



# 2022 RESEARCH INFRASTRUCTURE WORKSHOP

Panel for RIW'22: O&M Budget Execution  
Panelists: Bob Blum, Laura Slicer, Hannah Hansen, John Maclean  
September 15, 2022





# WBS related approach vs 1030

Bob Blum  
Rubin Observatory/NSF's NOIRLab  
Director for Operations





# Rubin Observatory Context



Rubin is a 50-50 DOE-NSF partnership



Operated by NOIRLab and SLAC via managing organizations AURA and SLAC



Each partner has visible contributions, but overall plan is integrated based on activities laid out by Operations WBS



Under construction, Ops start 2024

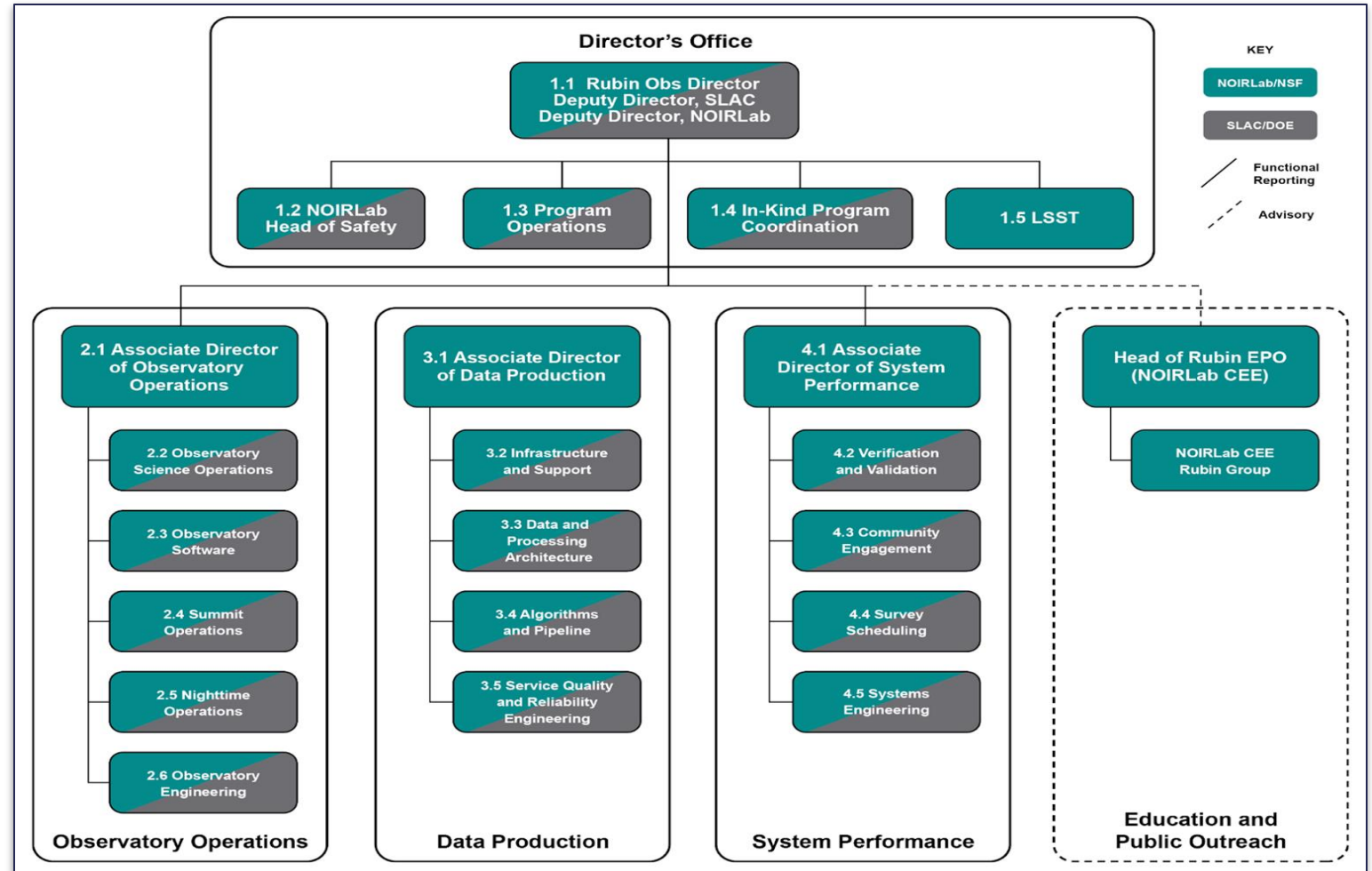




# WBS Based Operations Plan



- Currently in “pre-Operations” as separate CSA to Construction
- 5yr Proposal to Joint NSF-DOE Review in February
- \$320M FY23-27



*The WBS provides a consistent framework for planning, estimating costs, developing schedules, identifying resources, and determining where risks may occur.*





