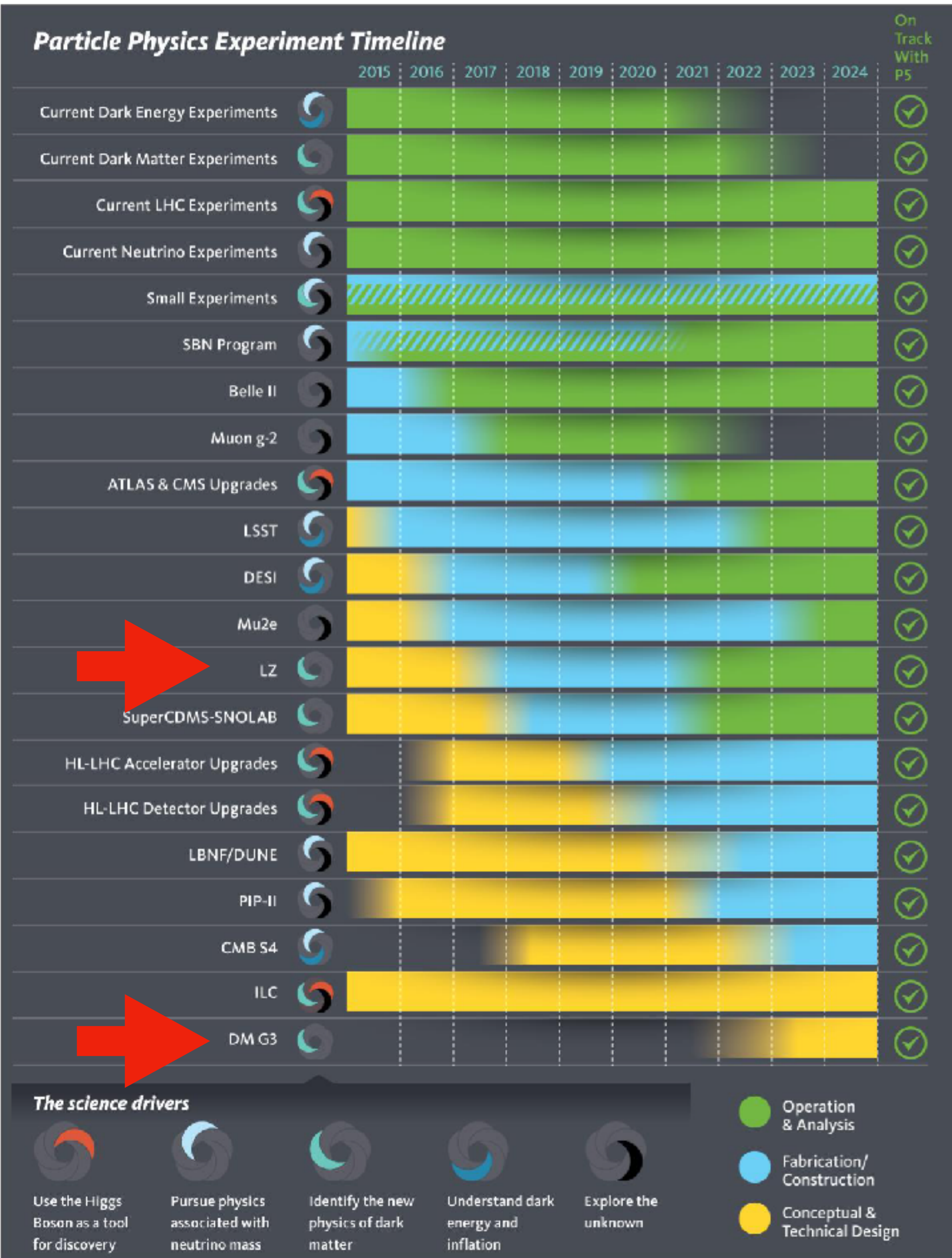


US perspective on XLZD

KJ Palladino for US contingent
including slides shown to P5

2014 P5



- 2014 Particle Physics Project Prioritization Panel “got it right” and was well received in Washington and HEP funding increased 45%
- 1 of 5 Science Drivers: “Identify the Physics of Dark Matter”
 - Rec 19: G2 (which became LZ, SuperCDMS, ADMX) + Cosmic Visions
 - Rec 20: G3 “Support one or more third-generation (G3) direct detection experiments, guided by the results of the preceding searches. Seek a globally complementary program and increased international partnership in G3 experiments.”

