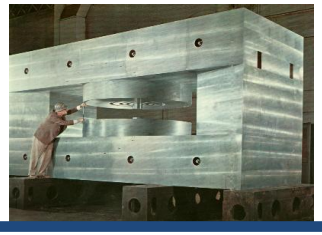
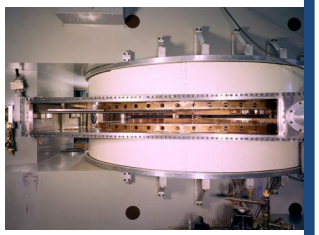
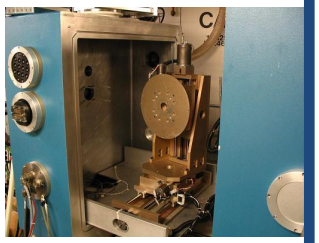
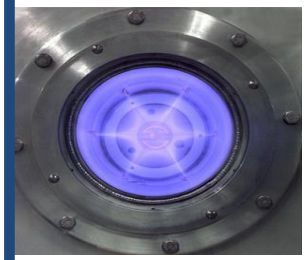
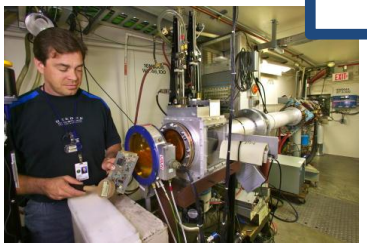
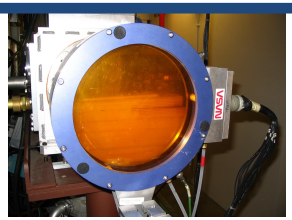
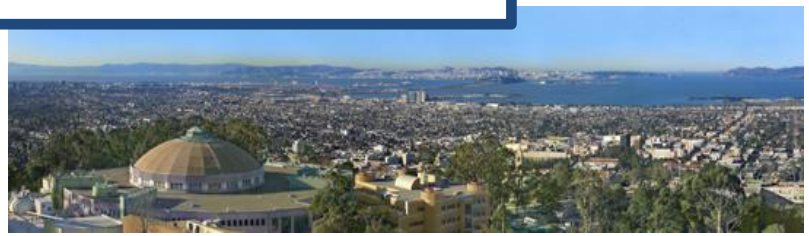
Staffing and work force level





BERKELEY LAB

Larry Phair

Scenarios (+1)

- **Scenario 1** is “now.”
  - What are the resources needed to implement the current NP and applied programs?
- **Scenario 2** is the super-heavy element (SHE) search, 2,000 hours/year. Looking for element 120, in addition to current basic science work.
- **Scenario 3** is operating at full capacity (defined as 5,500 hours/year, 4,000 hours for DOE-NP and 1,500 hours other).
  - What resources and capabilities are needed to ensure robust operations at full capacity?
- Scenario 4: DOE-only, 2,800 hours (for comparison)

Drivers for staffing levels

STAFFING

- Run time staff requirements: xx FTE-years
  - depends on number of hours run
  - depends on whether we run 4, 5, or 6 days a week
  - currently run 5 days a week (10/4 schedule: 10 days on, 4 days off)
- 2 long shutdown maintenance periods, January and July of each year (2.4 FTE-years of work in each shutdown)
- 2.5 FTE-years set for improvements, major repairs, other projects

During each long shutdown, we perform scheduled and preventive maintenance. Some of the required staff are matrixed from Engineering Division.

Among these 2.4 FTE-years of work,

- ~0.6 FTE-years: mechanical technician work, repairing cyclotron leaks, servicing the deflectors, and addressing LN and LHe issues.
- ~0.8 person-years of electrical effort goes into servicing transformers, rectifiers, the RF system, magnet power supplies, and other subsystems. It also includes certifying the Personnel Protection System and maintenance of cyclotron control systems.

When some of the upgrades or replacements of old and/or risky systems are complete, we will reevaluate the staffing needs for shutdown-period maintenance.

