



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

# Office of High Energy Physics (HEP) Cosmic Frontier

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Astronomy & Astrophysics Advisory Committee

March 4, 2022

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Office of High Energy Physics, Office of Science (SC)*

# OUTLINE

## Short Update since January 2022 Presentation

- Budget
- Projects/Experiments
- Comments on Astro2020 Recommendations to DOE



# HEP Budgets – No Changes to Report since the January 2022 meeting

## FY 2022

- In a Continuing Resolution (CR) until March 11
- Hopes/rumors that the FY22 budget will be approved by March 11<sup>th</sup>

HEP Funding Category (\$ in K)	FY 2020 Actual	FY 2021 Request	FY 2021 Enacted	FY 2021 Actual	FY 2022 Request	FY 2022 vs. FY 2021
Research	389,646	328,906	398,203	408,163	419,605	21,402
Facility & Experimental Operations	317,310	285,725	314,297	304,337	309,395	-4,902
Projects	338,044	203,500	333,500	333,500	332,000	-1,500
<b>Total</b>	<b>1,045,000</b>	<b>818,131</b>	<b>1,046,000</b>	<b>1,046,000</b>	<b>1,061,000</b>	<b>15,000</b>

Cosmic Frontier (\$K)	FY2021 Actual	FY2022 Pres. Req.
Research	50,521	49,118
Facilities/Operations	42,880	42,500
Projects	6,000	5,000
<b>Total</b>	<b>99,401</b>	<b>96,618</b>

**FY 2023:** Rumors in the papers (e.g. WaPo) that the FY23 budget request will be released in late March or early April

**FY 2024:** Starting to work on FY24 budget in the next few months



# Dark Energy Spectroscopic Instrument (DESI) Experiment



## **DOE's DESI started its 5-year survey in May 2021**

- World's premier multi-object spectrograph w/5,000 fibers, positioned robotically
- First **Stage IV dark energy** → Will measure spectra of > 40 million galaxies

**Continues successful data-taking: 10 Million extra-galactic redshifts recorded (more than all other surveys combined)**

**Dark time survey > 18% complete; Bright time survey > 26% complete.**

**DOE/LBNL Project:** Instrumentation, Data Management System, & Upgrades of NSF's Kitt Peak Mayall telescope (including MOSAIC camera).

**Operations:** DOE provides full support for NSF's Mayall telescope.

Recent maintenance & operations tasks:

- CO2 cleaned the telescope primary mirror and obtained post-cleaning reflectivity measurements to confirm success.
- Investigated and resolved an issue with the cooling of the hydrostatic bearing oil. Cooling of this oil during nighttime observing is one of several measures taken to reduce air turbulence ("seeing") inside the dome.
- Completed the annual inspection of the dome rail for cracks. No cracks were found, meaning that a shutdown for crack repair will not be necessary this summer.
- Launched a maintenance agreement for the new building cooling system, with the first maintenance visit happening in late February.