Dark Matter Mass

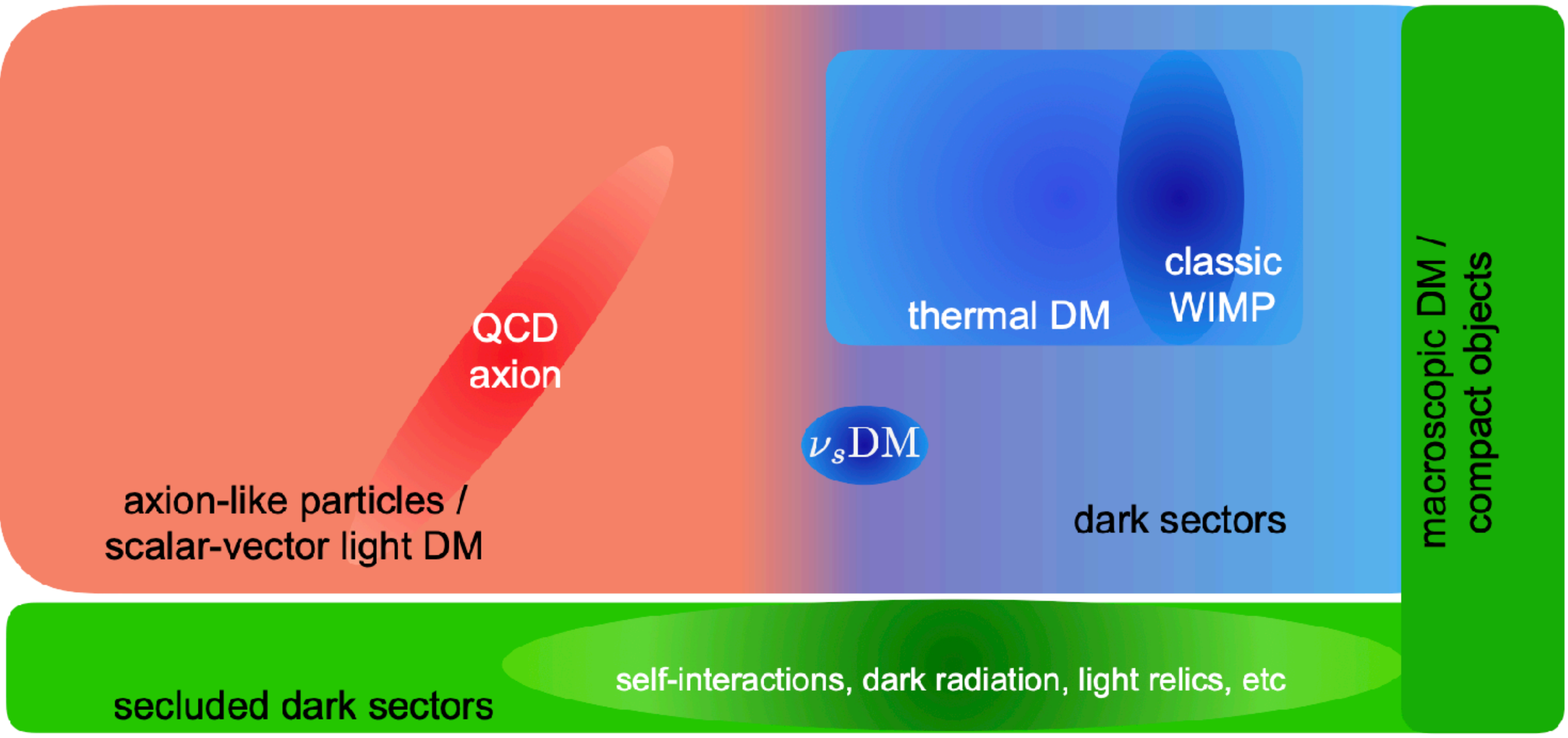
zeV aeV feV peV neV μeV meV eV keV MeV GeV TeV PeV $10M_{\odot}$