# Operations planning, from WBS to Staffing and Budget

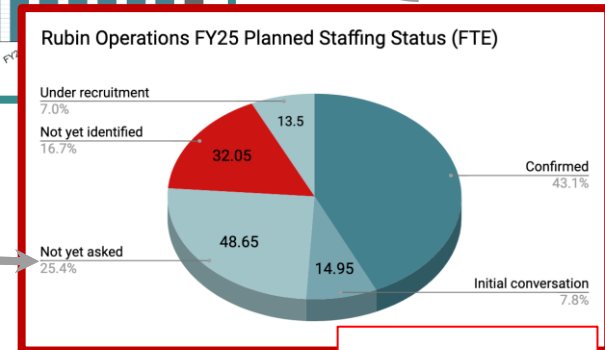
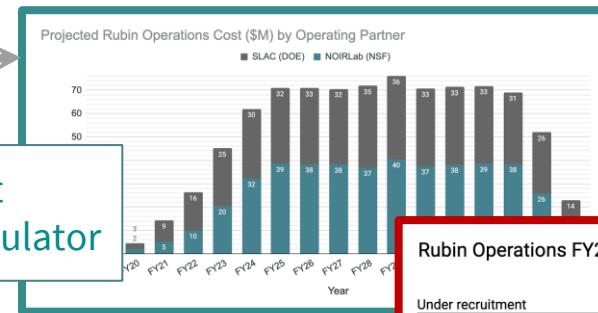


- We use a system of custom-built, dynamically-linked, collaborative Google Sheets workbooks for interactive and cross-department staffing and budget planning.
- We specify resource needs in a WBS workbook that includes our labor and non-labor plans
- We estimate costs and derive budget requests from the labor and non-labor plans in a connected Cost Calculator workbook.
- We then identify people to meet our labor needs in a connected Staffing Plan workbook.

		Pre-Operations				
		FY21	FY22	FY23	FY24	FY25
1	2 3 4 5					
WBS	Role Title					
0.0c	<b>Total Direct FTEs</b>	<b>35.0</b>	<b>63.3</b>	<b>107.4</b>	<b>139.8</b>	<b>171.0</b>
1.0	<b>Director's Office</b>	<b>7.1</b>	<b>8.3</b>	<b>11.0</b>	<b>13.3</b>	<b>15.3</b>
1.1	Rubin Observatory Directorate	2.50	2.75	3.00	3.00	3.00
1.2	Safety	0.00	0.00	0.00	0.13	0.25
1.3	Program Operations	4.00	4.225	6.50	8.15	9.75
1.4	In-kind Program Coordination	0.50	1.10	1.50	1.80	1.80
1.5	LSST	0.13	0.19	0.00	0.25	0.50
2.0	<b>Observatory Operations</b>	<b>1.7</b>	<b>2.6</b>	<b>16.1</b>	<b>36.5</b>	<b>59.6</b>
2.1	Observatory Operations Management	0.38	0.50	1.50	1.60	2.25
2.2	Observatory Science	0.38	1.00	3.00	5.10	6.75
2.3	Observatory Software	0.50	0.50	3.50	7.62	11.50
	Observatory ITC	0.00	0.00	0.00	0.00	0.00
2.4	Summit Operations	0.10	0.20	0.80	7.70	14.60
2.5	Nighttime Operations	0.00	0.00	5.00	8.00	13.00
2.6	Observatory Engineering	0.35	0.35	2.30	6.43	11.50
3.0	<b>Data Production</b>	<b>17.7</b>	<b>36.2</b>	<b>48.4</b>	<b>59.1</b>	<b>65.7</b>
3.1	Data Production Management	0.75	1.25	1.25	1.45	1.75
3.2	Infrastructure and Support	4.99	15.17	22.13	24.15	23.20

WBS (labor & non-labor)

