



## Report on the Accelerator Directorate

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Fermilab PAC Meeting

## 2022 Recommendation

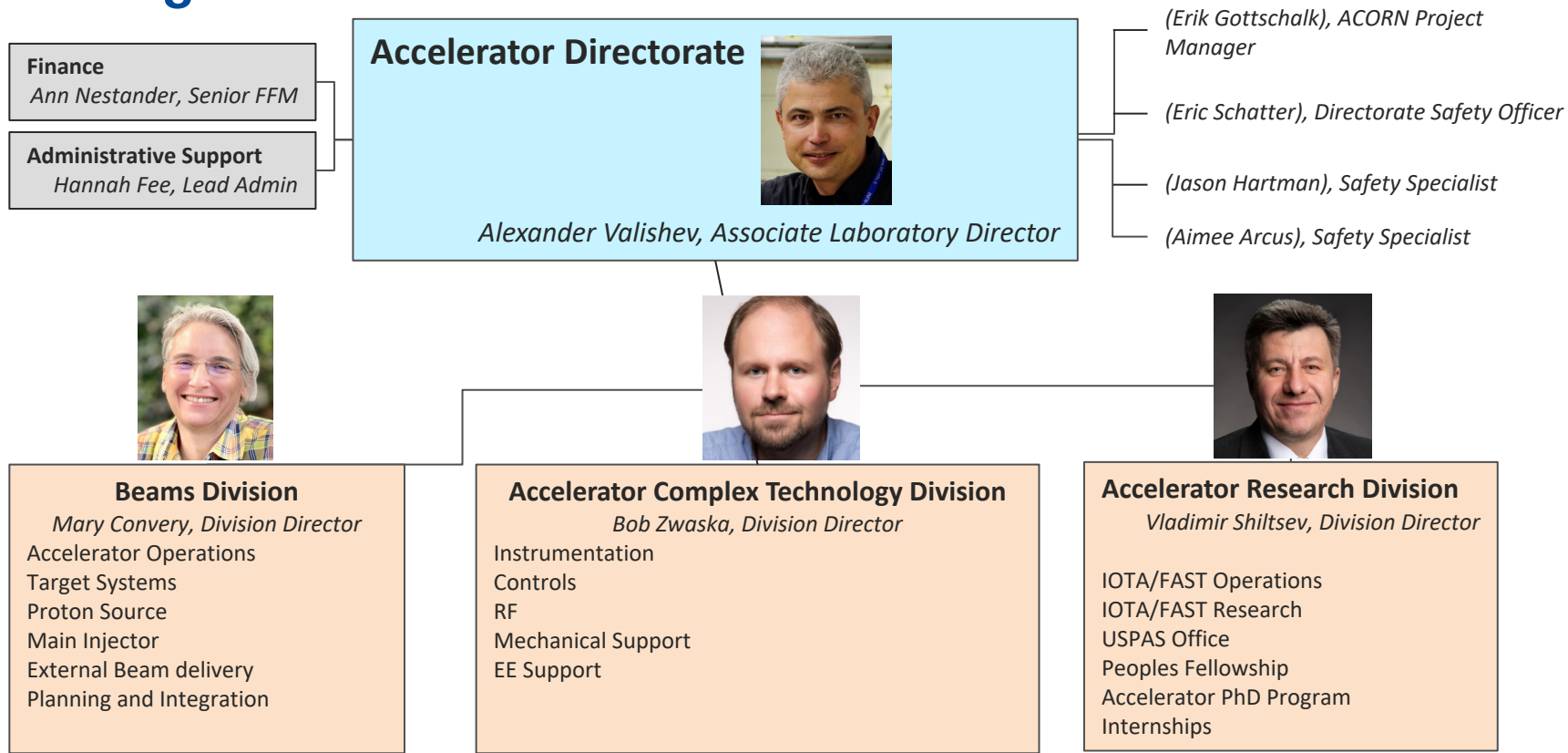
- The PAC encourages the Accelerator Division to continue regular hiring and succession planning to maintain needed expertise.

