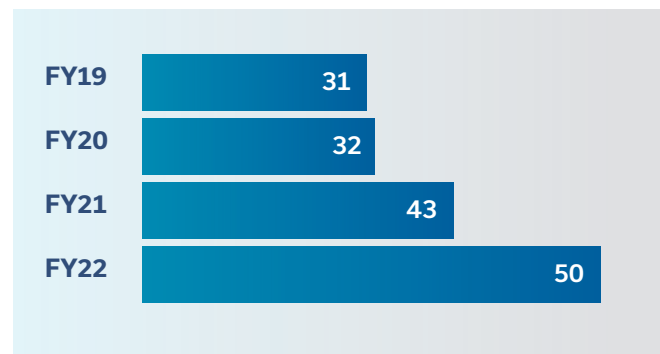


EXAMPLE OF PROJECTS IN PROGRESS

Fermilab Illinois Accelerator Research Center (IARC) will soon support smaller laboratories and scientific operations that seek to generate small-scale accelerator beam operations. The IARC team has been working to create a compact accelerator solution to be marketed for E-BEAM operations. Currently called the Compact Superconducting Radio Frequency Accelerator, the small-scale linear accelerator requires a klystron, cooling system, cryocooler(s), and power supply. It produces a beam designed for high-power/high-throughput industrial applications of e-beam/x-ray irradiation. [9]

The laboratory also has increased its portfolio of approved and in-process patents. Active patents increased from 31 in FY19 to 50 in FY22 (see Figure 26).

FIGURE 26—FERMILAB ACTIVE PATENT PORTFOLIO



19 | ECONOMIC IMPACT FROM TECHNICAL PUBLICATIONS

As a laboratory known for its expertise in high-energy physics (HEP), scientific publications are a staple of the scientific industry and create a positive impact on other scientific institutions as a basis for further research.

UNDERSTANDING OUTPUT

In FY22, Fermilab generated the greatest number of HEP papers among all U.S. physics laboratories. Outside of CERN, Fermilab-based researchers had the greatest number of HEP published articles in FY22.

UNDERSTANDING THE IMPACT

The h-index is a metric used to measure both the productivity and citation impact of publications from a particular source (such as an author or institution). The higher the h-index, the greater the impact of the research. Using this measurement, Fermilab is one of the most impactful contributors to high-energy physics publications throughout the world. Table 9 below highlights the impacts of Fermilab's technical publications to date.

TABLE 9—OUTPUT OF HIGH ENERGY PHYSICS PUBLICATIONS

LAB	LOCATION	TOTAL PAPERS	PUBLISHED PAPERS	PUBLISHED ARTICLES IN 2022	h-INDEX SCORE	h-INDEX # OF PUBLISHED PAPERS IDENTIFIED
CERN	Switzerland	50,292	31,984	891	545	530
Fermilab	IL—USA	21,720	12,827	522	425	405
Brookhaven	NY—USA	18,370	11,440	359	382	369
SLAC National Accelerator Laboratory	CA—USA	16,763	10,771	298	403	386
DESI—Deutsches Elektronen—Synchrotron DESI A Research Centre of the Helmholtz Association	Germany	14,655	9,691	450	367	355
KEK—Kō Enerugī Kasokuki Kenkyū Kikō High Energy Accelerator Research Organization	Japan	14,862	9,062	283	336	318

20 | COMMUNITY ENGAGEMENT

Fermilab is committed to engaging with the local communities and providing educational support. In Illinois, a monthly community advisory board keeps local leaders informed on Fermilab projects and new initiatives. Members of the advisory board include city leaders, representatives from school districts and community leaders, including from around the Chicagoland area. The community advisory board also provides a platform for community members to ask questions or share feedback with the lab.

Fermilab is home to the Lederman Science Center that attracts more than 5,000 visitors per year and hosts roughly 35,000 elementary and high school students annually via field trips and other programming.¹⁰ The Lederman Science Center is the premier educational science center in Chicago’s western suburbs.

SATURDAY MORNING PHYSICS

Through the Office of Education and Public Engagement, Fermilab hosts an 11-week program known as Saturday Morning Physics. The program features Fermilab’s scientists and takes high school students through a rigorous overview of high-energy physics and neutrino science.

Educational efforts expand beyond the laboratory and support not just students, but also educational professionals.