Cost Calculator



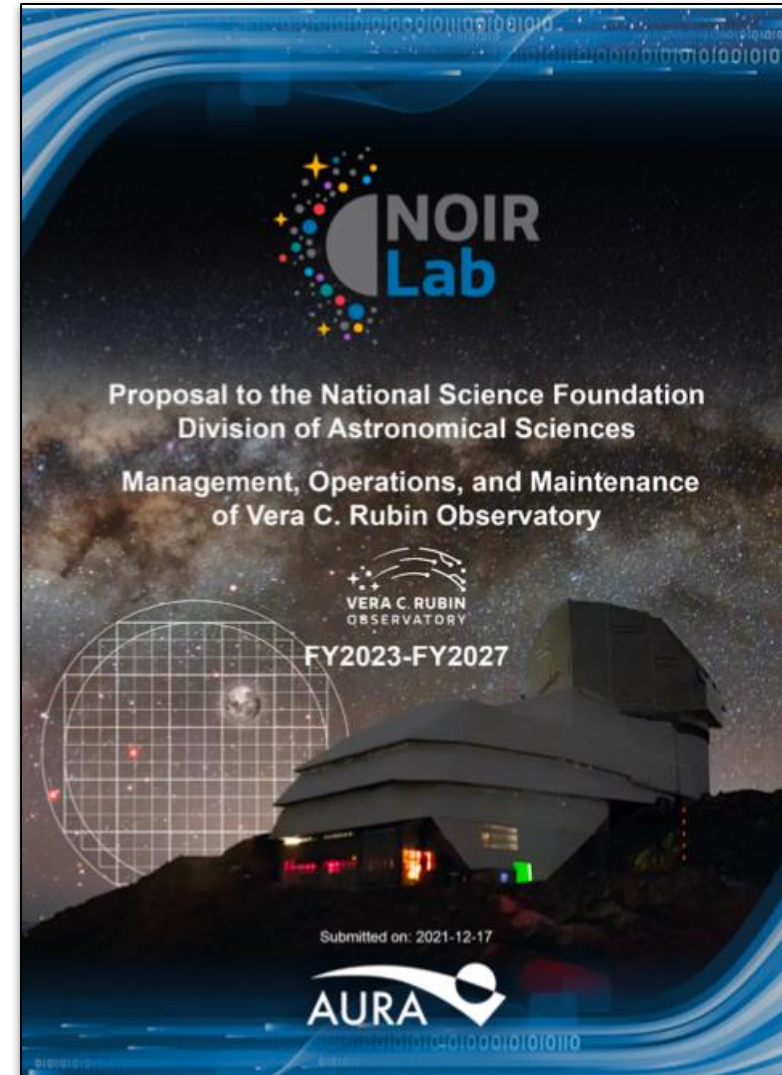
Staffing Plan

Each of these interconnected tools is based on the WBS



# Proposal and Reporting

- WBS easily allows splitting costs between NOIRLab SLAC
- Independent budgets submitted to each agency, but WBS based plan reviewed by joint panel
- NSF proposal budget submitted in 1030 format, but reviewed independently in WBS format (BOEs, staffing)
- Significant effort to map WBS into 1030. Single category can draw from many distinct WBS elements/structure (e.g. travel).













# WBS related approach vs 1030



- Rubin budget and operations planning/tracking based at all levels on WBS
- Allows seamless development framework from plan to proposal to budget to reporting
- Ask whether 1030 format and categories adds value. Can be difficult to map from WBS leading to errors through manual steps required to capture this view. Expenses can always be easily tracked by category within WBS.
- Programs, reviewers, program officers all need WBS view.





# NSF's NOIR Lab

John Maclean  
Director of Central Operations Services

Presented by Bob Blum  
Rubin Observatory/NSF's NOIRLab  
Director for Operations

## Discovering Our Universe Together



For the first time, all of the ground-based optical observatories funded by the National Science Foundation are unified into a single organization.



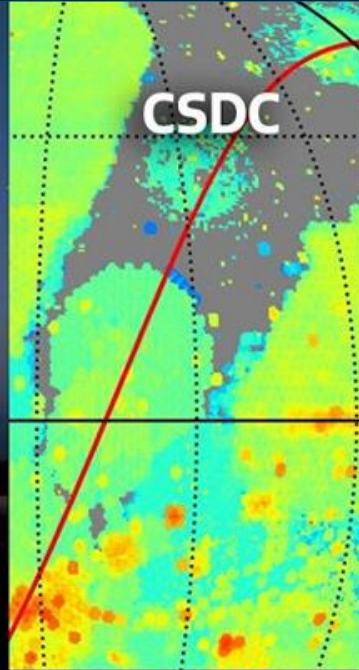


# NOIRLab's five Programs are:

**Kitt Peak**



**CSDC**



**Gemini**  
*With our international partners*



**Cerro Tololo**



**Rubin Observatory Operations**  
*An NSF-DOE Partnership*





**NSF's NOIRLab**  
 HQ, Tucson, Arizona

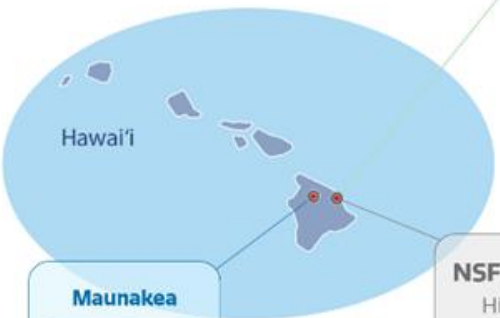
CSDC CTIO GEMINI KPNO RUBIN US-ELTP

**AURA Corporate Office**  
 HQ, AURA-O, CAS, NSF-funded HR

Washington DC | Baltimore, MD  
 La Serena, Chile | Santiago, Chile  
 Tucson, AZ | Hilo, HI

