Office of Science Project Management

Kurt W. Fisher
Director, Office of Project Assessment
Office of Science

Who the heck is Stumpy??

So long, Stumpy…

- Among the trees to be removed is one very famous tree known as "Stumpy.“
- It's a scraggly tree with a trunk that is mostly rotted out. At high tide, the base of the tree is flooded. Yet, each spring, Stumpy's three or four small branches burst into flower, with the Washington Monument standing tall in the background

Office of Project Assessment Staff

- Kurt W. Fisher—Director
  - Kurt Fisher's professional career consists of over 35 years in the areas of Engineering, General Contracting and Construction Management. Kurt's experience includes 30 years within the 3 major programs, EM, NNSA, and the Office of Science within the Department of Energy.
- Alex Bachowski—Engineering and Construction Manager
  - Prior to joining DOE as an FPD in 2021, Alex served as a Resident Engineer with the US Army Corps of Engineers, executing civil works, military construction, and interagency projects across multiple geographical areas including the NY Metro Area, DC Beltway, and Europe. As an FPD at Brookhaven Site Office, Alex gained hands-on experience managing SC projects, as well as a working knowledge of DOE Order 4313.3B. Alex has just recently taken over the PMCDP program for SC.
- Kin Chao—Engineering and Construction Manager
  - As OPA's senior engineer, Kin plays a key role in establishing and overseeing project management policy for SC/OPA, providing support and direction to on a wide range of PM inquiries, oversees PARS, serves as budget liaison, maintains the SC project success history chart, and most recently oversaw and maintained SC's COVID project impact information.
- Mohammad Khalil—Engineering and Construction Manager
  - Prior to joining DOE in 2022, Mohammad served as Chief of Facilities Operations and Maintenance at a primary training facility for the US Secret Service. He also worked at NIST as leader in the reimbursable projects group responsible for the design and execution of scientific laboratory upgrades, renovations, and research equipment installations.
- Ray Won—Engineering and Construction Manager
  - Ray's primary focus is oversight of the large portfolio of SC Science Laboratories Infrastructure projects. Ray is also responsible for the development of the Collaboration Toolkit, which adapts private industry methods to measure SC performance and promote best practices. Ray is also a proponent for mentoring and training new project staff.
- Casey Clark—Program Analyst
  - Casey oversees SC's IPR and reporting processes, as well as maintains and oversees the ESAAB Equivalent process for SC.
- Christina Wetzel—Executive Assistant
  - Christina provides coordination and support for the OPA staff, and exceptional customer service to OPA customers. She is also responsible for coordinating the SC ESAAB Equivalent and Watch List meetings.

Congratulations Ray Won!

Retiring tomorrow April 3!!!

Best of Luck Ray!!