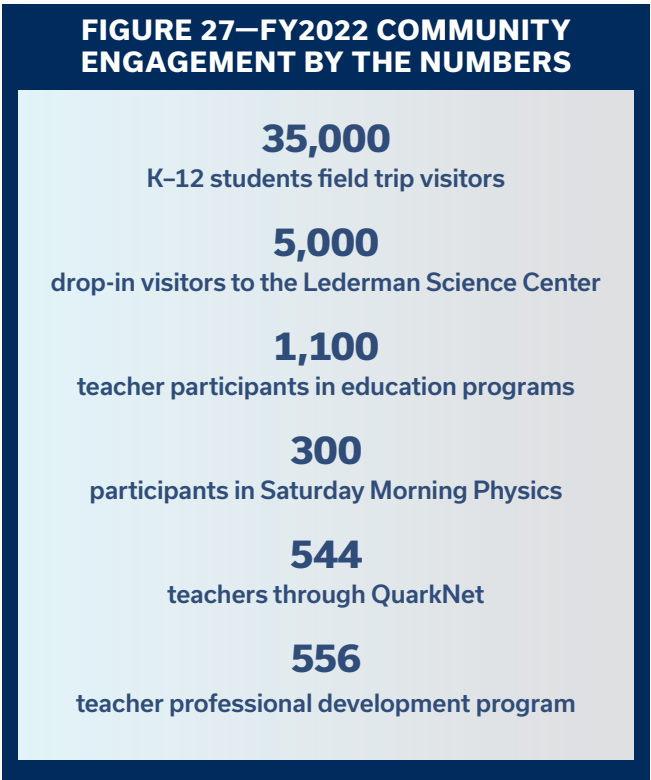
QUARKNET

QuarkNet is a nonprofit collaboration between Fermilab and the University of Notre Dame that is focused on fostering the skills of high school science teachers who

in turn carry their expanded knowledge to the classroom. This collaboration provides real-world experiments and workshops to support a nationwide network of teachers and scientific leaders [10].

TEACHER PROFESSIONAL DEVELOPMENT PROGRAM

Specialized teacher professional development programs geared to all levels of science educators across the K-12 spectrum are provided. Through this program, Fermilab works with Illinois teachers as part of the State Board of Education professional development to further their knowledge of high energy physics.



10. Visitors to the Lederman Science Center are reported separately from lab visitors/lab visits.

21 | COMMUNITY CONNECTION

The laboratory is an active partner in local economies and has the opportunity to expand collaboration with local communities in the years to come. The lab's community connections establish a basis for exploring future economic opportunities.



21.1 Batavia, Illinois

The city of Batavia has been an excellent source of support to the laboratory. Fermilab has benefited from shared resources and mutual aid provided by the city established through cooperative agreements. Some of these services cover emergency, fire and rescue, and small power consumption agreements for ancillary onsite operations. The local Batavia school district is pleased with the presence of Fermilab and the access it provides for scientific field trips. The Chamber of Commerce also discussed the positive impact that Fermilab has on the local economy based on the patronage of local businesses in the area.



21.2 Lead, South Dakota

With the economic activity generated by the SURF site and the LBNF/DUNE project, the town of Lead is seeing significant economic benefits. From FY1 to FY22, the town's hotel/motel taxable sales have nearly doubled, increasing from \$3.16 M in 2019 to over \$6.22 M in 2022 [11]. Part of this increase can be attributed to the laboratory's impact on short-term rentals as well as housing rentals consumed by SURF workers. The increased activity in the region is also creating a spike in miscellaneous retail sales and grocery sales.

22 | FUTURE ECONOMIC OPPORTUNITIES

Expanding on economic partnerships with local communities means identifying and addressing emerging needs for both the lab and the community. Discussions with community leaders in both Lead, South Dakota and Batavia, Illinois identify opportunities for mutually beneficial partnerships outlined below.

22.1 Expanded Educational Reach

Fermilab has an exceptional science center attracting thousands of K-12 students from the Chicagoland region. The laboratory also focuses on providing education programs for high school students (Saturday Morning Physics) and partnership education programs for teachers from across the United States, meant to expand their capabilities and educate students on complex physics topics. The school district in Lead, South Dakota is seeking to expand its educational programs. SURF currently is involved in summer programs with K-12 students and frequently sponsors events in the school system. Fermilab has the opportunity to partner with the Lead school district and connect their students and teachers with existing educational programs. Other possibilities include establishing a summer camp that engages students with science once LBNF construction is finished and the DUNE experiment nears completion. Additionally, the school district is interested in exploring sponsorship of a Neutrino Day celebration to occur within the K-12 program. Through this event, students can build awareness of the cutting-edge science occurring within their community. This Neutrino Day celebration could also be adopted in Batavia in connection with the local community, schools and the DOE.

In Illinois, Fermilab has an opportunity to grow partnerships by exploring funding opportunities that can expand the Fermilab educational programs that support local K-12 students and teachers. Additionally, further analysis on laboratory current and future demographics can be conducted that will support providing the local school system with critical data to aid in classroom planning and resource development.

SCHOOL-BASED INITIATIVES

- Expanded partnerships for teacher-based STEM education program.
- Joint planning efforts to explore available federal and state funding for expanded STEM- and Physics-based learning programs.
- The development of teaching programs involving Fermilab scientists as opportunities to connect with their community and build awareness of research being conducted at Fermilab.
- Conducting an expanded demographics study of future international users and affiliates to understand growing international student needs. This study will help Batavia schools plan for future class and language programs needed in their K-12 education program.