# Accelerator Directorate

## Vision and Mission Statement

- Accelerator Directorate's vision is to develop and operate Fermilab's accelerator facilities delivering particle beams that enable the high energy physics mission while also leading in innovating and realizing future accelerators for scientific discoveries.
- Our mission is to drive scientific discovery by
  - Reliable delivery of megawatt class particle beams for scientific research;
  - Advancing accelerator physics research to enable future accelerators;
  - Designing and building accelerator systems and support installations to extend the scientific reach of existing facilities;
  - Engaging in national and international collaborations and supporting training programs to develop and maintain a world-class accelerator workforce.

# AD org chart



# Accelerator Complex operations highlights since 6/2022 – FY22

Efficiency

- Uptime = [run time]/[scheduled time]
  - FY22 69% dominated by MI magnet failures
- Runtime = [scheduled time]/[CYear]
  - FY22 77% scope of shutdown and ops funding
- Sustained power =  $\langle P \rangle / P_{\max}$ 
  - FY22 76% lossless operations, tuning

Target systems

Machine capability  $P_{\max} = 0.895\text{MW}$   
reached on July 15, 2022

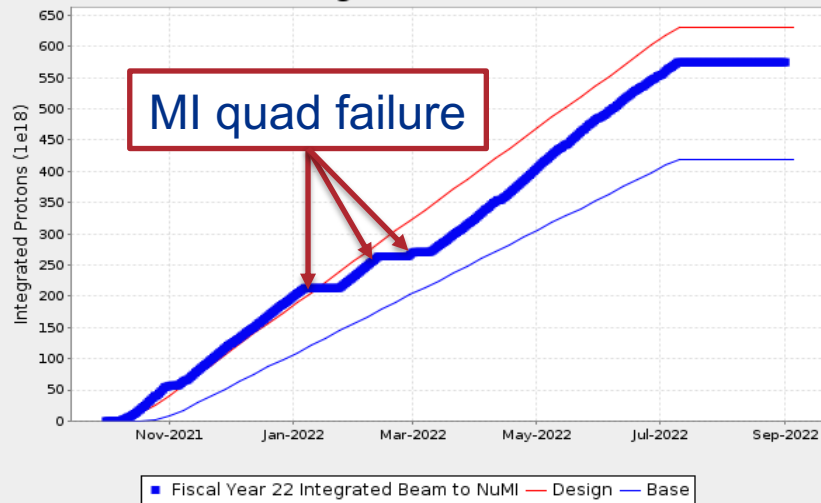
Capability

physics

$$= P_{\max} \cdot \text{Uptime} \times \text{Runtime} \times \text{Sustained power}$$

Overall Operations Efficiency 41% in FY22

FY22 Integrated Beam to NuMI



# Accelerator Complex operations highlights since 6/2022 – FY23

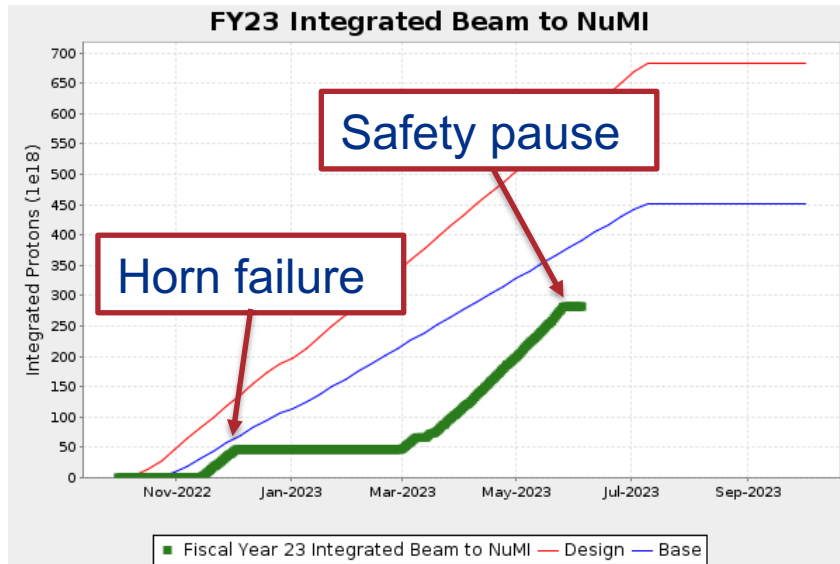
Efficiency

- Uptime = [run time]/[scheduled time]
  - Dominated by failure of Horn 2
- Runtime = [scheduled time]/[CYear]
  - FY23 77%
- Sustained power =  $\langle P \rangle / P_{\max}$