Open Positions Within the Office of Science

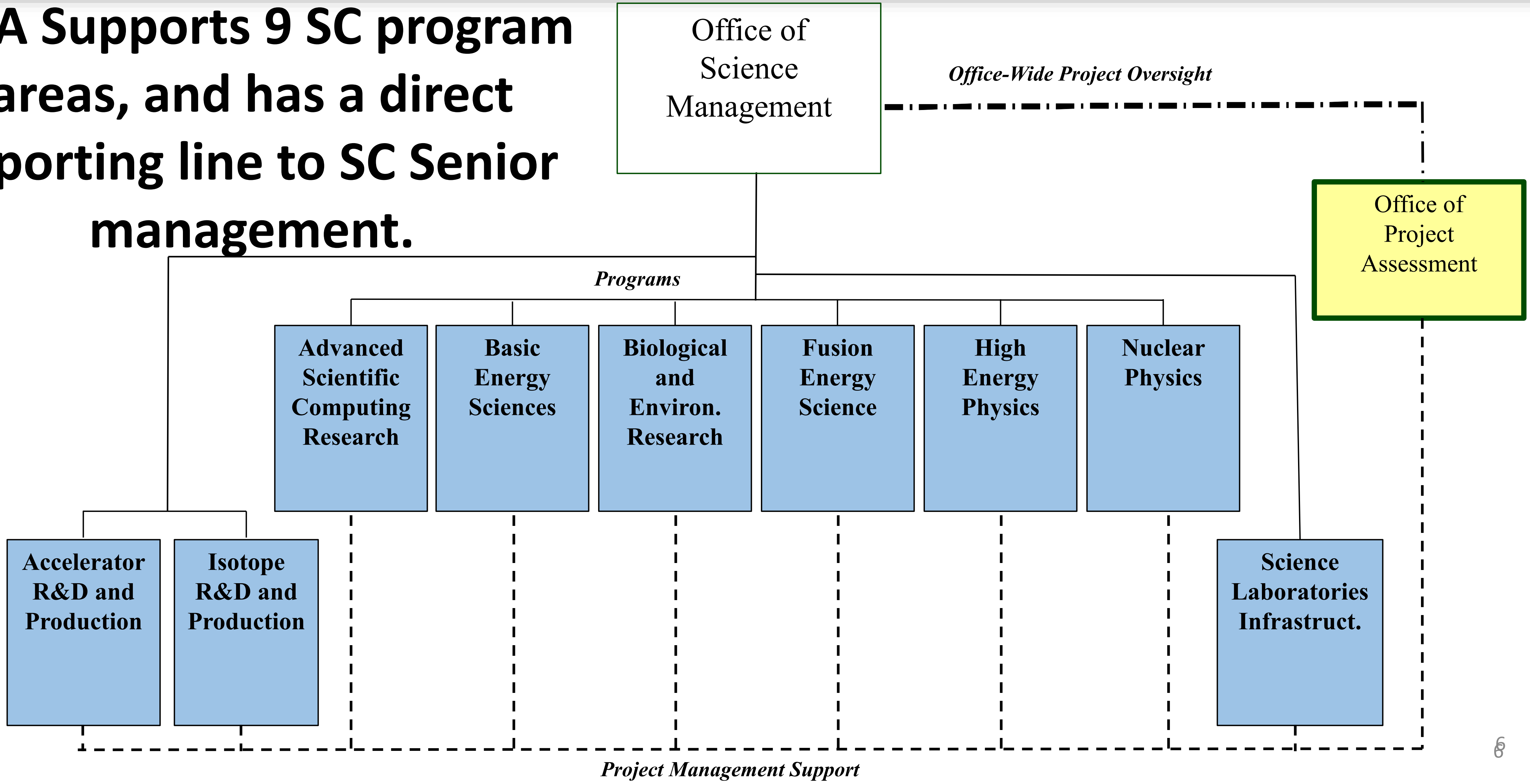
Check-Out th t SC
advertisemer

Office	Location	
IRP	Germanto	)ON
OPA	Germanto	)ON
OSS	Germanto	)ON
ASO	Lemont IL	)ON
BSO	Berkeley, (	)ON
BHSO	Upton NY	)ON
FSO	Warrenvill	)ON
FSO	Warrenvill	)ON
OSO	Oak Ridge	)ON
PSO	Princeton	)ON
SSO	Menlo Parl	)etails/780647200

Check out these SC Jobs

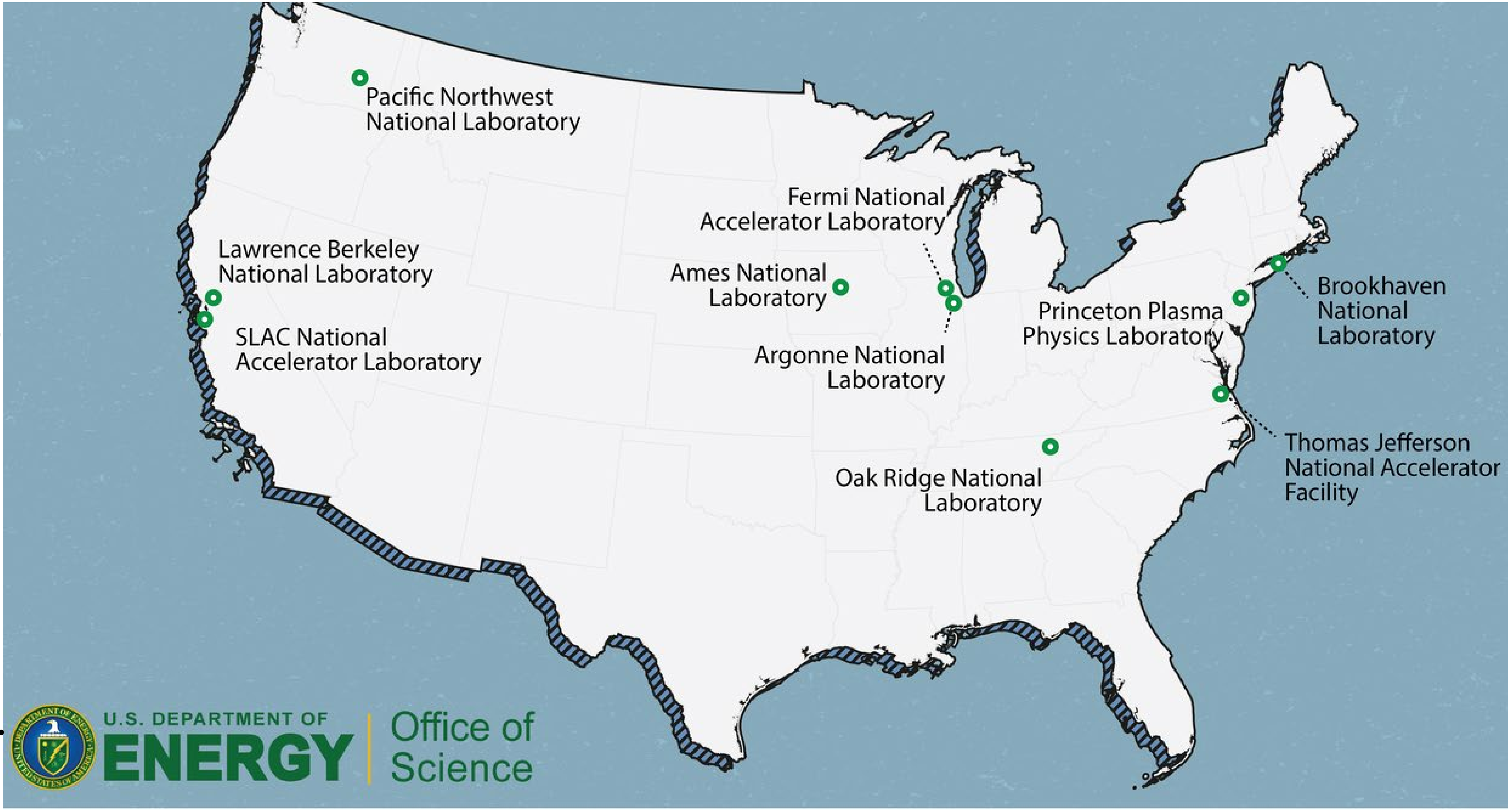
Office of Science Program Offices

OPA Supports 9 SC program areas, and has a direct reporting line to SC Senior management.