~SM

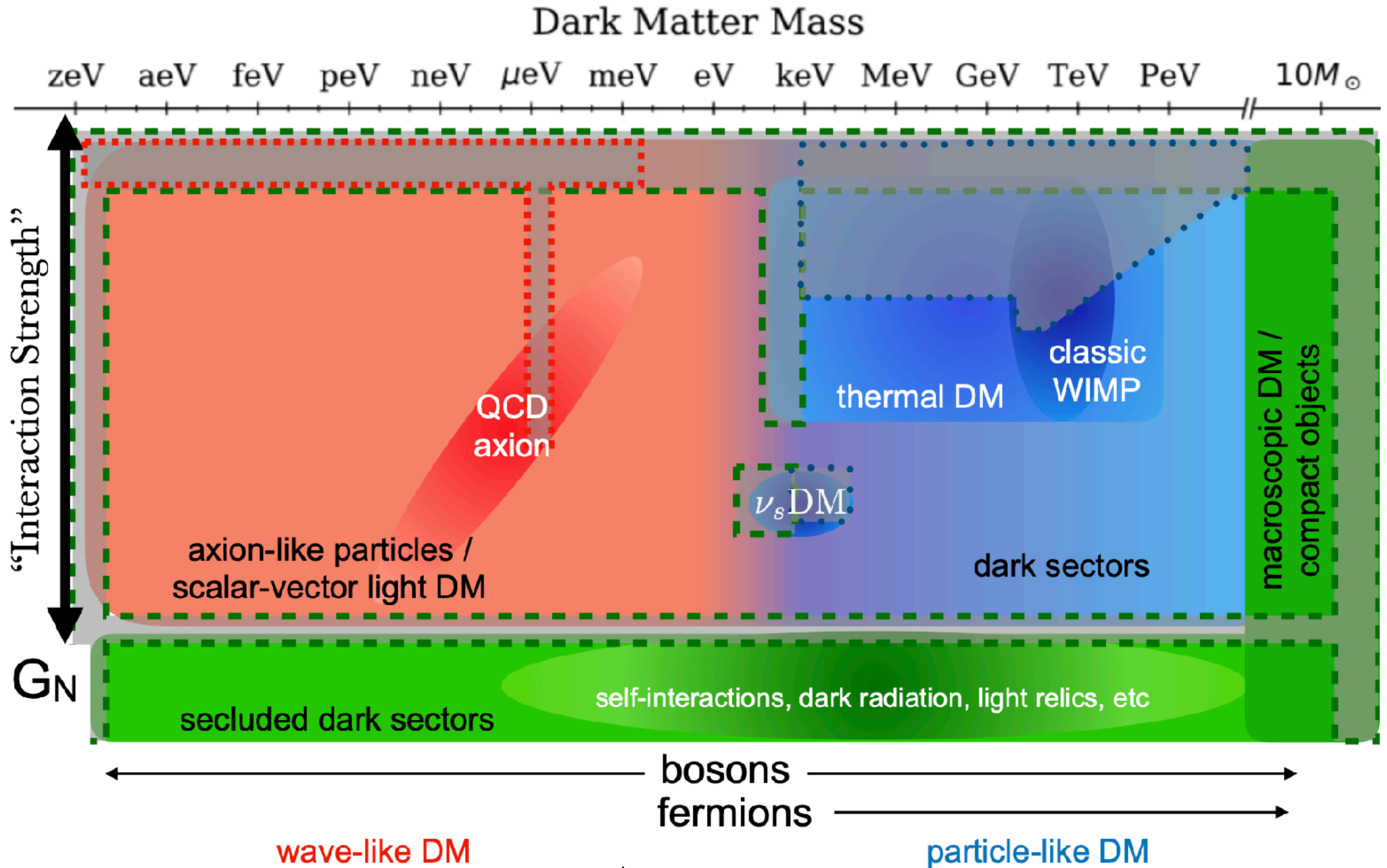
“Interaction Strength”