**Kitt Peak**

KPNO



**Maunakea**

GEMINI

**NSF's NOIRLab**  
 Hilo, Hawai'i

GEMINI

**NSF's NOIRLab**  
 Recinto, La Serena, Chile

CTIO CSDC GEMINI RUBIN

**Cerro Tololo**

CTIO

**Cerro Pachón**

CTIO GEMINI RUBIN

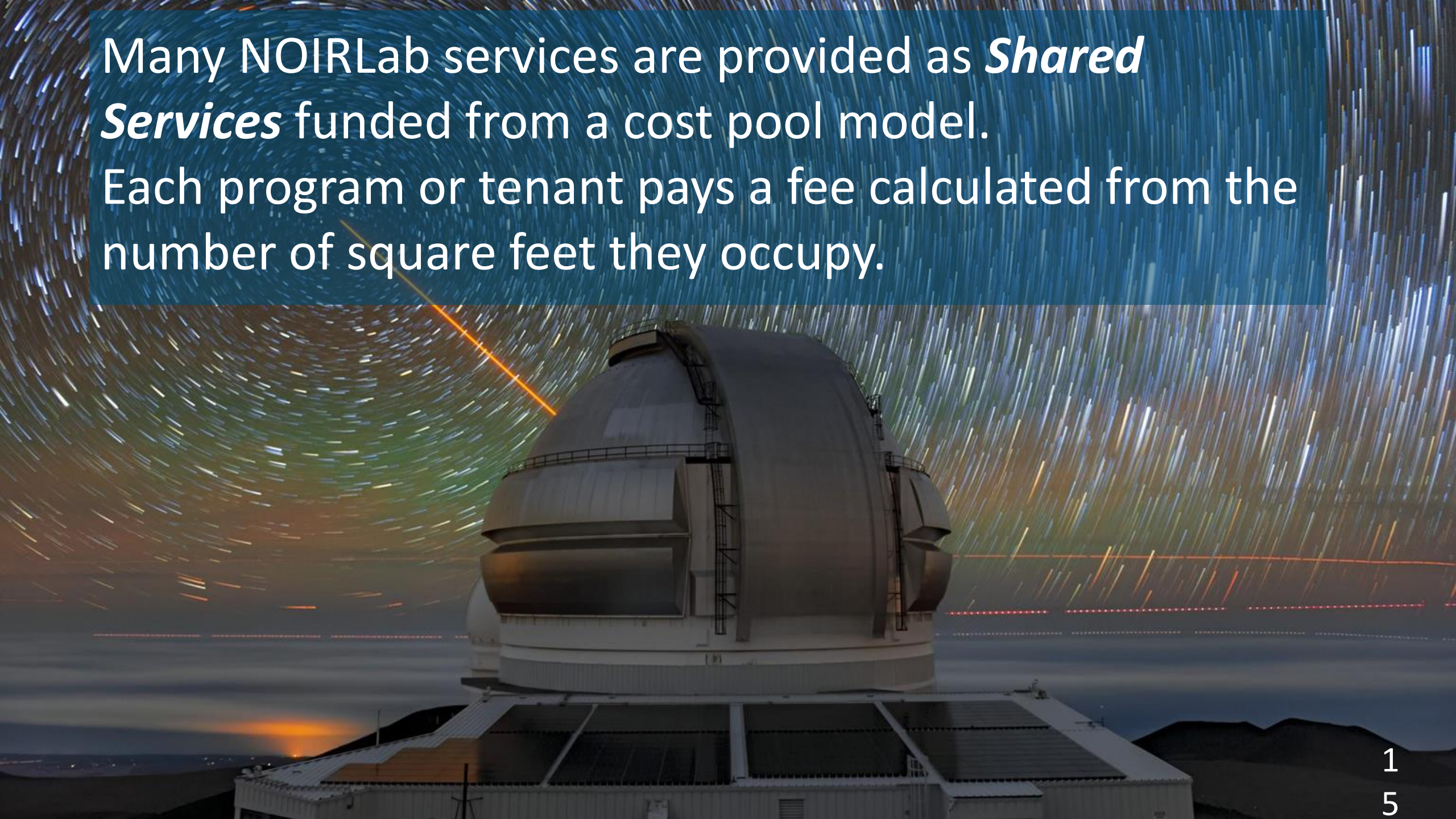


NOIRLab hosts 70 of the most diverse and innovative ground-based telescopes in the world.





Many NOIRLab services are provided as *Shared Services* funded from a cost pool model. Each program or tenant pays a fee calculated from the number of square feet they occupy.





Each service organization provides a range of services  
from a service catalog





Center Operations Services provides shared services across the whole of  
NOIRLab:  
Safety, Information Technology and Facilities





## Advantages for NOIRLab :

- Simplified administration of charging costs to programs
- Share expertise across the Lab
- Standardizes processes
- Increases efficiency





## Things to consider:

- Each site has to have its own charge per sq foot
- Some services charged on 'per use' basis
- Avoid the appearance of double charging for effort







# WBS related approach vs 1030

Laura Slicer  
Ocean Observatories Initiative  
Sr. Manager - Finance

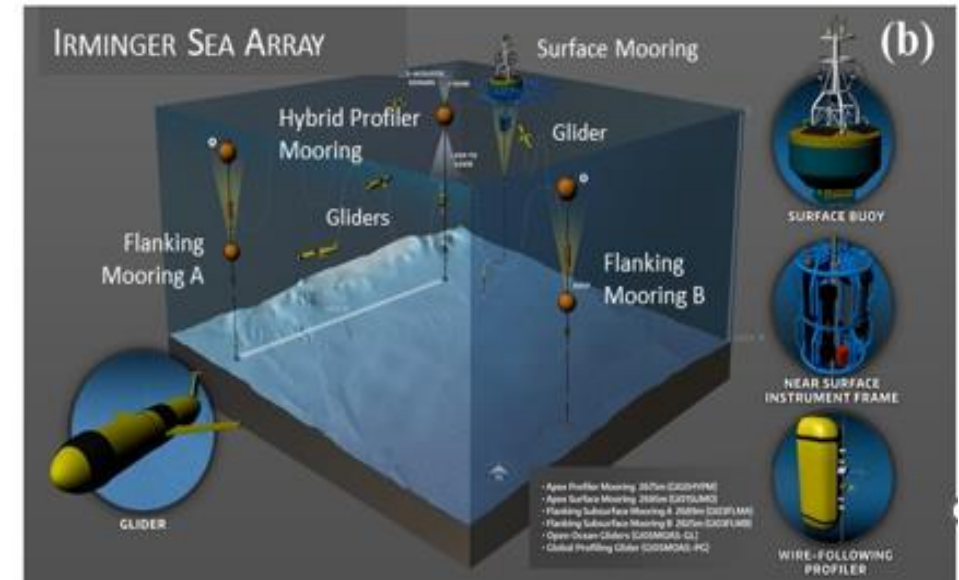
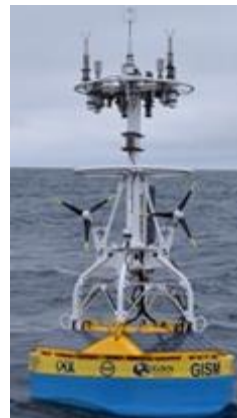