## Target systems

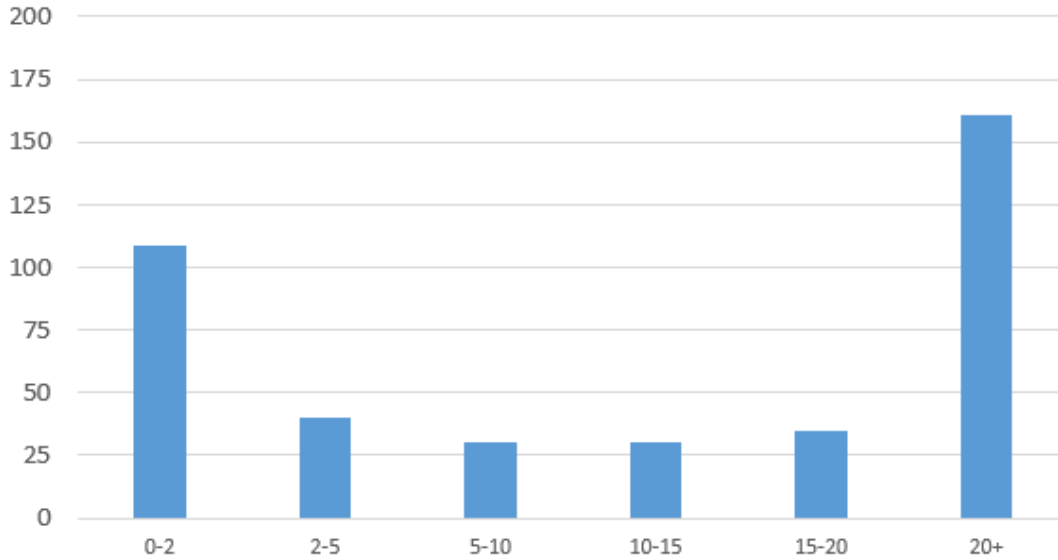
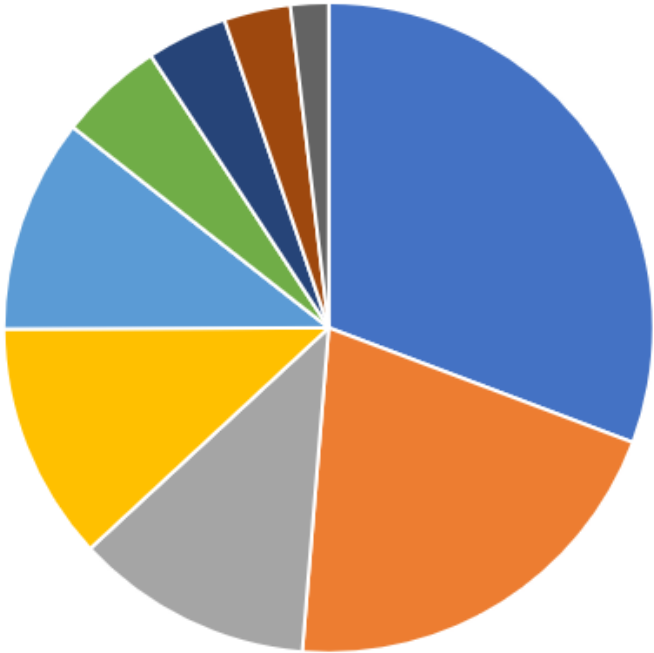
Machine capability  $P_{\max} = 0.959 \text{ MW}$   
reached on May 22, 2023 via MI cycle  
time reduction 1.2 → 1.13 s  
(N.Tran's ACE talk)

Capability



# AD workforce snapshot – 405 employees

Employees by Years of Service



- Technicians
- Engineers
- Engineering Physicists
- Scientists
- Computer Professionals
- Administrative & Management
- Technical Support
- Drafters
- Clerical & Secretarial