# Dark Energy Spectroscopic Instrument (DESI) Experiment



## DESI Education and Outreach



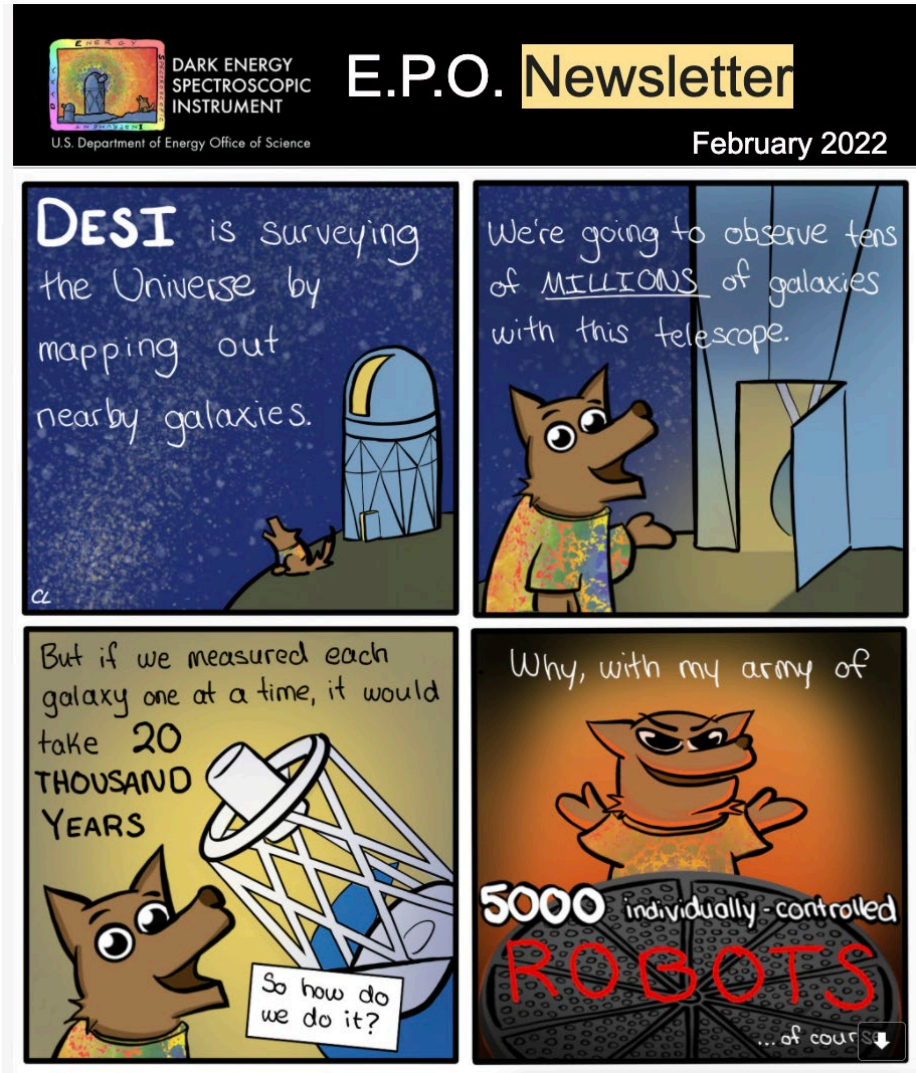
### Say Hello to BaoBan!

We finally have a name for the DESI ambassador: **BaoBan!**

The name selected by the Tohono O'odham Nation Youth Council (TONYC) connects the O'odham word "*ban*" (=coyote) with the key DESI observable "BAO", which is also the sound a coyote makes.

We are deeply grateful to TONYC for their engagement and hope for more collaborations to come. Special thanks to collaboration members **Eric Linder** and **Dustin Lang** for their initial idea of including "ban" in the name and **Samuel Breiden** for coordinating the effort. Hope you enjoyed **Claire Lamman's** BaoBan comic!

P.S: BAO is pronounced as "bow" and the "a" in *Ban* is pronounced as in father.