# Ocean Observatories Initiative (OOI) Overview



- OOI is an integrated distributed network that enables scientific investigation of interlinked physical, chemical, biological, and geological processes at key locations in the Atlantic and Pacific Oceans.
  - Coastal and Global Arrays - Moorings, gliders, underwater vehicles
  - Cabled Array - Permanent electro-optical cables
- Data collected from the OOI arrays are freely distributed over the internet to researchers, students, and educators in real-time via a common integrated Cyberinfrastructure.
- Managed by Woods Hole Oceanographic Institution
  - Program Management Office (PMO)
  - Coastal and Global Scale Nodes (CGSN)
  - Major Subawardees
    - University of Washington
      - Regional Cabled Array (RCA)
    - Oregon State University
      - Endurance Array (EA)
      - Data Center (DC)





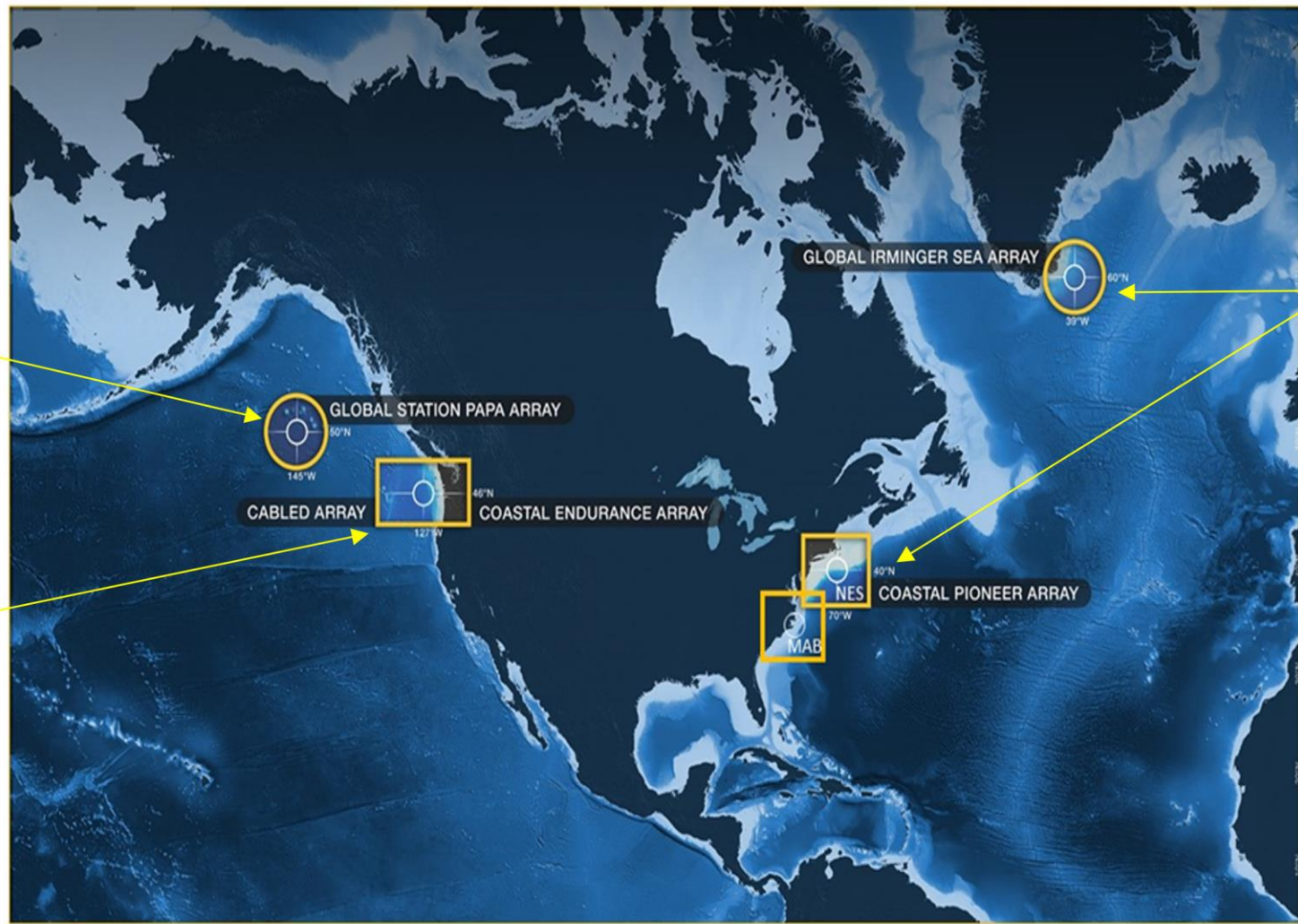


# Ocean Observatories Initiative (OOI) Overview



WHOI -CGSN

UW – RCA  
OSU - EA



WHOI -CGSN





# WBS Structure



- OOI utilizes a single, comprehensive WBS structure across the entire program.