Staffing for 3800 hours (Scenario 1)

FTE breakdown

- 5.0 Operators
- 0.7 Mechanical engineer
- 1.0 Electrical engineer
- 3.3 Mechanical technicians
- 3.8 Electrical technicians
- 1.9 Ion source effort
- Approximately 1.5 operations management
- 1.0 BASE technician
- 0.8 Safety
- Approximately 0.5 for planning, compliance, proposal development, etc.
- 0.6 for Facilities work
- 0.2 for engineering support work

Total 20.3 FTEs

Staffing for 4000 DOE hours (Scenario 2)

FTE breakdown

- 5.0 Operators
- 0.7 Mechanical engineer
- 1.0 Electrical engineer
- 3.1 Mechanical technicians
- 3.8 Electrical technicians
- 2.0 Ion source effort
- Approximately 1.5 operations management
- **0.0 BASE technician**
- 0.9 Safety
- Approximately 0.5 for planning, compliance, proposal development, etc.
- 0.9 for Facilities work
- 0.3 for engineering support work

Total 19.6 FTEs

Staffing for 5500 DOE hours (Scenario 3)

FTE breakdown

- 6.0 Operators
- 0.9 Mechanical engineer
- 1.0 Electrical engineer
- 4.0 Mechanical technicians
- 4.7 Electrical technicians
- 2.1 Ion source effort
- Approximately 1.5 operations management
- 1.0 BASE technician
- 1.0 Safety
- Approximately 0.6 for planning, compliance, proposal development, etc.
- 0.3 for Facilities work
- 0.2 for engineering support work

Total 23.3 FTEs

Operators

Scenario 1 (3,800 hours):

- 5 day work week. 3 operators + 1 + 1 crew chief = 5

Scenario 2 (4,000 hours):

- 5 day work week. 3 operators + 1 + 1 crew chief = 5

Scenario 3 (5,500 hours):

- 6 day work week. 3.6 operators; ⇒ 4 + 1 + 1 crew chief = 6

Question 2A. From SHE search ramp-up plan (Appendix A of strategic plan):

An additional cyclotron operator will be needed to begin a SHE search program. Hire happened in FY20 Q1 and the operator is now being trained. Training takes 6-12 months. This new hire will take us to 5 operators currently.

- Operator-tech
  - hybrid position with specialized skills of both operator and technician (electrical or mechanical)
  - Can contribute to maintenance and improvement work when not on shift as operators
  - Maximize efficiency. No need to bring in additional part-time techs (from Engineering Division) during shutdowns

Electrical and Mechanical staffing

	Scenario 1 (now, 3800h)	Scenario 2 (SHE, 4000h)	Scenario 3 (5500 h)
Mechanical Tech	3.3	3.1	4.0
Mechanical Engineer	0.7	0.7	0.9
Electrical Engineer	1.0	1.0	1.0
Electrical Tech	3.8	3.8	4.7

Comments

- Scenarios 1 and 2 have roughly the same number of hours.
- Similar electrical tech needs even with BASE running removed. Cyclotron vault work dominates.
- Mechanical support slightly lower. With no BASE running, caves 3, 4, 4A and 4B do not need to be maintained.

Ion source effort

	Scenario 1 (now, 3800h)	Scenario 2 (SHE, 4000h)	Scenario 3 (5500 h)
Ion Source	1.9	2.0	2.1

Starting in FY18, DOE-NP began to support ion source R&D separately at the level of $300k. This represents about 0.78 FTE and would be added to the table above to account for all ion source work.

Management and Safety

	Scenario 1 (now, 3800h)	Scenario 2 (SHE, 4000h)	Scenario 3 (5500 h)
Management	2.0	2.0	2.1
Safety	0.8	0.9	1.0

Management time is currently spent overseeing:

- BASE
- experiment scheduling
- planning, compliance, proposal development, reporting
- safety
- etc.

These activities are captured in the activity-based costing, but their accuracy has not been rigorously assessed. The activities are also not well assigned to different managers.