COMMUNITY BUSINESS-BASED INITIATIVES

- Expand site access at Wilson Hall for business leaders and outline the process for hosting community events onsite at Fermilab.
- Improve communication with the Batavia Chamber of Commerce to educate the business community

about both science and business/site access changes that occur.

- Launch a voluntary community business-based learning program where scientists are invited to speak at a community business to explain research projects and answer questions from community members.

22.2 Expanded Workforce Development Programs and Strategic Initiatives

Once the LBNF construction is completed and the DUNE experiment is operating, a small workforce will be needed on-site to maintain the equipment. This operating team could be designed 5–10 years before the resource needs are required onsite. By creating a workforce training program that invests in members of the existing community and helps them develop skills needed for future employment, the laboratory would be creating a sustainable workforce solution well before scientific experiments start in 2028. The regional schools in proximity to Lead, South Dakota are well positioned to engage in a future partnership and begin networking to develop a future program.

LEAD, SOUTH DAKOTA

- Economic Development: In partnership with local government and economic development leaders, the laboratory could support common initiatives that would both further the local economy and add value for scientific operations to those who are either working on the LBNF construction efforts or for visiting scientists who support the start-up of the DUNE experiment. These activities could involve:
 - Sourcing new businesses with an interest in the experiment to co-locate to the town of Lead.

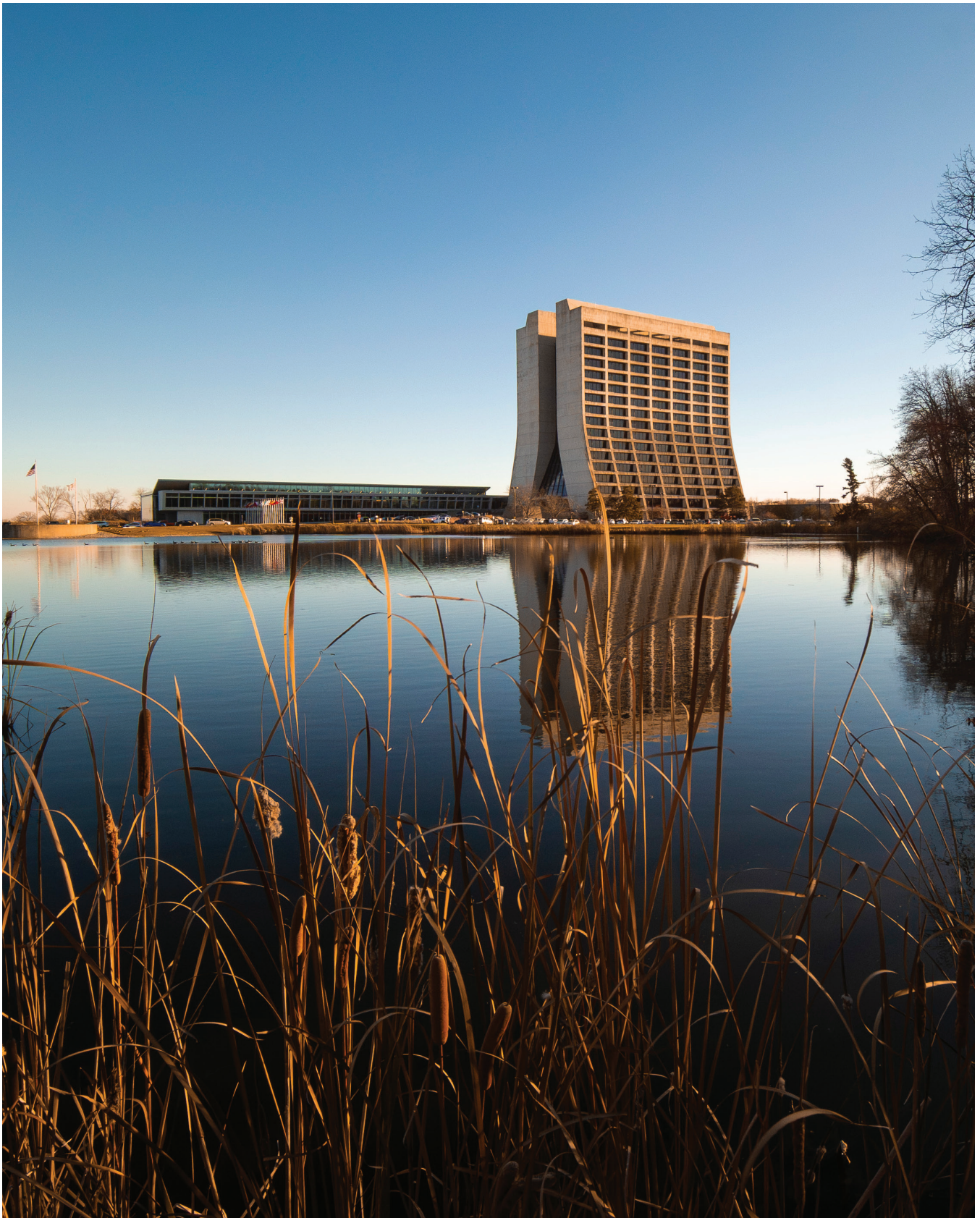
- Sourcing start-up funds for attracting restaurants and crucial infrastructure businesses in the community.
- Supporting fundraiser initiatives for community projects sponsored by the SURF Foundation.
- Coordinating common needs across the two scientific operations and with the community.