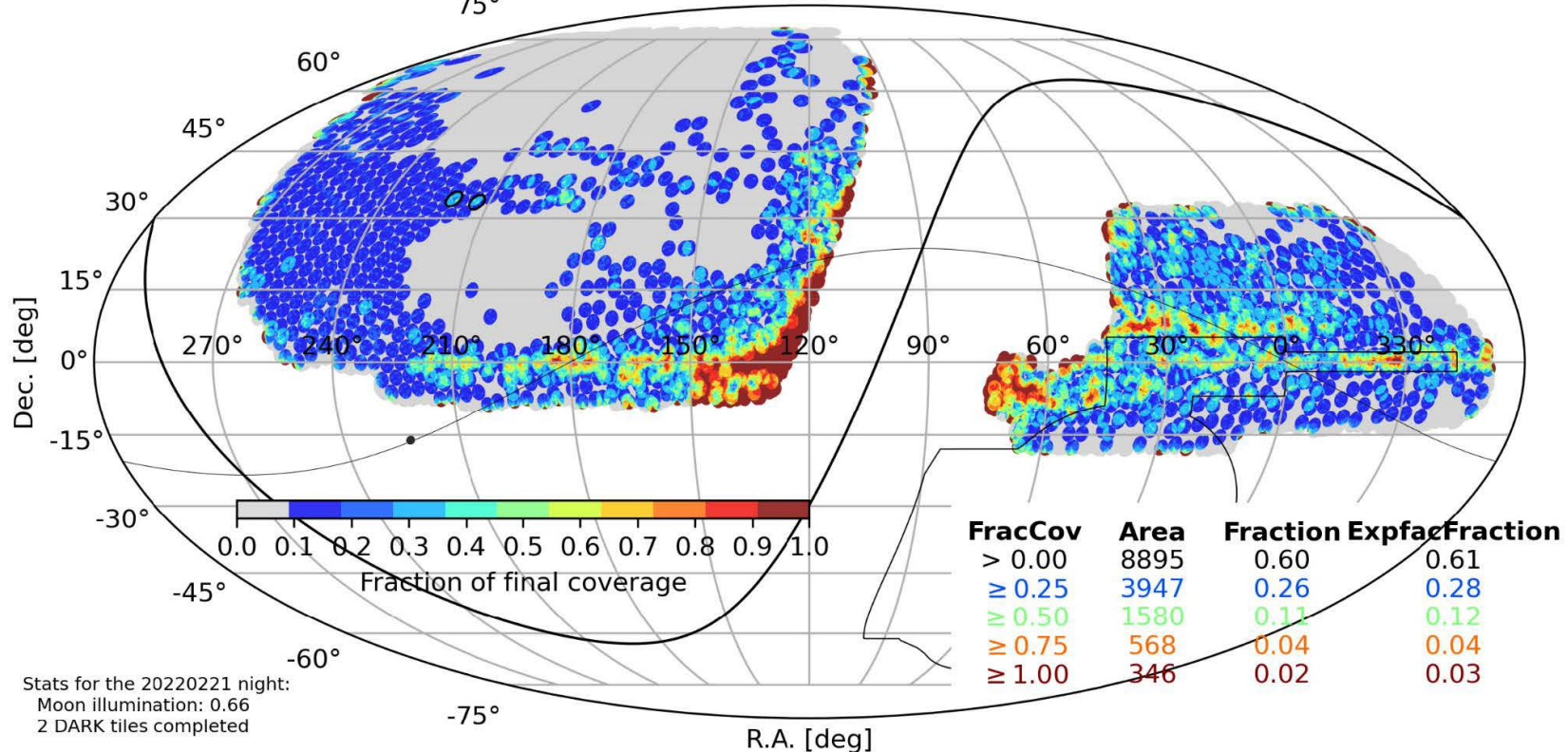


# Dark Energy Spectroscopic Instrument (DESI) Experiment



## Fraction complete for the dark-time program

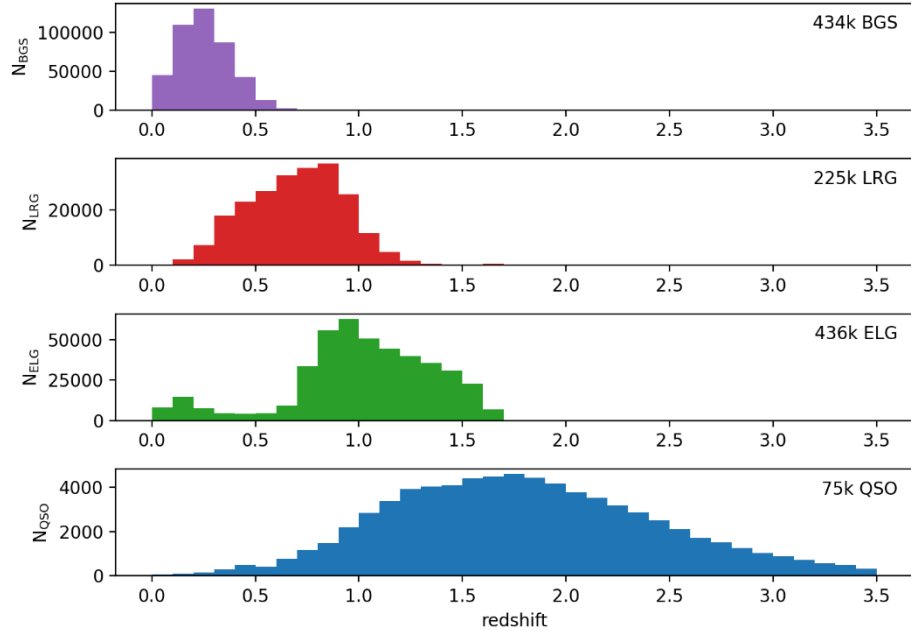
Main/DARK : 1716/9929 (=17%) completed tiles up to 20220221  
75°