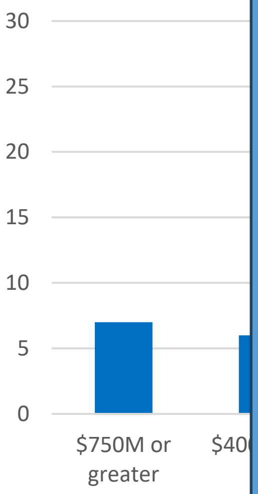
SC Peer Reviewers

SC benefits from a large community of peer review practitioners (1,500+ technical, ES&H, C&S, and PM subject matter experts) from the SC National Labs, university, and other institutions.



Office of Science Projects

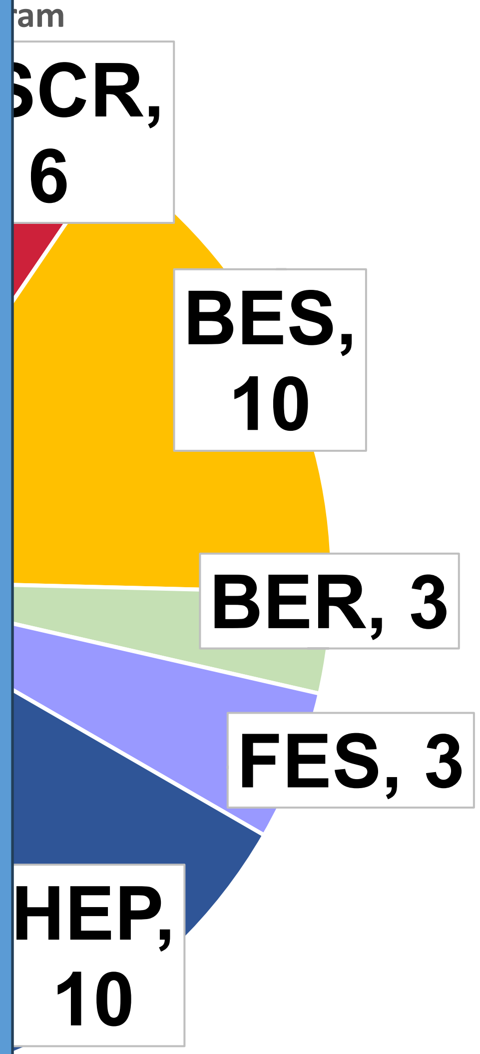
- **59 Active Pr**
- Performance
  - —17 project
  - —1 projects
  - —No projec
- Phase
  - —21 project
  - —34 project
  - —4 projects



5 Projects Under $50M Delegated

SCAN ME!