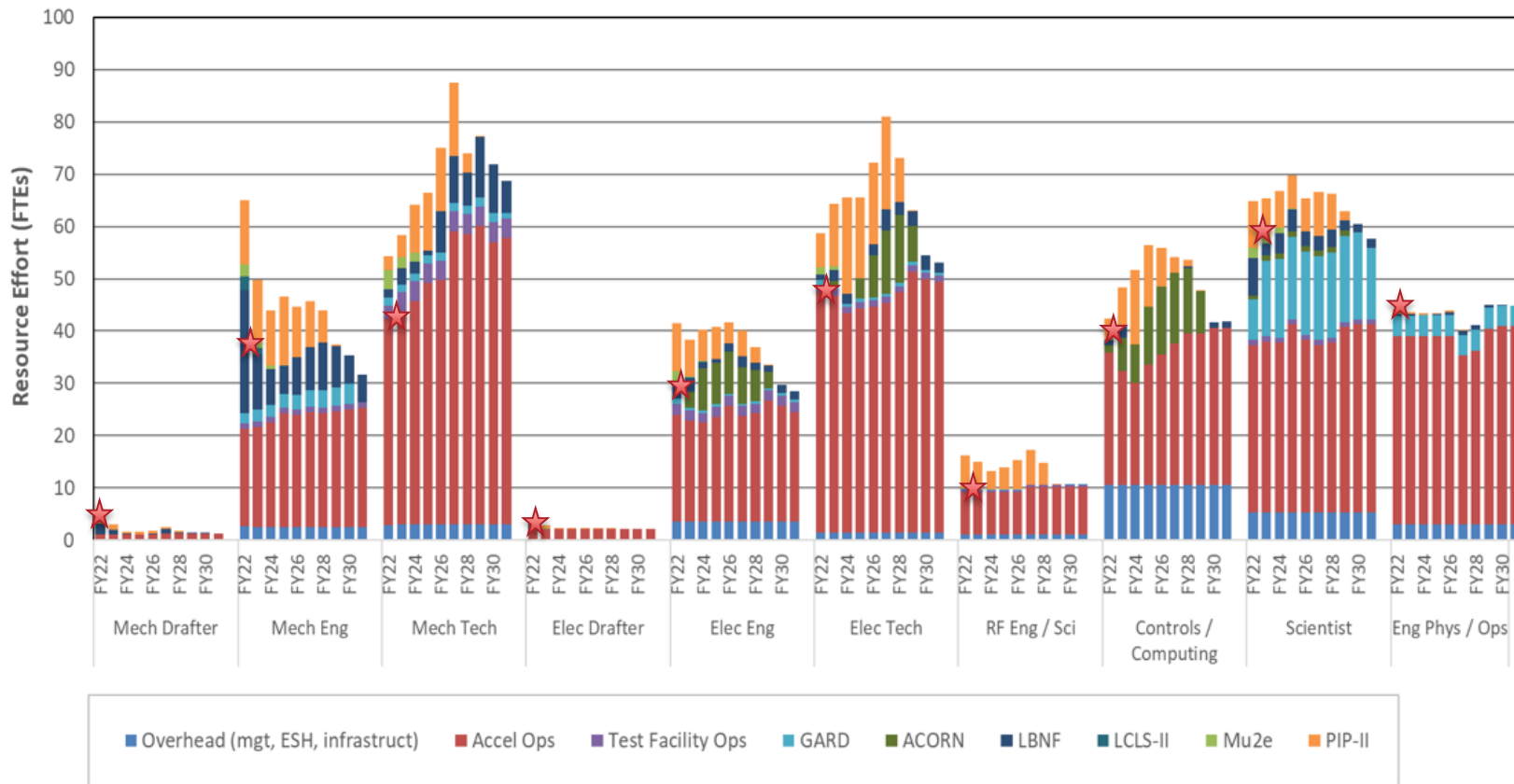
# AD workforce management

Priorities: importance and time criticality

- Projects – Mu2e, PIP-II, LBNF, ACORN where AD provides labor
- Accelerator Operations
- Matrixing of critical expertise is needed for project success
  - Opportunity: efficient and cost-effective for projects
  - Challenge: broad expertise base, but no longer deep
- Lab-wide workforce planning through 2030
  - Half the AD workforce will retire/leave the lab by 2030
  - Ongoing effort to succession plan, hire, and train the workforce to meet demand