G_N

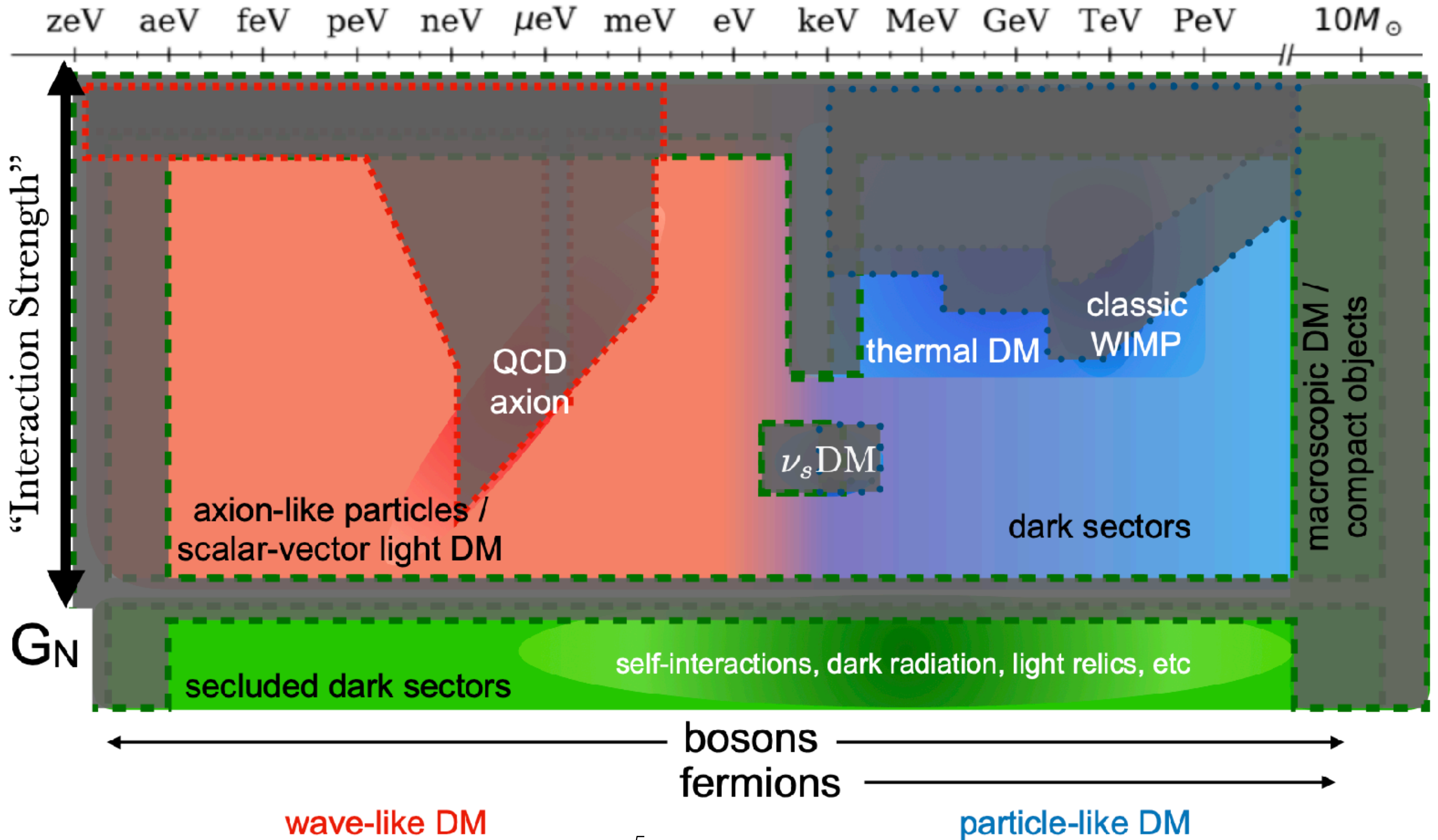
Gravity



← bosons →
← fermions →
← wave-like DM →
← particle-like DM →



Dark Matter Mass



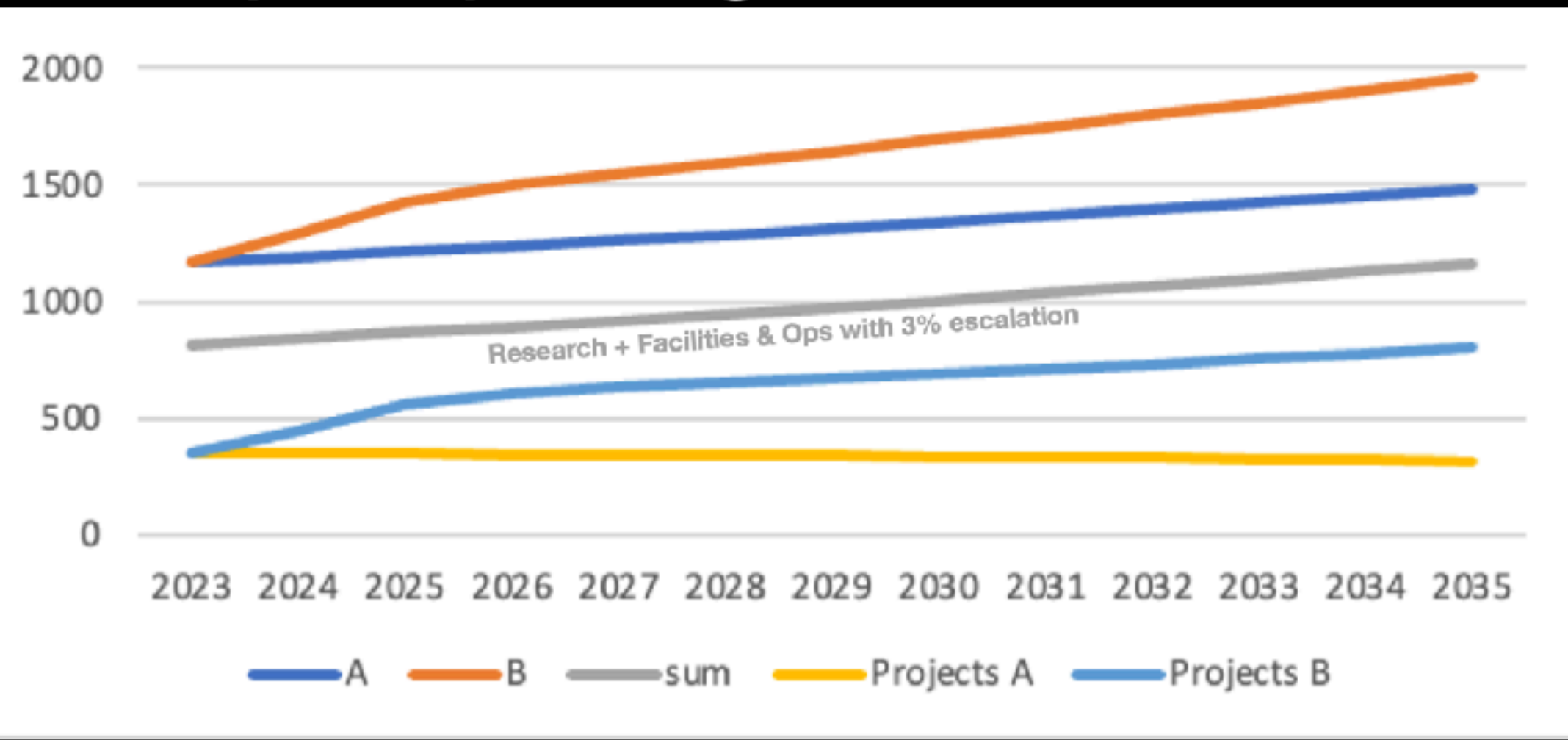


SNOWMASS

- Many XLZD collaborators took part in multiple ‘frontiers’ of SNOWMASS, our main science was in CF1 Particle Dark Matter
 - 150 LOIs submitted, the most of any topical group, arranged into 8 Big Question white papers ... and the only(?) cross frontier report
- Main messages: Particle dark matter is theoretically well-motivated and a diverse portfolio of experiments and tools maximizes the possibility of discovery
- The Cosmic Frontier’s DM program will “delve deep, search wide” by employing a broad portfolio of small and medium-scale, direct and indirect, detection experiments, as is required to search optimally for each decade in dark matter mass. - SNOWMASS Executive Summary
 - Note: \$500M cost to the US was the cutoff between medium and large projects

2023 P5

(DOE) Budget Scenarios



P5 is a closed subpanel of HEPAP that takes community input to respond to the DOE/NSF charge to make recommendations to DOE HEP, NSF PHY and Congress generally.