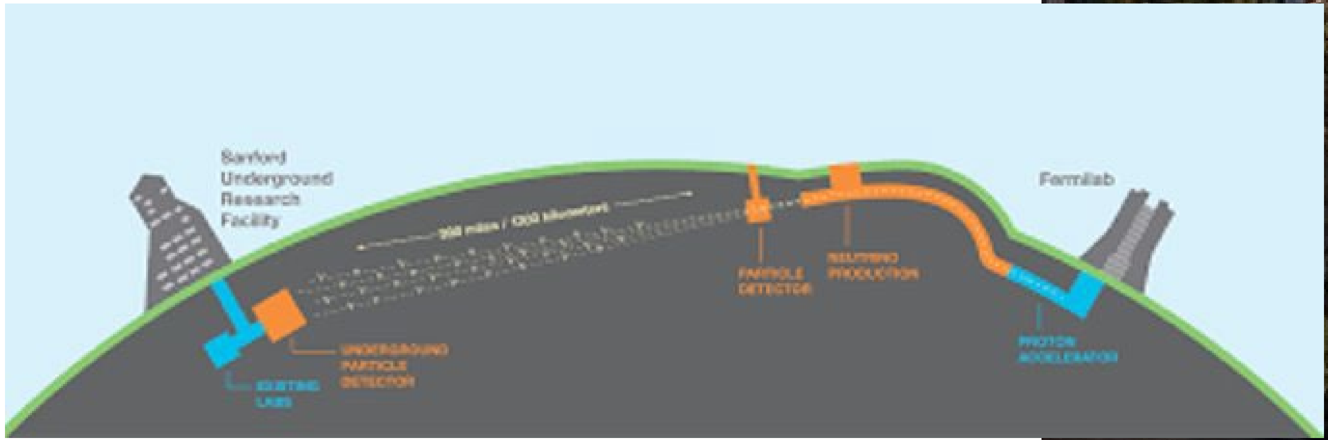
Visit the OPA Website

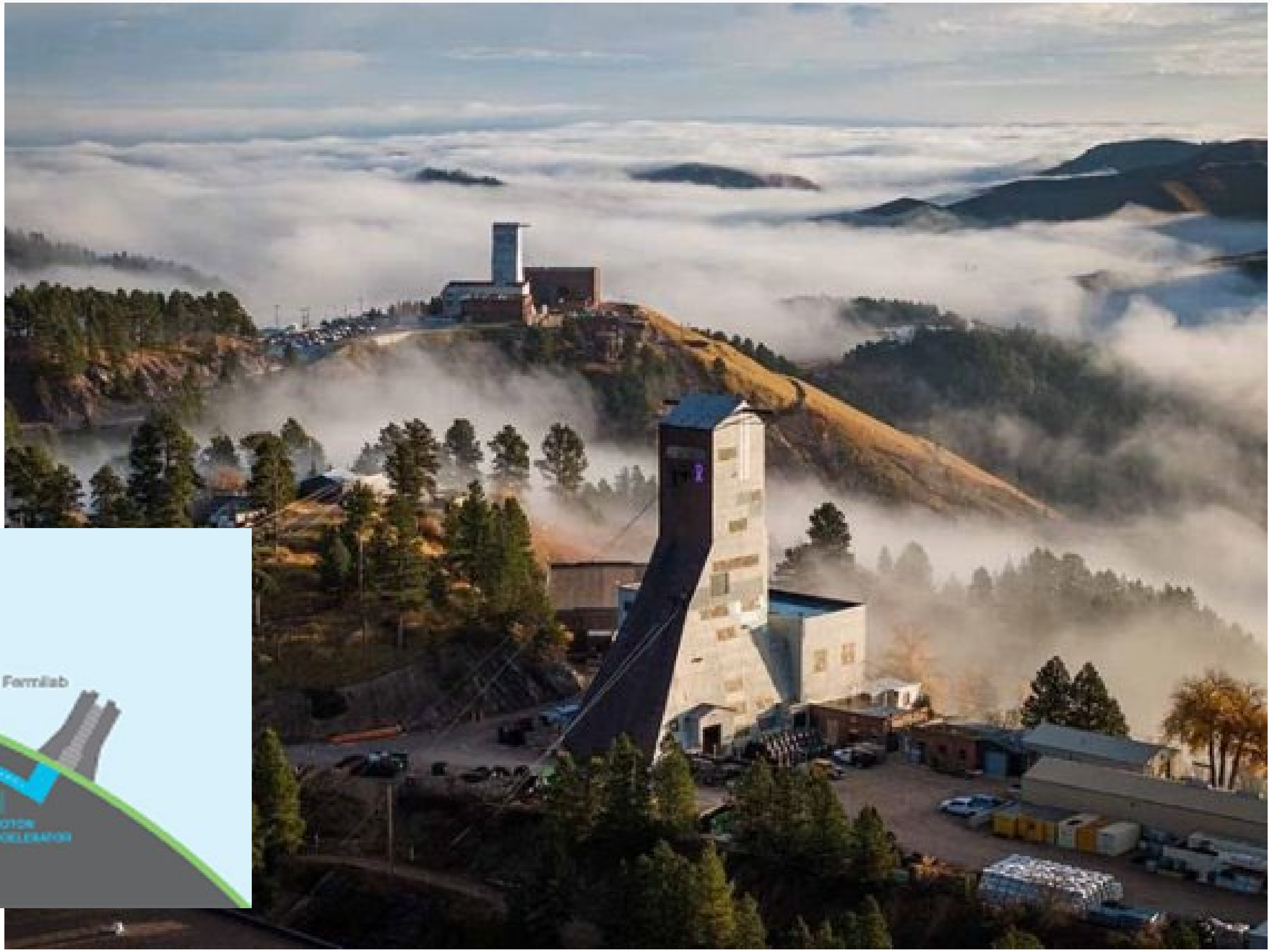


Office of Science – The LBNF/DUNE Project

The Long Beamline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE)

Fermi National Accelerator Laboratory

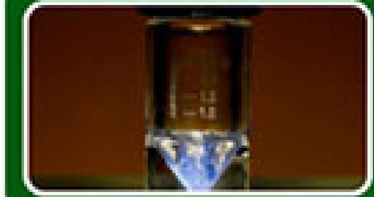




Office of Science – The SIPRC Project

The U.S. Stable Isotope Production and Research Facility (SIPRC)

Oak Ridge National Laboratory



Produce and/or distribute radioactive and stable isotopes that are in short supply; includes by-products, surplus materials and related isotope services

Maintain the infrastructure required to produce and supply priority isotope products and related service

Conduct R&D on new and improved isotope production and processing techniques which can make available priority isotopes for research and application. Develop workforce.

Reduce U.S. dependency on foreign supply to ensure National Preparedness.

Office of Science – The LCLS-II Project

The Linac Coherent Light Source II

SLAC National Accelerator Laboratory

Linac Coherent Light Source II Project

Hanley Lee
Manager
DOE-SLAC Site Office

Outline

- Background
- International Competition
- Mission Need
- Project Overview
- Key Performance Parameters
- Project Organization
- Schedule and COVID
- Scope
- Lessons Learned
- Final Thoughts

Background

- Prior to LCLS, x-ray light sources were ring-based synchrotron radiation facilities
- Early research for an x-ray facility using a linear accelerator was conducted in the early 1990's
- SC funded R&D to develop the Free Electron Laser (FEL) concept
- LCLS project was initiated in 2000 and was completed in 2009 which was the world's first hard x-ray FEL; a 4^{th} generation light source
- Success of LCLS initiated international competition for FELs

International Facilities

EuXFEL, Germany

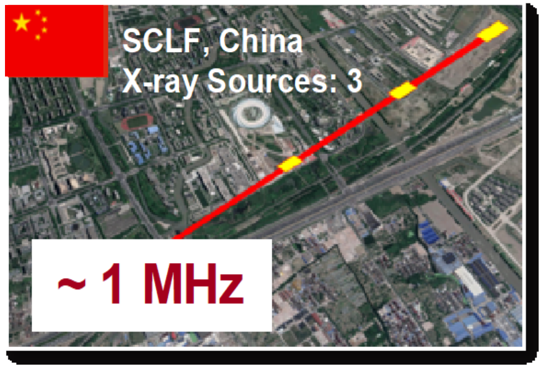
SACLA, Japan

SwissFEL, Switzerland

PAL-FEL, Korea

Upgrade path (2025-2030)
- Second instrument fan
- MHz CW operation

Under construction



Shanghai XFEL, ~2025
- Plans for MHz CW repetition rate
- 3 beamlines, 10 instruments