# AD workforce demand projections

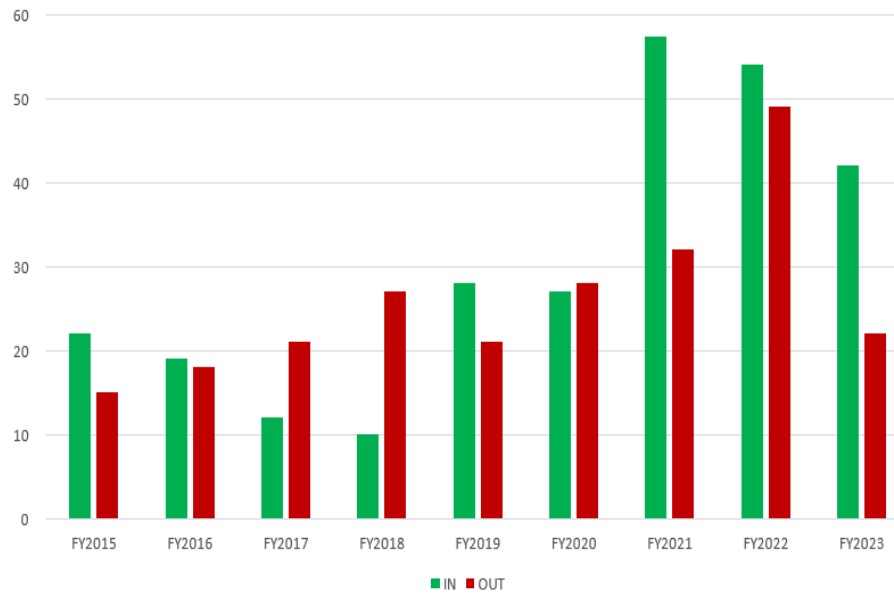


# AD workforce dynamics – changes in previous years

AD Overall