WBS Hierarchy	Type	WBS Level Description
X	S1	Project Year (Summary Level)
X.X	S2	Functional Category (Summary Level)
X.X.X	S3	Array (Summary Level)
X.X.X.X	S4	Platform/Activity (Summary Level)
X.X.X.X.X	C	IO Specific Control Account (Funding Allocation)

WBS Hierarchy	Type	WBS Level Description
6	S1	Project Year VI
6.2	S2	Refurbishment
6.2.5	S3	Pioneer Array
6.2.5.3	S4	Coastal Instruments
6.2.5.3.1	C	WHOI

WBS Hierarchy	Type	WBS Level Description
6	S1	Project Year VI
6.2	S2	Refurbishment
6.2.6	S3	Endurance Array
6.2.6.3	S4	Coastal Instruments
6.2.6.3.3	C	OSU





# WBS Structure



- Cost estimates are done at the 5th level of the WBS structure.
  - IOs may utilize an additional level for further management insight into a specific area, but funds are not requested, tracked, or reported beyond level 5.
- Cost estimates and resource allocation by WBS are contained in a series of Cost Books, specific to each IO.
  - Includes such information as:
    - Personnel, level of effort, and wage costs
    - Refurbishment requirements, including BOMs and schematics
    - Cruise Plans and Schedules
- Cost Books are the driver behind Annual Work Plan development





# WBS Structure vs. 1030



- There is some measure of effort involved to map the WBS to the specific 1030 cost categories for funding request purposes.
  - OOI does not formally report on 1030 cost categories, other than the Financial Data Collection Tool.
    - Quarterly and Annual Reports include financial activity - actuals, pending changes, and projections - by the WBS control account.
- 1030 costs are tracked at a high level by WHOI for internal control and institutional budgeting and as part of subaward management activities.





# WBS related approach vs 1030

Hannah Hansen  
LIGO Laboratory  
Business Manager





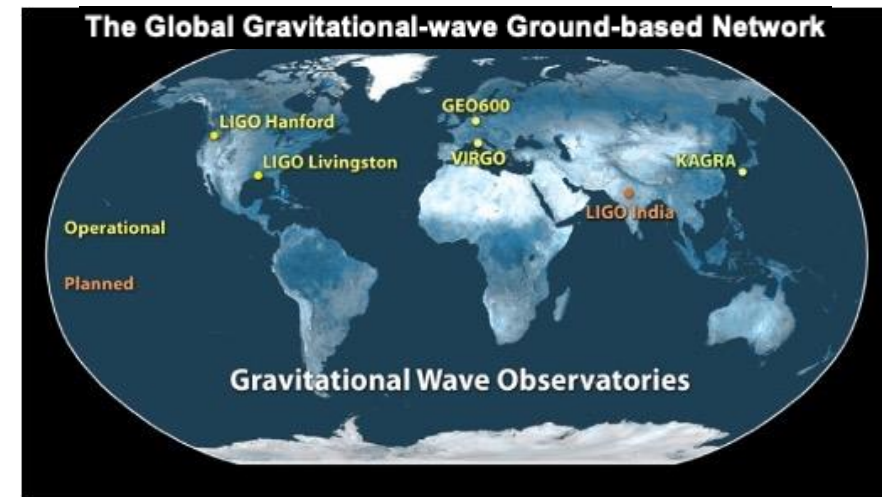
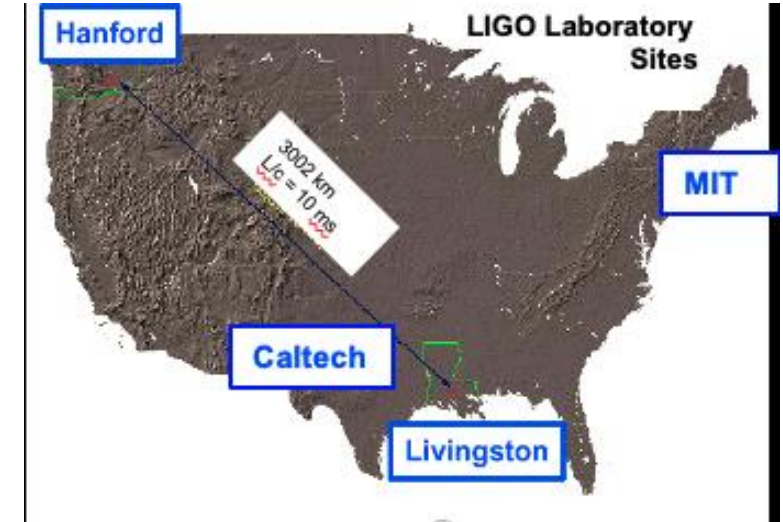
# LIGO Laboratory Overview

**LIGO**

**LIGO Laboratory is the world's leading facility for producing gravitational-wave science.**

LIGO Laboratory is comprised of 186 FTEs, working primarily from four locations: Caltech, MIT, LIGO Hanford (LHO), LIGO Livingston (LLO).