NEW Subcommittee on Costs/Risks/Schedule this time

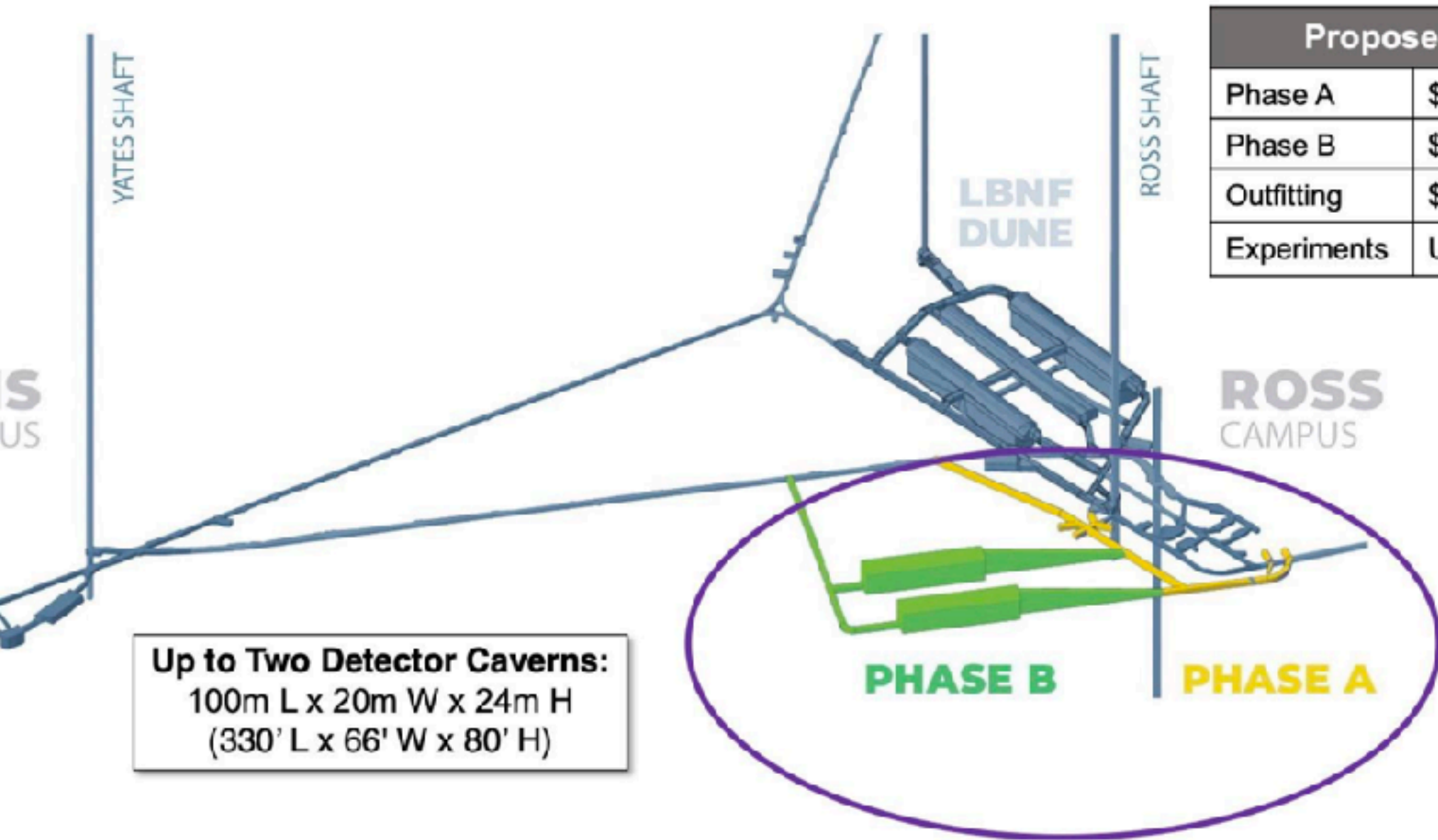
Schedule:

- Open Town Halls February-May
- Virtual Town Halls in June
- Closed sessions beginning in May
- Preliminary recommendations to agencies in August
- Final report expected in October