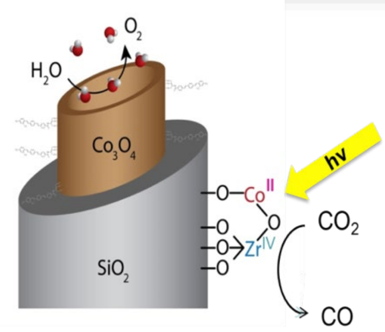
The success of LCLS has driven construction of international FELs

Mission Need

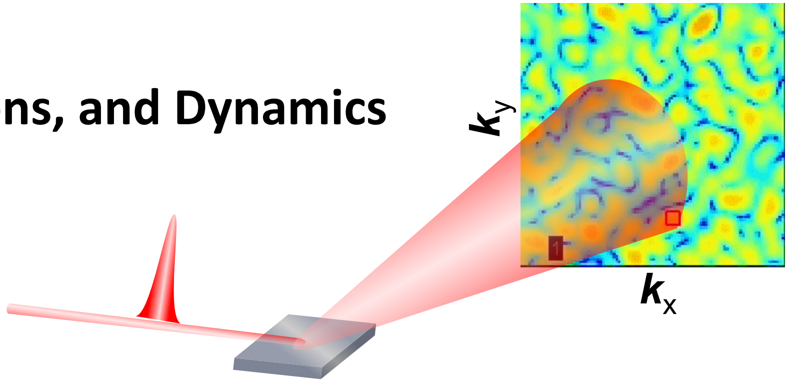
- To maintain US leadership, the Office of Science approved the mission need statement in 2010 to upgrade LCLS.
- On July 25, 2013, a report from the Basic Energy Sciences Advisory Committee recommended specific scientific performance requirements for future x-ray sources.
- The advisory committee stated, "It is considered essential that the new light source have the pulse characteristics and high repetition rate necessary to carry out a broad range of coherent "pump-probe" experiments, in addition to a sufficiently broad photon energy range (at least ~0.2 keV to ~5.0 keV) and pulse energy necessary to carry out novel "diffract before destroy" structural determination experiments important to a myriad of molecular systems."

The Science

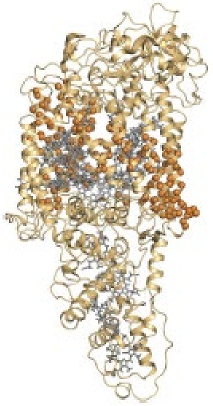
1. **Chemistry - Predictive understanding of photo-catalysis**
   - Natural and artificial photo-catalytic systems
   - Fundamental light harvesting and charge separation



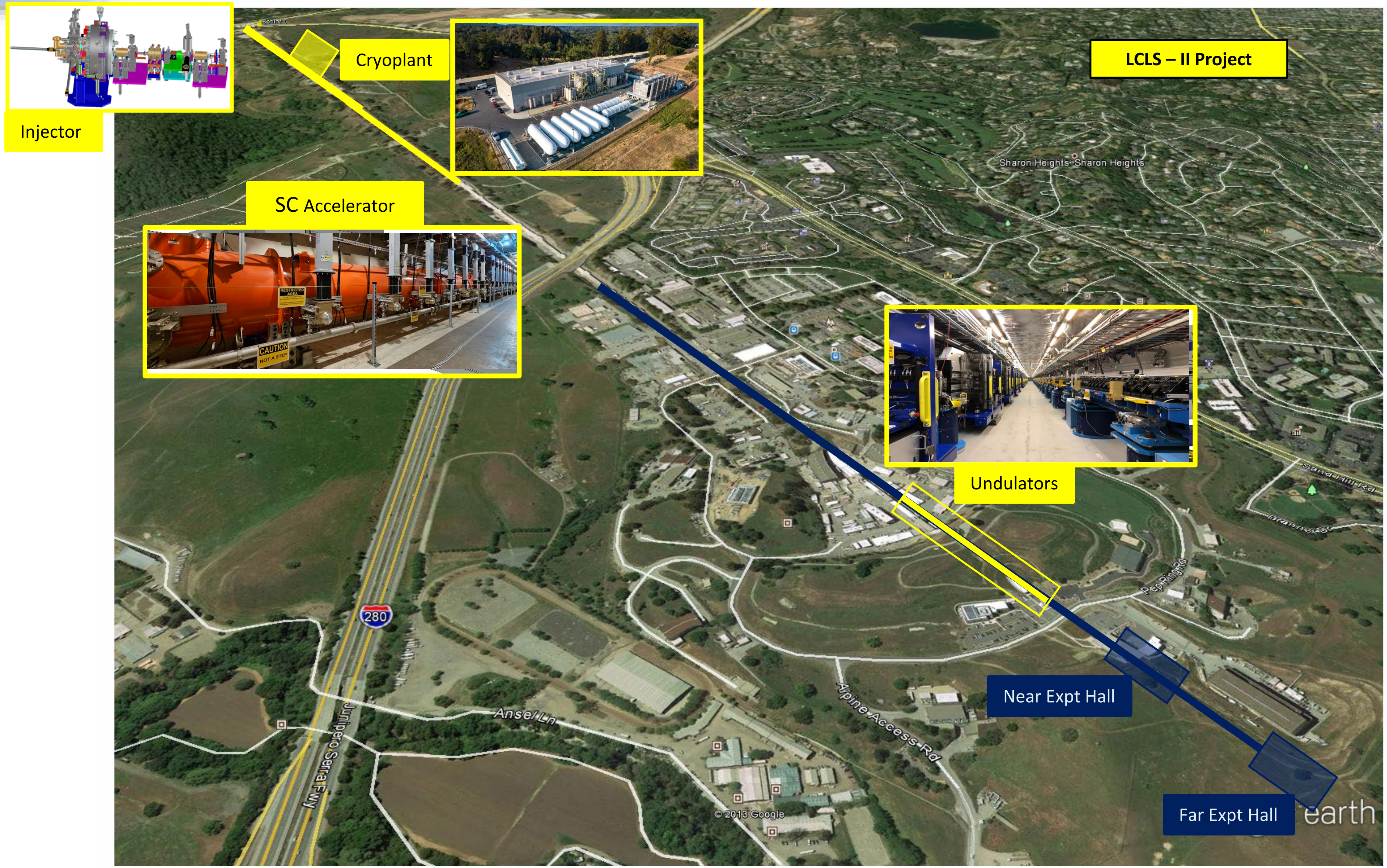
2. **Materials Physics – Understand Nanoscale heterogeneity, fluctuations, and Dynamics**
   - Energy conversion, transport and phase transitions at the nanoscale
   - Electronic, chemical, structural heterogeneity & fluctuations