# Dark Energy Spectroscopic Instrument (DESI) Experiment

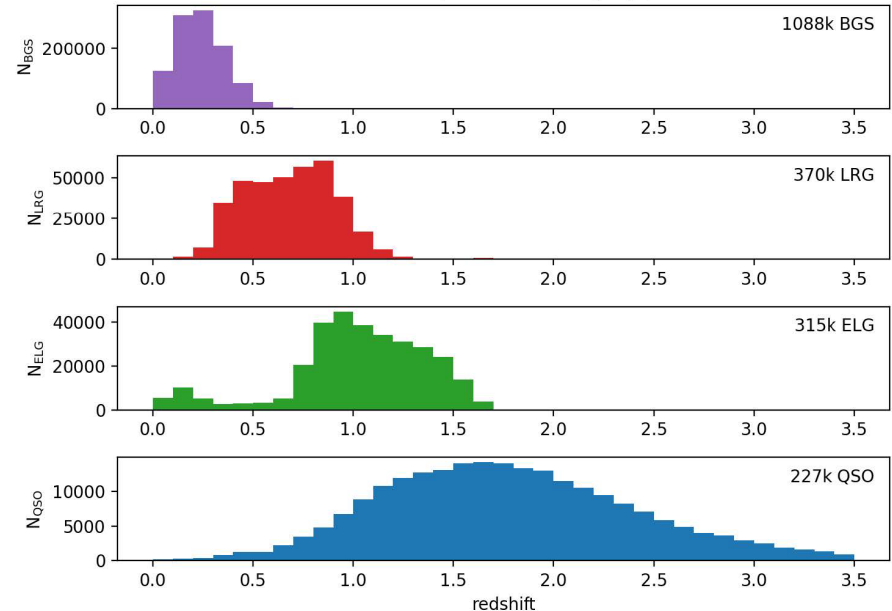


Fuji: Survey Validation N(z)



**Survey Validation phase objects, based on the Fuji data processing run**

Guadalupe: Main Survey N(z)



**Main Survey unique targets for the first two months**



# Vera C. Rubin Observatory



A next-generation, ground-based facility, providing time-lapse imaging of faint astronomical objects across the entire visible sky every few nights.

## NSF (AURA) and DOE (SLAC) partnership, with private, international contributions

- Project: DOE responsible for the LSST Camera fabrication & commissioning

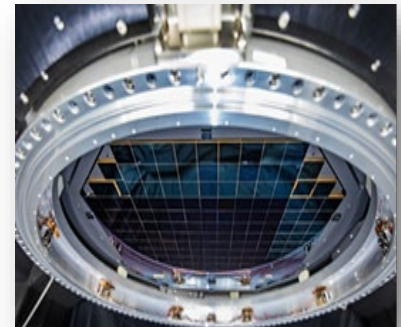
LSST Camera project completed Sept. 2021.

## HEP Commissioning roles

- LSST Camera assembly and verification at SLAC; Ready to ship to Chile & then installation & commissioning on telescope (~ late fall FY2022)

Facility Operations: 50/50 DOE & NSF split; DOE responsible for camera maintenance and operations, US Data Facility;

- **Successful joint NSF/DOE review of Rubin Operations in Feb. 2022 as part of the NOIRLab review.**



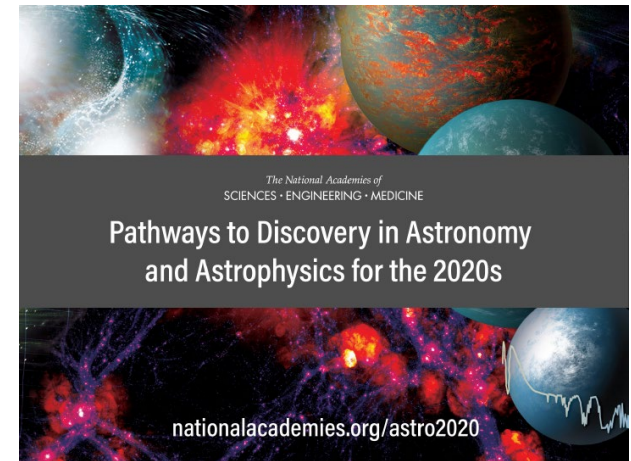
Due to covid-19, expect delay of about ~ 22 months for overall Observatory completion & data-taking start (now ~ mid 2024)



# Astro2020 – Pathways to Discovery in Astronomy and Astrophysics for the 2020s

National Academies Decadal Survey of Astronomy and Astrophysics was released Nov. 4, 2021. Charged & supported by DOE, NSF and NASA

- DOE appreciates all the hard work the National Academies, the Chairs and the Community have done in carrying out the study and providing the report.
- We are fully committed to considering and responding to the report.



**We are carrying out internal discussions on the recommendations**

- **Have begun engaging with NASA and NSF regarding joint recommendations**

## **Recommendations**

- DOE/NSF partnership on CMB-S4
- Efforts on diversity, equity, inclusion, demographics, data, etc. (joint with NSF & NASA)
  - A re-cap of current efforts and comments on planning are described next.