- The LIGO Observatories serve a broad, worldwide community of gravitational-wave researchers
  - The LIGO Scientific Collaboration - ~ 1500 members who carry out the scientific mission of LIGO
  - The Virgo Gravitational-Wave Detector and the Virgo Collaboration – European GW detector
    - A partner since 2007
  - The KAGRA Gravitational-Wave Detector and KAGRA Collaboration
    - A partner since 2019







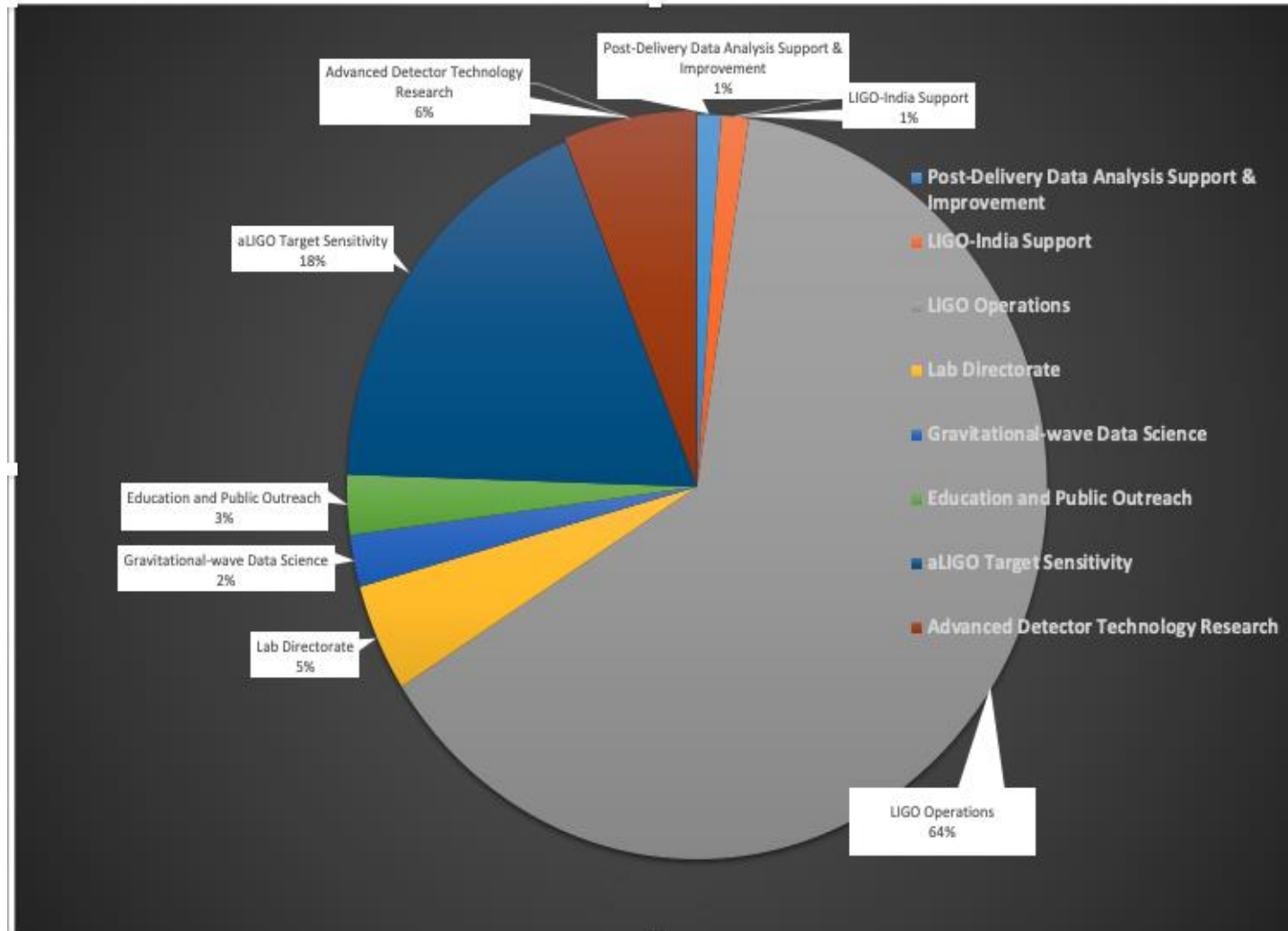
# LIGO O&M Budget Overview



**LIGO**

LIGO Operations and Maintenance FY19-23 structured into activity-based work breakdown structure organized along 8 'level 1' activities

- All Annual Reports, Annual Work Plans, Quarterly Reports, and internal monthly financial reports are all reported at this level. The monthly internal financial reports include ability to review budgets, spending, and variances at the lowest cost collector and expenditure type. (PTA: Project, Task, Award)
- Post Award: 1030 Codes are manually mapped to budget and actual financial data. Utilize for funding requests and LF Data Collection Tool