3. **Life Sciences - Understanding the dynamics of biological complexes and molecular machines**
   - Dynamical measurements to increase insight to biological function



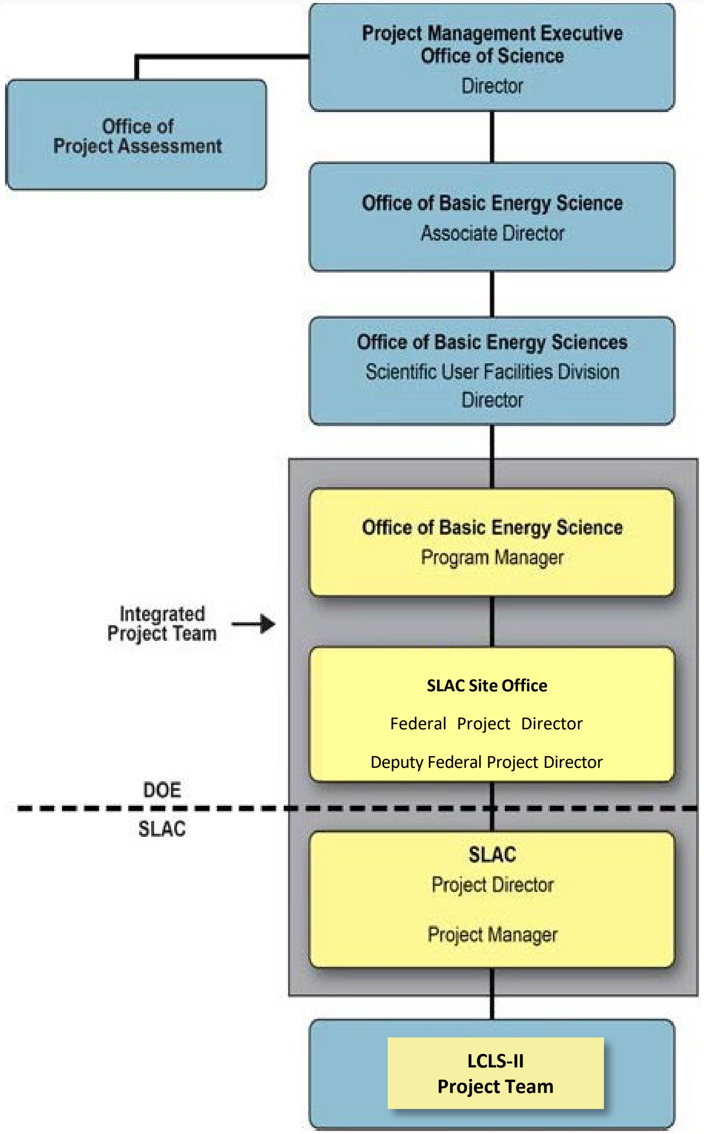
Project Overview



Key Performance Parameters

Performance Measure	Threshold (5 kW beam)	Objective (120 kW beam)	Measurements
Variable gap undulators	2 (soft and hard x-ray)	2 (soft and hard x-ray)	
Superconducting linac-based FEL system			
Superconducting linac electron beam energy	3.5 GeV	≥ 4 GeV	Spectrometer bend (magnet strength, screen)
Electron bunch repetition rate	93 kHz	**929 kHz**	BPM's, laser rate
Superconducting linac charge per bunch	0.02 nC	0.1 nC	Toroid, Faraday cup
Photon beam energy range	250–3,800 eV	**200–5,000 eV**	Absorption edges, spectrometer
High repetition rate capable end stations	≥ 1	≥ 2	Installed
FEL photon quantity (10^{-3} BW) per bunch	$5x10^8$ (10x spontaneous) @2,500 eV	> 10^{11} @ 3,800 eV	Gas energy monitor, GMD, Spectrometer
Normal conducting linac-based system			
Normal conducting linac electron beam energy	13.6 GeV	15 GeV	Spectrometer bend (magnet strength, screen)
Electron bunch repetition rate	120 Hz	120 Hz	BPM's, laser rate
Normal conducting linac charge per bunch	0.1 nC	0.25 nC	Toroid, Faraday cup
Photon beam energy range	1–15 keV	1–25k eV	Absorption edges, spectrometer
Low repetition rate capable end stations	≥ 2	≥ 3	N/A
FEL photon quantity (10^{-3} BW[a]) per bunch	10^{10} (lasing @ 15 keV)	> 10^{12} @ 15 keV	Gas energy monitor, GMD, Spectrometer