# Astro2020 Chapter 3: The Profession & its Societal Impacts

- **Recommendations - Relating to Diversity, Equity, Inclusion**

**Recommendation (p. 3-14):** Funding agencies should increase incentives for improving diversity among the college/university astronomy and astrophysics faculty, for example by increasing the number of awards that invest in the development and retention of early-career faculty and other activities for members of under-represented groups.

**Recommendation (p. 3-22):** NASA, NSF, and DOE should reinvest in professional workforce diversity programs at the division/directorate levels with purview over astronomy and astrophysics. Because academic pipeline transitions are loss points in general, supporting the creation and continued operation of “bridge” type programs across junctures in the higher-education pipeline and into the professional ranks appear especially promising.

**Recommendation (p. 3-23):** NSF, DOE and NASA should implement undergraduate and graduate “traineeship” funding, akin to the NIH MARC and NIH “T” training grant programs, to incentivize department/institution-level commitment to professional workforce development, and prioritize interdisciplinary training, diversity, and preparation for a variety of career outcomes.

**Recommendation (p. 3-30):** NASA, DOE, and NSF should consider including diversity—of project teams and participants—in the evaluation of funding awards to individual investigators, project and mission teams, and third-party organizations that manage facilities. Approaches would be agency specific, and appropriate to the scale of the projects.

## Astro2020 Chapter 3: The Profession & its Societal Impacts - DOE Efforts/Comments - Relating to Diversity, Equity, Inclusion

An SC-wide FOA is in progress for Reaching a New Energy Sciences Workforce (RENEW) program for undergrad and grad student fellowships targeted at MSI/URG

SC now includes diversity-promoting program policy factors in all of its FOA's which allow the selection official to make award decisions based on other factors when all other things such as merit are considered equal, including e.g. promoting diversity of PI's, institutions, etc.

SC Early Career Program continues to promote diversity of PI's & Institutions and supports over 80 PI's/year. The 2022 FOA strengthened review criteria consideration of promotion of diversity of PI's and Institutions.

HEP Research Funding Opportunity Announcement (FOA) for FY2022 required information on the PI's Recruitment and Mentoring Plan

- An appendix describing their plan was required
- A new merit criterion was added as part of the proposal evaluation.

# Astro2020 Chapter 3: The Profession & its Societal Impacts

## - DOE Efforts/Comments - Relating to Diversity, Equity, Inclusion

### Continued...

HEP specifically considers diversity when setting up review panels for proposals as well as projects, experimental operations and facilities.

HEP has graduate student traineeships in Instrumentation, Accelerator R&D and Computing, e.g. see

[https://science.osti.gov/-/media/grants/pdf/foas/2021/SC\\_FOA\\_0002496.pdf](https://science.osti.gov/-/media/grants/pdf/foas/2021/SC_FOA_0002496.pdf)

SC Office of Workforce Development for Teachers and Scientists (WDTS) programs: <https://science.osti.gov/wdts>

- SC Graduate Student Research fellowships (SCSGR)
- Science Undergraduate Laboratory Internships (SULI)
- Visiting Faculty Program



# Astro2020 Chapter 3: The Profession & its Societal Impacts

## - DOE Efforts/Comments - Relating to Diversity, Equity, Inclusion

**Our labs have active efforts on community outreach and workforce development, e.g.**

Fermilab Office of Education and Public Engagement  
<https://ed.fnal.gov/office/index.shtml>

LBL K-12 STEM Education & Outreach  
<https://k12education.lbl.gov/>

SLAC – Education & Internships  
<https://careers.slac.stanford.edu/jobs-slac/educational-and-outreach-programs>

SLAC Outreach  
<https://www6.slac.stanford.edu/outreach>



## Astro2020 Chapter 3: The Profession & its Societal Impacts - Relating to Harassment Issues

**Recommendation (p. 3-27):** NASA, NSF, DOE, and professional societies should ensure that their scientific integrity policies address harassment and discrimination by individuals as forms of research/scientific misconduct.

### DOE Efforts/Comments:

SC has added language to its FOA's to remind the community of prohibition of harassment & discrimination by awardees and recipient institutions.

Most of the HEP Cosmic Frontier projects and collaborations have developed Codes-of-Conduct. This is a promising practice within the community.