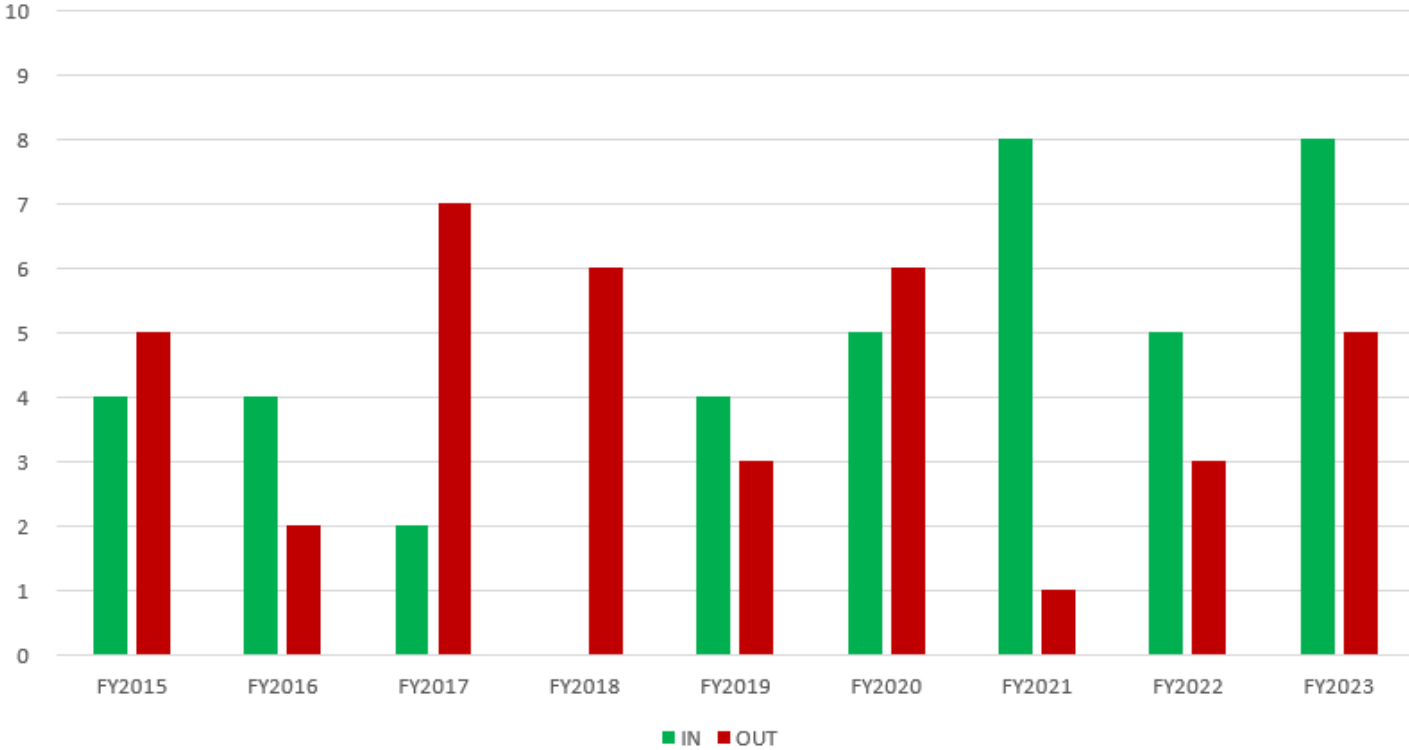


AD Overall



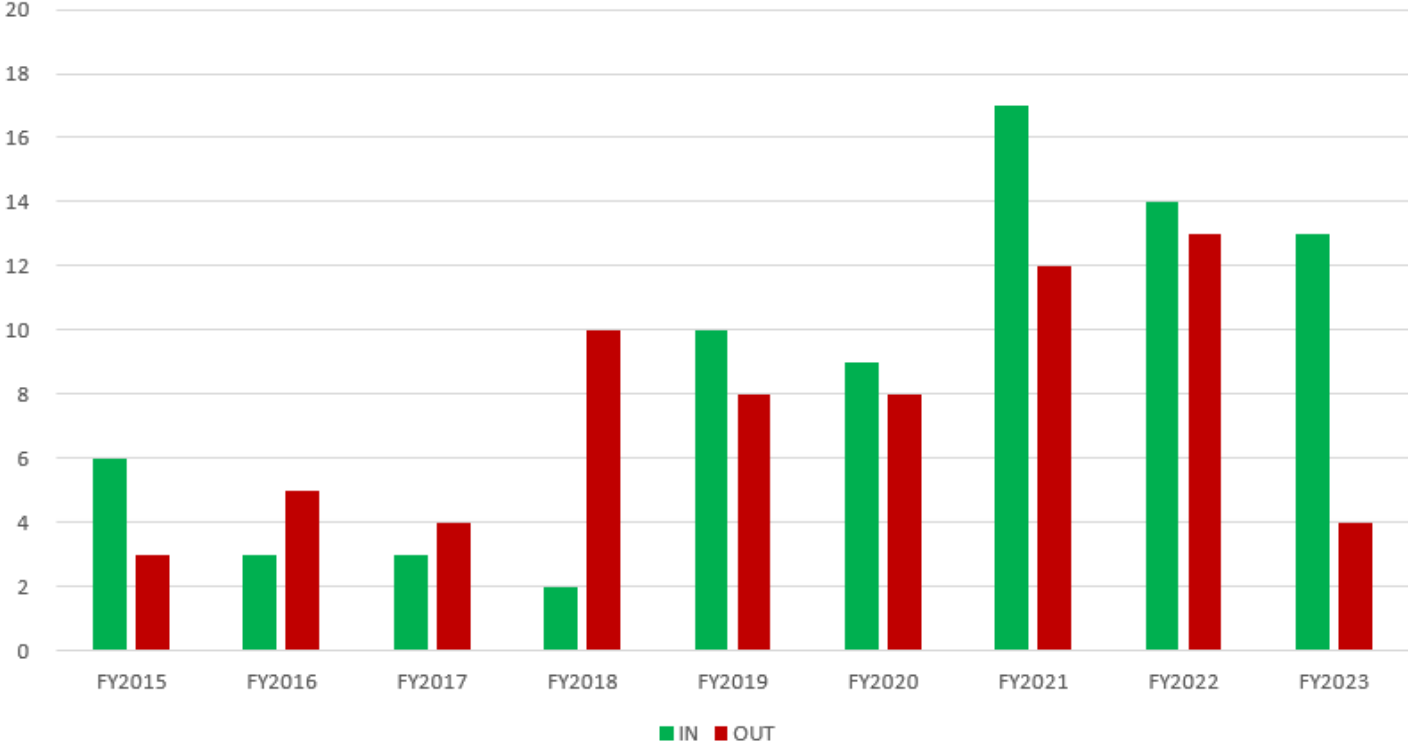
# AD workforce dynamics – scientific jobs (Scientists, Postdocs)