BATAVIA, ILLINOIS

- Undertaking projects shared with local community leaders that would not be appropriately funded by the laboratory's prime contract.
- Partnering with the governor's office, the City of Chicago, and associated nonprofits to help with strategic planning to connect the science at Fermilab with strategic state-based initiatives.

22.3 Expanding Fermilab's Role as an Ambassador for the Communities

In both Illinois and South Dakota, Fermilab has the opportunity to drive economic benefits for both the lab and the community. As a national laboratory, Fermilab has resources that can add value to local economies. Through strategic relationships with other businesses, Fermilab's relationship with other national laboratories, federal agencies, universities, and international and domestic partnerships, Fermilab has the opportunity to encourage businesses to co-locate near the laboratory and the DUNE experiment in South Dakota. Leadership can tap into business expertise to support efforts for seeking federal and private funding to support public-private partnerships.



23 | CITATIONS

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24 | GLOSSARY

Administrative Spend

Procurement awards that result from administrative modifications to existing subcontract and task order awards.

Affiliates

Visiting scientists accessing Fermilab to conduct or participate in experiments that are not associated with a Department of Energy-recognized center.

DOE O 413.3B Projects

Department of Energy Projects for the acquisition of capital assets. Instructions and details of the DOE Order can be found at Program and Project Management for the Acquisition of Capital Assets – DOE Directives, Guidance, and Delegations.

Economic Output

The aggregate value of economic effects which represents the total impact created by an operation or event. Economic Output in this assessment is the aggregate of direct, indirect, and induced impact effects.

Fiscal Year

The United States federal government's annual timeframe that companies and the government use for fiscal reporting and budgeting. The timeframe begins on October 1 of each calendar year and ends on the last day of September of the following year. Fermilab observes the federal government fiscal year in the execution of our prime contract.

Gross State Product

A component of economic output focused on measuring the income generated within a state. Also commonly referred to as value add.

Payroll

The total amount of compensation paid to employees, covering the period from one payday to the next payday.

Procurement

The act of obtaining goods or services, typically for business purposes.

Small Business

Businesses defined by the average number of employees within a span of the last twelve months or by the average annual receipts over time. Additional factors include whether the business is organized for profit; established and operates within the United States; makes a contribution to the national economy through taxes; uses American labor, products, or materials; and is independently owned and operated; and is not dominant within its field on a national basis [13].

Students

Undergraduate and graduate level interns and postdoctoral candidates conducting research at Fermilab.

Subcontract

A contract for a company or person to do work for another company as part of a larger project.

Subcontractor

A visitor to the lab working in support of an awarded subcontract.

Tech Transfer

The movement of data, designs, inventions, materials, software, technical knowledge, or trade secrets from one organization to another or from one purpose to another.

Total Economic Output

The aggregate value of all economic impact created by a specific activity.

Users

Visiting scientists accessing Fermilab to conduct or participate in experiments that are associated with a Department of Energy-recognized center.

Workforce

The people engaged in or available for work, either in a country or area or in a particular company or industry.

25 | ACKNOWLEDGMENTS

Community Members within the City of Lead and Deadwood, South Dakota

Thank you for your thoughtful engagement throughout this process. We look forward to continuing to work with you on solutions that will support both the mission of our work with the Department of Energy and the needs of the community.

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City of Batavia, Batavia School District 101 & Batavia Chamber of Commerce

Thank you for meeting with us as we planned out this economic impact assessment and providing us feedback on current economic and operational objectives as well as suggestions on continued partnership opportunities.

Waubonsee Community College Education and Workforce Development

Thank you for providing background on the workforce education program focused on the city of Batavia, Illinois, and discussing possible future opportunities to collaborate on workforce initiatives.

Anderson Economic Group, LLC

Fermilab references Anderson Economic Group, LLC's Impact Study titled "The Economic and Fiscal Impact of Fermilab on Illinois". Fermilab's Economic Impact Study was completed in December of 2019 comprising FY18 economic results. The FY18 study can be found here: www.fnal.gov/economicimpact-fy18.

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