<https://www.usparticlephysics.org/p5/>

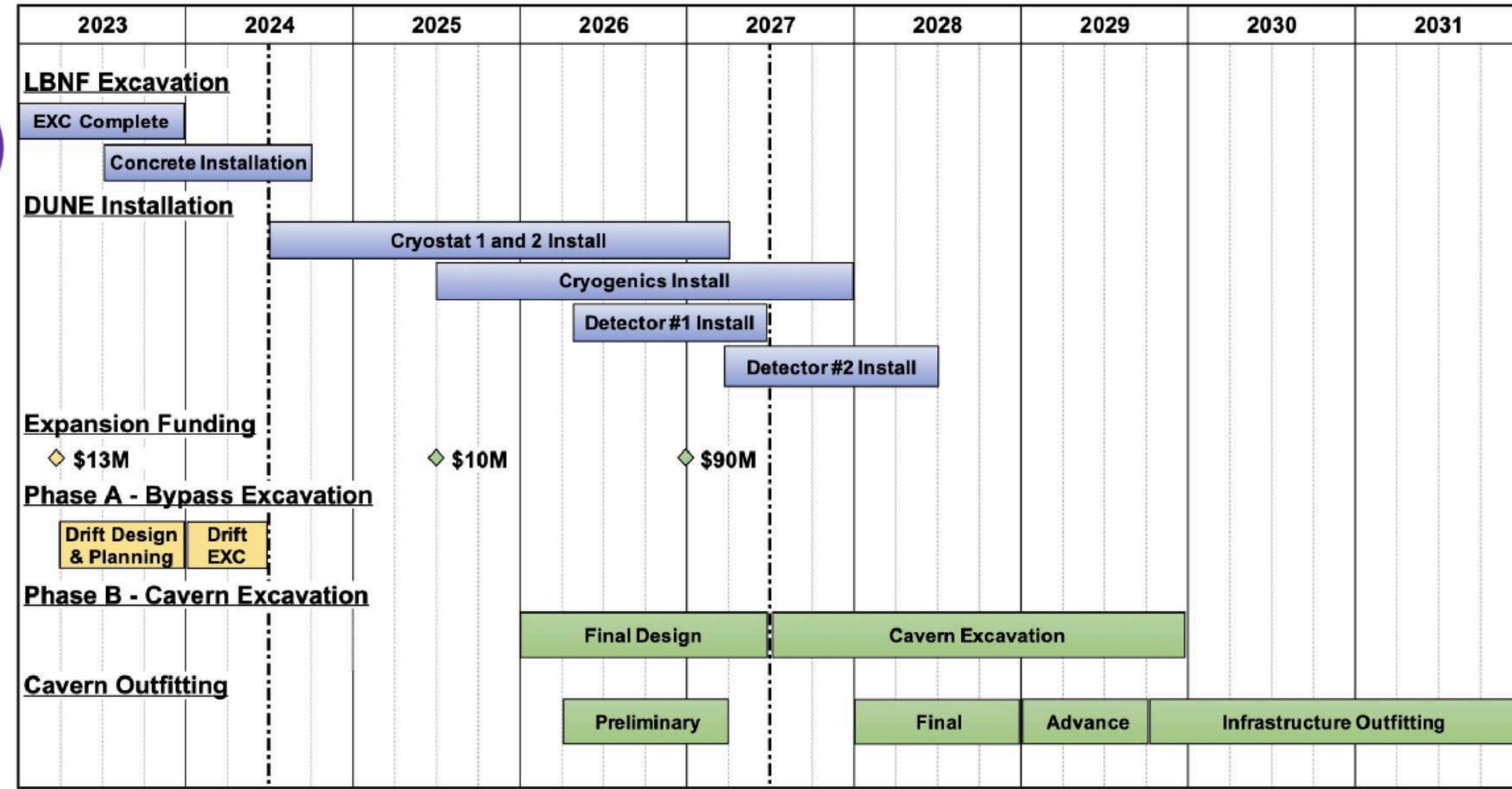


Potential US Siting at SURF



Proposed Funding Model	
Phase A	\$13M State of SD ✓
Phase B	\$100M Private
Outfitting	\$85M Federal
Experiments	Up to \$500M ea. - Fed/Intl