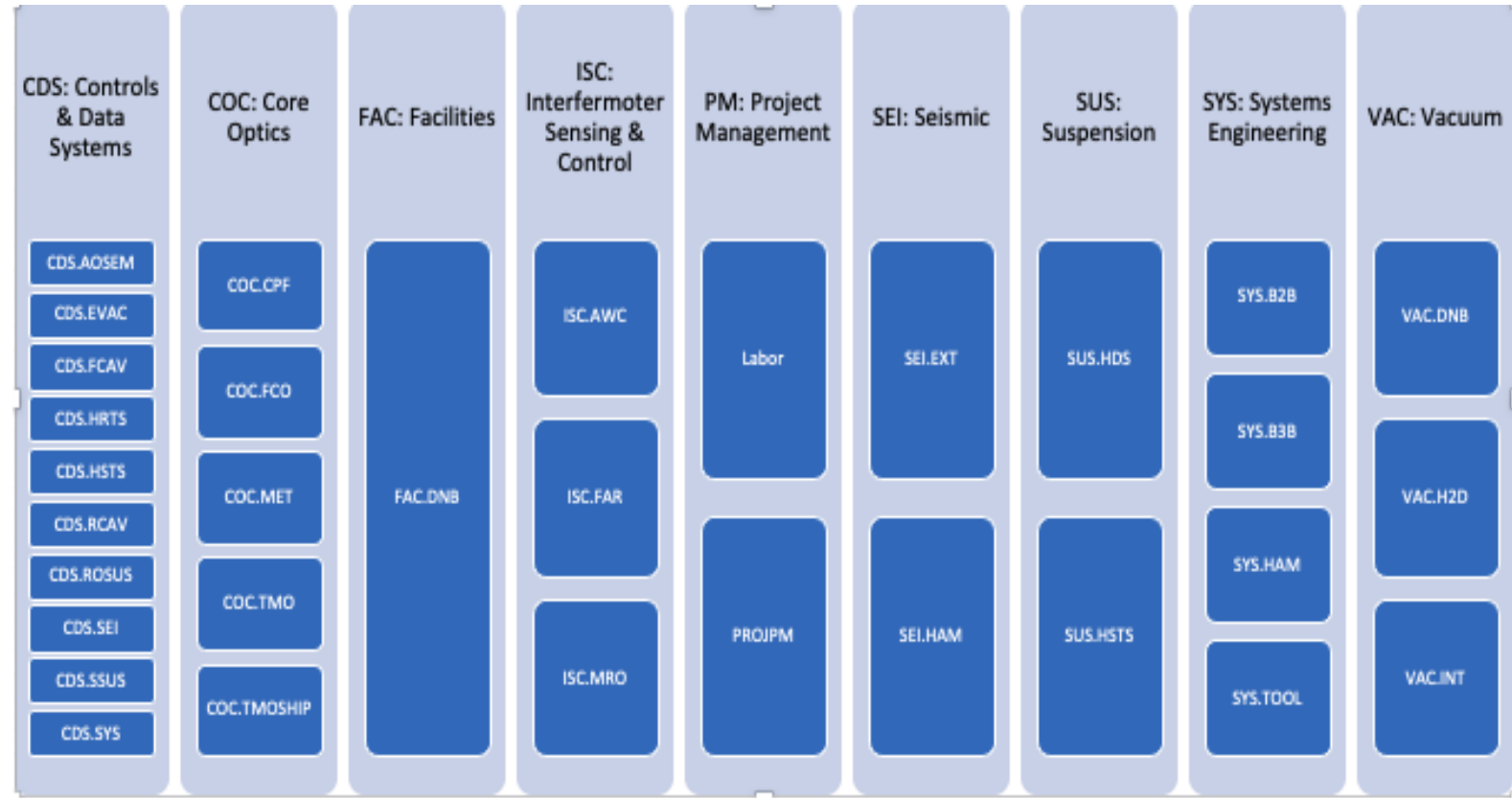


# LIGO A+ Upgrade Project Overview



LIGO A+ Project Upgrade is a separate award with project schedule and EVMS reporting requirements. This project is broken down into 9 level 1 subsystem categories.

- All Annual Reports, Annual Work Plans, Quarterly Reports, and internal monthly financial reports are all reported at this level. The monthly subsystem lead financial reports can be viewed at the lowest cost collector and expenditure type. (PTA: Project, Task, Award)
- Earned Value is calculated at Level 1, per award requirements
- Budgetary change control is also management at Level 1







# LIGO Pre-Award Process Overview



**LIGO**

We specify resource needs in a labor allocations workbook that requires supervisors to allocate their staff resources to a cost objective. For budgeting they can pick up to 8 cost objectives.

We estimate costs and derive budget requests from the non-labor basis of estimate templates. Each workbook is at Level 1 or Level 2, depending on the scale. Example: LOPS - Laboratory Operations in broken out in multiple workbooks and assigned to different budget managers, such as Facilities

The travel estimate is its own workbook. An estimator is assigned to estimate travel needs based on planned work activities.

All budgets are tied back to the WBS structure and mapped to proposal sections where the scientific and technical objectives are described.







# LIGO Post-Award Financial Reporting

The LIGO logo, consisting of the word 'LIGO' in a bold, black, sans-serif font, positioned to the right of several concentric, curved lines that represent gravitational waves.

**LIGO**

- All external and internal reporting revolves around the WBS structure
- Multiple layers of financial reporting roll-up ability by WBS and Expenditure Categories/Types
- Ability to also report by 1030 code, but only utilize for specific NSF requests
- Monthly reports are published to be reviewed by budget managers and monthly meetings are led by the Financial Analyst





# Panel Questions

The LIGO logo, consisting of the word 'LIGO' in a bold, black, sans-serif font, positioned to the right of a series of concentric, curved lines that represent gravitational waves.

**LIGO**

What are the main operational challenges when dealing with multiple awards and segregation of funds?





# Panel Questions

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**LIGO**

What do you see as the advantages of your facility's operational WBS?