AD Scientific



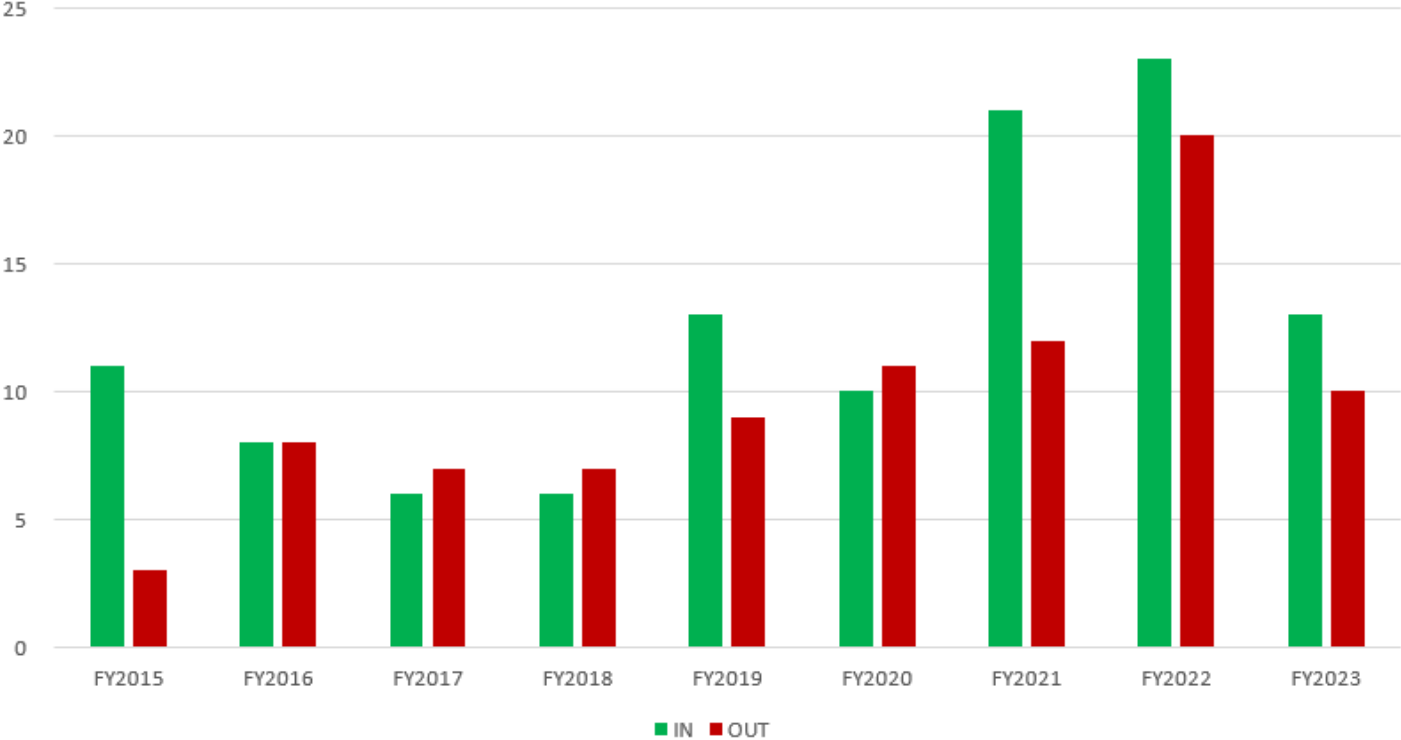
# AD workforce dynamics – engineering jobs