Project Organization



Partner Laboratories

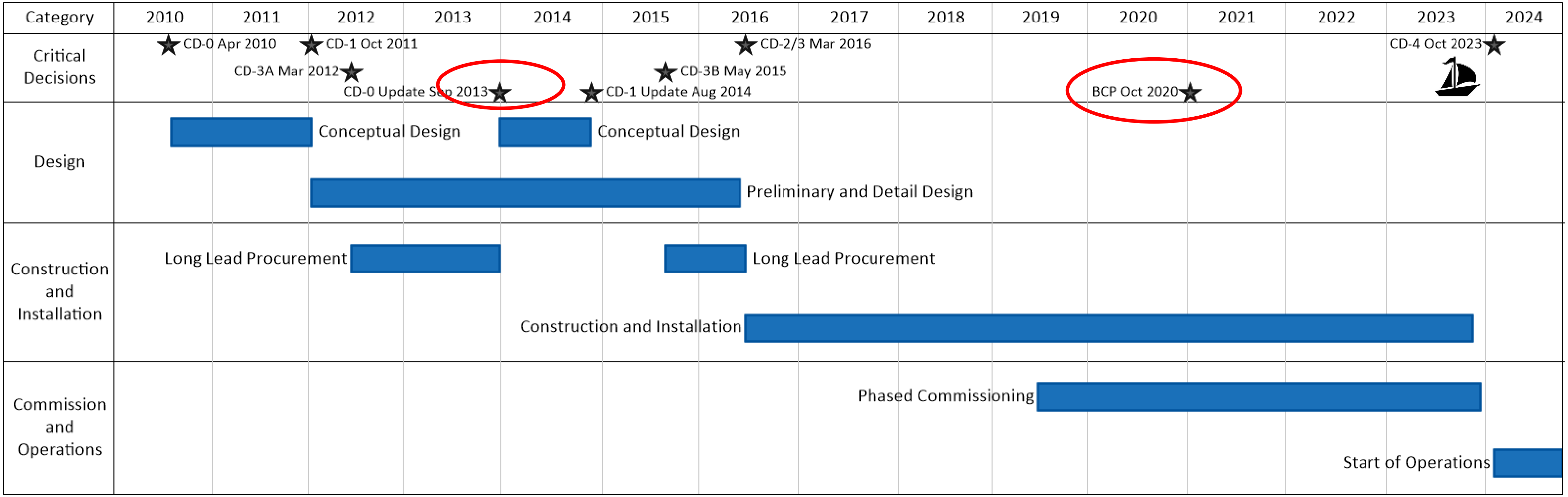
Fermilab	• Cryomodule engineering and design • 50% of 1.3 GHz cryomodules • 3.9 GHz cryomodules • Helium distribution system • Processing for high Q (FNAL-invented gas doping)
Jefferson Lab	• 50% of 1.3 GHz cryomodules • Cryoplant design and acquisition • Processing for high Q
Berkeley Lab	• Undulators • electron gun and associated injector systems
Argonne National Laboratory	• Undulator vacuum chamber • Undulator R&D: vertical polarization prototype • Supports FNAL w/ SCRF cleaning facility
Cornell University	• R&D planning, prototype support • processing for high-Q (high Q gas doping)