# Astro2020 Chapter 3: The Profession & its Societal Impacts

## - Relating to Harassment Issues

**Recommendation (p. 3-35):** The astronomy community should, through the American Astronomical Society in partnership with other major professional societies (e.g., American Physical Society, American Geophysical Union, International Astronomical Union), work with experts from other experienced disciplines (such as archaeology and social sciences) and representatives from local communities to define a Community Astronomy model of engagement that advances scientific research while respecting, empowering and benefiting local communities.

### DOE Efforts/Comments:

- Local efforts by labs and experiments
- Participate in efforts by NSF labs with HEP efforts (DESI at Kitt Peak).

# Astro2020: Chapter 3 The Profession & its Societal Impacts and Chapter 4 Optimizing the Science - Foundations

## DOE Efforts/Comments - Related to Proposal Demographics, Data

**DOE/SC started collecting demographics data** within our new awards management system (PAMS), based on a questionnaire provided to people when create a user profile

- This began in 2013 and was voluntary.
- Starting in 2021, it was required when creating a profile, though “do not wish to provide” is still an option.

**SC conducts regular reviews**, with an external panel, of its awards management business practices of all of the offices’ research programs through Committee of Visitors (COV) reviews every 3-4 years.

- This includes an evaluation of demographics of applicants and awardees and provides an assessment of diversity efforts.
- See the **2020 HEP CoV report** at [https://science.osti.gov/-/media/sc-2/pdf/cov-hep/2021/HEP\\_COV\\_2020\\_Report.pdf](https://science.osti.gov/-/media/sc-2/pdf/cov-hep/2021/HEP_COV_2020_Report.pdf)



# Astro2020: Chapter 3 The Profession & its Societal Impacts and Chapter 4 Optimizing the Science - Foundations

## DOE Efforts/Comments - Related to Proposal Demographics, Data

→ The **PAMS questions** are based on the **OMB standards for demographic data collection**.

**Gender** (3 questions): Female, Male, Do Not Wish to Provide

**Race** (6 questions): American Indian or Alaska Native; Asian; Black or African American; Native Hawaiian or Other Pacific Islander; White; Do Not Wish to Provide

**Ethnicity** (3): Hispanic or Latino; Not Hispanic or Latino; Do Not Wish to Provide

**Disability** (6): Hearing Impairment; Visual Impairment; Mobility/Orthopedic Impairment; Other; None; Do Not Wish to Provide

## Astro2020 Chapter 4: Optimizing the Science - Foundations - Relating to Data archiving, processing and analysis

**Recommendation (p. 4-20):** NASA and the National Science Foundation should explore mechanisms to improve coordination among U.S. archive centers and to create a centralized nexus for interacting with the international archive communities. The goals of this effort should be informed by the broad scientific needs of the astronomical community.

**Recommendation (p. 4-21):** The National Science Foundation and stakeholders should develop a plan to address how to design, build, deploy, and sustain pipelines for producing science-ready data across all general-purpose ground-based observatories (both federally and privately funded), providing funding in exchange for ensuring that all pipelined observations are archived in a standard format for eventual public use.

**Comment:** “importance of joint analysis of observations from different facilities [Rubin-Roman-Euclid], and of sophisticated archiving with associated science platform tools, will grow dramatically over the next decade.”

# Astro2020 Chapter 4: Optimizing the Science - Foundations - Relating to Data archiving, processing and analysis

## DOE Efforts/Comments

- Though DOE isn't listed, we do have an interest and efforts in data simulations, processing, analysis, serving and archiving
- All survey projects (DES, eBOSS, DESI, Rubin Observatory) are making data public after a proprietary period.
- DOE is participating with NSF, NASA and the Rubin, Roman & US-Euclid to investigate possibilities for joint simulations, data processing and analysis to ensure we provide the best science within available funding levels. This will entail supercomputing resources and personnel to carry out these efforts.

# HEP Cosmic Frontier - Summary

- **Continue data-taking and analysis to produce excellent, world-leading science results**
- **Awaiting information on the FY 2022 and FY 2023 budget**
- **Future Planning**
  - **Astro2020** – DOE is working internally & with NSF & NASA to plan a path forward to respond to the report.
  - **HEP overall planning**
    - APS DPF+DPB “snowmass” science planning is continuing:
    - <https://snowmass21.org/start>
      - “Community Summer Study” July 17–27, 2022 at UW-Seattle.
      - Full Snowmass reports will be available by the end of Oct. 2022
    - NAS Elementary Particle Physics (EPP) Decadal Survey will run concurrently with and complement the Snowmass process
    - Next HEPAP/P5 process starts late 2022: P5 report by May 2023 will inform FY 2024 Congressional actions & FY 2025 U.S. budget formulation







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