AD Engineers



# AD workforce dynamics – technical jobs

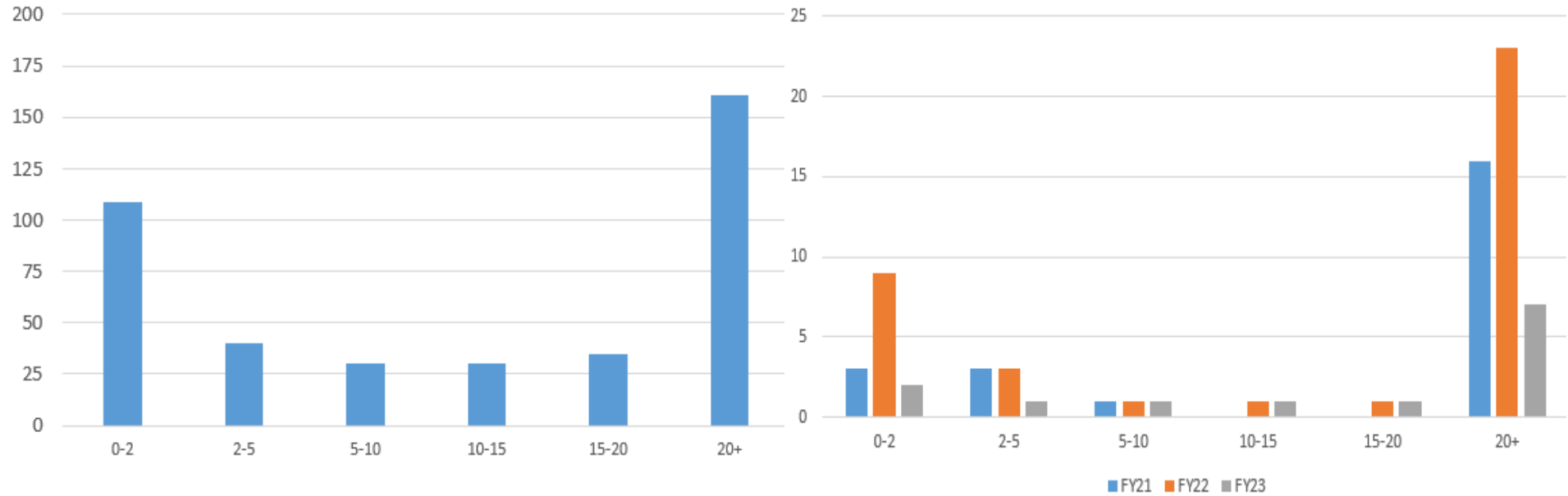
AD Technical



# AD workforce – demographics challenge

Employees by Years of Service

Terminations by Years of Service



# Strategy for the future

- AD is part of the lab-wide workforce planning through 2030
  - Succession planning
  - Hiring
  - Training

# AD ongoing hiring effort

- The laboratory is constantly improving hiring practices
- AD has a workforce development liaison who assists hiring managers, aids with outreach and headhunting, oversees EDIA matters
  - Plan to ramp up head-hunting effort
- Current recruitment snapshot
  - Total Openings 62
  - Total In Offer Stage 26
  - Total Confirmed Starts 12
  - Starts Confirmed for 6/5 7
  - Remaining Openings (Active Recruitment) 36





# Engagement with global accelerator workforce effort

- Nationwide campaign to develop accelerator expertise exists and is continually strengthened
- OHEP supported personnel development programs
  - Traineeships at universities
    - MSU Accelerator Science & Engineering Traineeship since 2017. Currently 28 students in physics, SRF, RF power, Cryogenic engineering.
    - IIT/NIU Traineeship
  - U.S. Particle Accelerator School (AD hosts the school office). Two sessions per year
  - Summer internship programs. Two are hosted and managed by AD: *Lee Teng and Helen Edwards* 10-week programs, 12 undergraduate students per year.
- Accelerator PhD Program managed by AD (jointly with APSTD). 7 students at present.
- Peoples Fellowship
- Joint appointments with universities