Additional support through many other institutions

CERN, DESY, CEA, CNRS, SNS Spallation Neutron Source

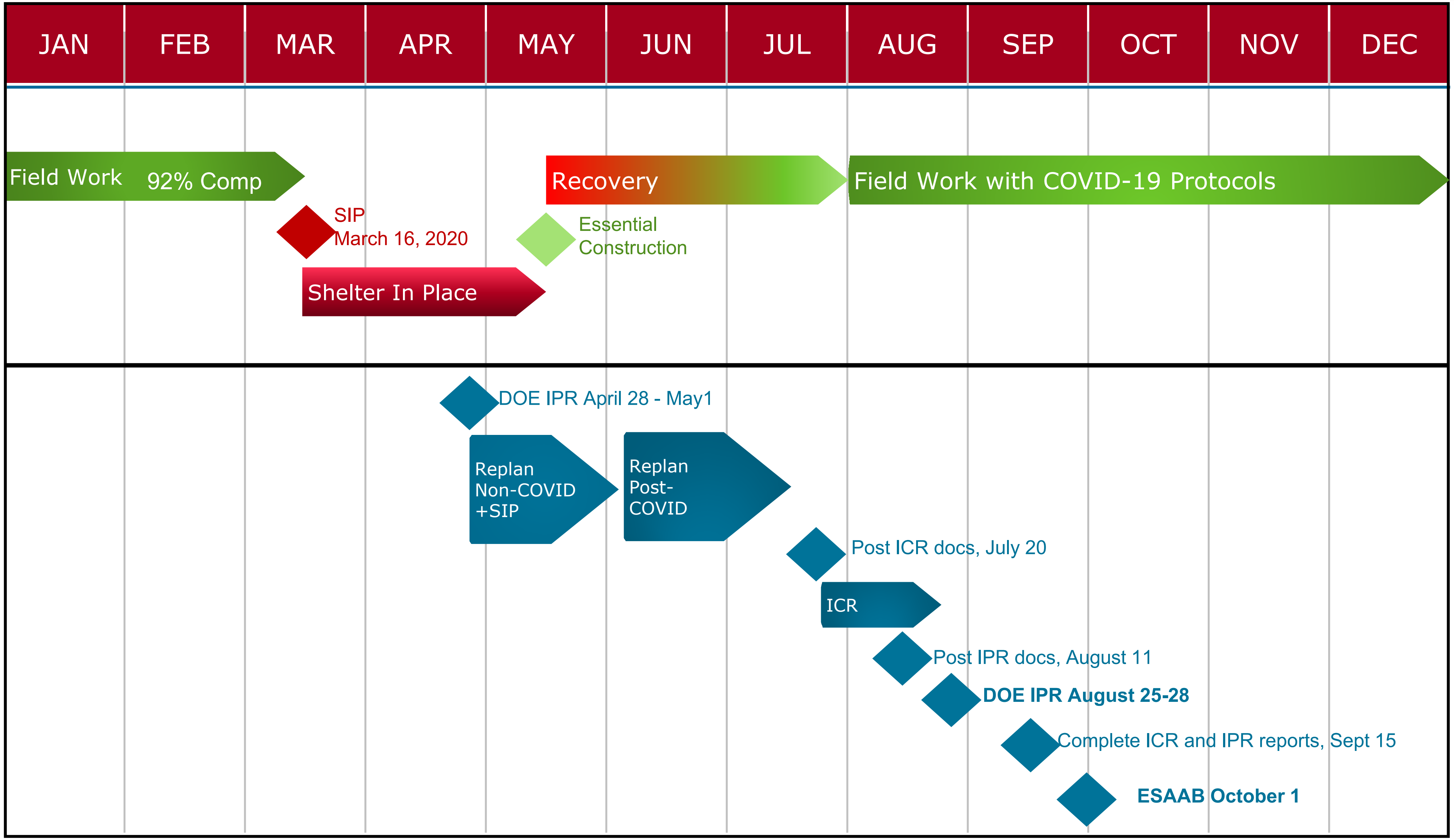
Collaboration's expertise and experience with superconducting technology were critical to the project's success

Schedule



Fiscal Year	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	Total
TEC-PED			2.0	5.0	4.0	21.0	15.0							47.0
TEC-Construction			42.5	17.5	71.7	117.7	185.3	190.0	192.1	129.3		59.0	28.1	1,033.2
OPC	1.1	9.5	8.0		10.0	9.3			7.9	6.1			4.3	56.2
TPC	**1.1**	**9.5**	**52.5**	**22.5**	**85.7**	**148.0**	**200.3**	**190.0**	**200.0**	**135.4**	**-**	**59.0**	**32.4**	**1,136.4**

COVID Rebaseline Process



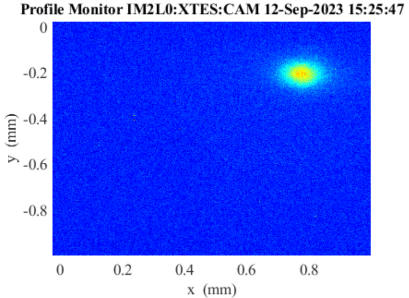
Superconducting Accelerator – FNAL and JLab

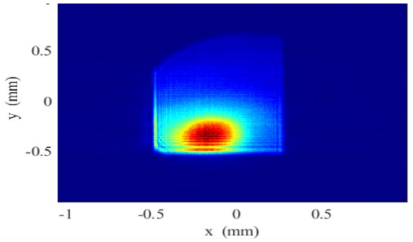
Cryogenic Plants - JLab

Hard and Soft X-ray Undulators - LBNL

Soft X-Ray Undulator

Hard X-Ray Undulator





First Light Achieved August and September 2023

By the Numbers

41,648 Project activities

907 Milestones (L1 thru L4)

146 Monthly reports

4.7M Work hours at all 5 national labs; 12 TRCs and 7 DARTs

2.8M Work hours at SLAC by 1,400+ employees

1.57M Linear feet of cables installed with 13,400 individual cables

570 Control racks installed

37 Cryomodules which required 20,000 piece-parts per cryomodule

32 HXU and **21** SXU

2 Cryoplants Each delivering 4.0 KW @ 2K with 2500 Kg of helium

Lessons Learned

- A multi-laboratory Collaboration was necessary to quickly deliver a new capability using their expertise on critical technologies
- Strong international collaboration with the Eu-XFEL Project, CEA-Saclay, CERN, and KEK provided lessons learned
  - CM production, transportation
  - Installation and commissioning
- Using extensive peer and independent review process was critical
- Quickly pivoting to re-baseline after COVID
- Shortcuts in Design Verification before Production were costly

Media Coverage

Final Thoughts

- Projects will always have to contend with issues and risks
  - Technical risks and resource issues
  - Natural events – wildfires, atmospheric river events causing power outages
  - COVID Pandemic
- IPT needs to work and communicate in an open environment
  - No surprises in communicating with Project Owner and stakeholders
- Project managers develop broad knowledge and experience
  - Management: Critical soft skills - communications, negotiating, conflict management
  - Technical: Understanding the underpinning science and engineering, ES&H
  - Business: Budget, finance, procurement, HR, site planning, S&S, real and personal property, legal
  - All of which prepares PMs as well-rounded resources or for career opportunities beyond managing projects

Questions