<u>Safety effort</u>

In FY19, the Nuclear Science Division hire a Division Safety Coordinator (DSC) that is not shared with other divisions at the Lab.

The cyclotron pays for 0.5 of the DSC's time which goes toward the safety efforts at the facility.

BASE technician

	Scenario 1 (now, 3800h)	Scenario 2 (SHE, 4000h)	Scenario 3 (5500 h)
BASE Tech	1.0	0.0	1.0

The BASE technician is dedicated to the BASE Facility in Caves 4A and 4B and is entirely supported by the BASE hourly charges.

2B. What resources are required to support staffing levels in each scenario?

	Scenario 1 (now, 3800h)	Scenario 2 (SHE, 4000h)	Scenario 3 (5500 h)	Scenario 4 (DOE, 2800h)
Operators	5.0	5.0	6.0	4.4
Mechanical Tech	3.3	3.1	4.0	2.5
Engineers	1.7	1.7	1.9	1.5
Electrical Tech	3.8	3.8	4.7	2.8
Management	2.0	2.0	2.1	2.0
Ion Source	1.9	2.0	2.1	1.8
BASE Tech	1.0	0.0	1.0	0.0
Safety	0.8	0.9	1.0	0.8
Facilities	0.6	0.9	0.3	1.0
Eng Support	0.2	0.3	0.2	1.0
Totals (FTEs)	**20.3**	**19.6**	**23.3**	**17.8**
Salaries ($M)	**5.72**	**5.40**	**6.59**	**4.88**

2B. Continued (Comparing Scenarios 3 and 1)

	Scenario 1	Scenario 3	Delta (S3-S1)
Total FTEs	20.30	23.29	2.99
DOE salaries	$ 3,858,213	$ 4,378,712	$ 520,499
BASE salaries	$ 1,865,969	$ 2,213,995	$ 348,026
total salaries	$ 5,724,182	$ 6,592,707	$ 868,525
DOE M&S	$ 591,705	$ 978,296	$ 386,591
BASE M&S	$ 441,094	$911,498	$470,404
total M&S	$ 1,032,799	$ 1,889,794	$ 856,995
DOE power	$ 489,474	$608,225	$118,751
BASE power	$ 174,812	$228,084	$53,272
total power	$ 664,286	$836,309	$172,023
Total DOE	$ 4,939,392	$ 5,965,233	$ 1,025,841
Total BASE	$ 2,481,875	$ 3,353,577	$ 871,702
Total	$ 7,421,267	$ 9,318,810	**$ 1,897,543**

	Delta(S3-S1) FTEs
Operators	1
Mechanical Tech	0.7
Mech. Engineer	0.1
Electrical Tech	1.0
Management, Fac., Eng. Supp.	-0.2
Ion Source	0.2
Safety	0.2
Total FTE delta=	**3.0**

Going from Scenario 1 to 3 requires an increase of $1.03M (DOE funding) and an overall increase of 3.0 FTEs shown in the table at right.

Summary

Work force levels calculated from an activity-based model depending on desired hours and available funding from several different sources.

Facilities and Engineering Support

	Scenario 1 (now, 3800h)	Scenario 2 (SHE, 4000h)	Scenario 3 (5500 h)
Facilities	0.6	0.9	0.3
Eng Support	0.2	0.3	0.2

Facilities and Engineering Support are difficult to predict

Staffing details (continued)

Example, Scenario 1 (now), 5 day work week. FTE needs:

Mech: 4.04 , Elec: 4.75, Oper: 3 (+1, +1 crew chief), misc: 6.84

= 20.64 FTEs while running.

Scenario 1 (3800 hours), 31.7 weeks of the year (out of 50, 63.4%)

⇒ 13.78 FTE-yrs

Combined with shut-down effort and improvement/repair effort

13.8 (run) + 4.8 (shut-down)+ 2.5 (imp/rep) = 21.1 FTE-years

subtract 0.78FTE ECR R&D ⇒ **20.3 FTE-years**