SD funding approved
Mar 23, 2023



from slides by J. Heise, SURF



XLZD Project Costing: DOE “style” for P5

US Cost estimate for 50% of scope: ~\$350M including 50% contingency

- Scaled from actual cost of LZ MIE Project per DOE Order 413.3B

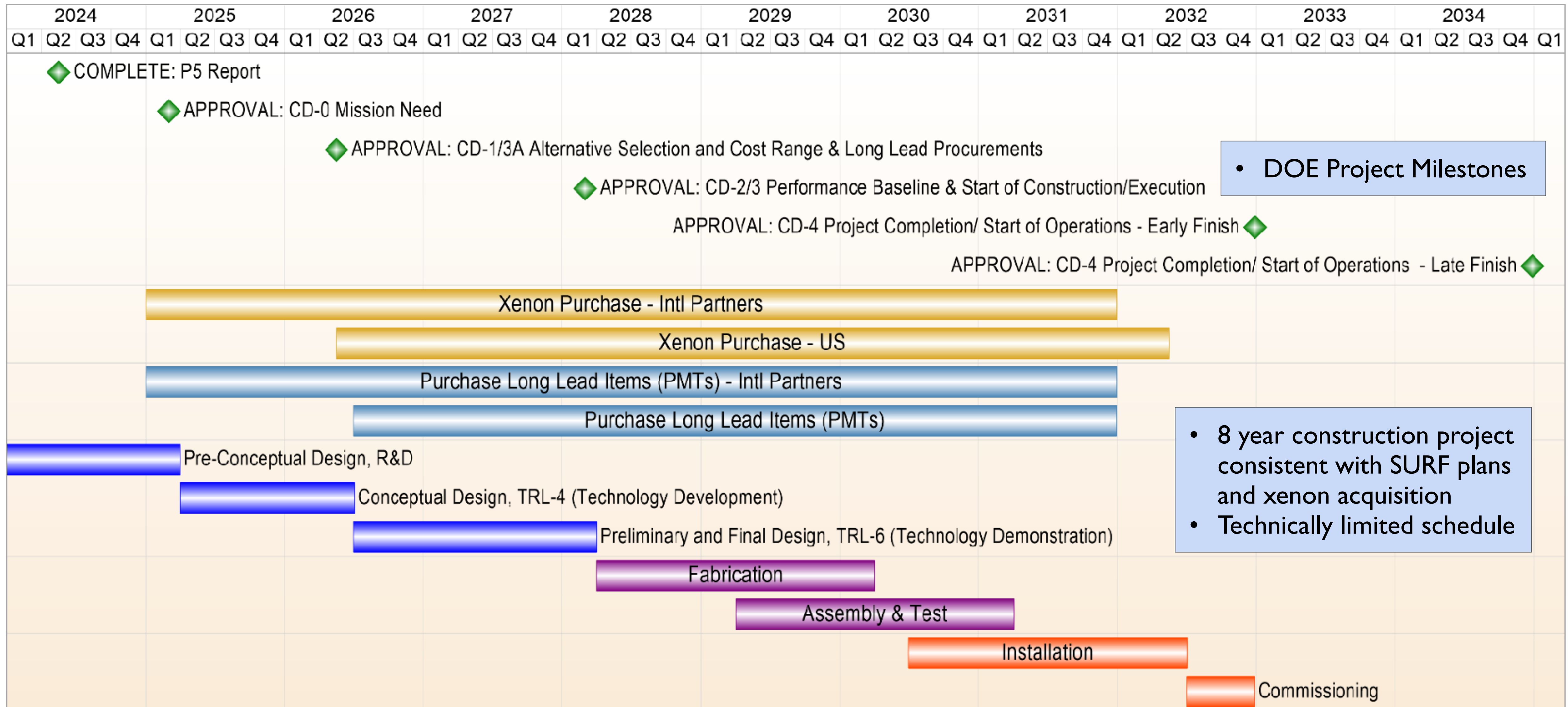
- Assumptions:

- Escalated from 2017 to 2023 dollars
- Xenon - price history \$(5-25)/liter
- US costing method - materials, management, technical labor

- Xenon is a long-term asset

Description	Cost Estimate \$M in 2023 dollars
Instrument (Management, Cryostat, Cryogenics, Purification, Detector, Calibration, Electronics, DAQ, Controls, Computing, Integration/ Installation, Offline Computing)	\$251
Xenon Acquisition	\$218
Sub-Total	\$470
50% Contingency	\$235
Project Total	\$705
US Contributes 50% of Project Total	\$352

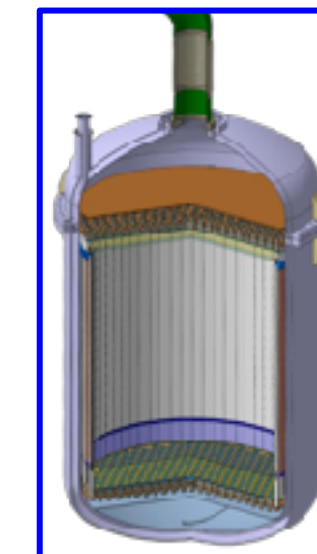
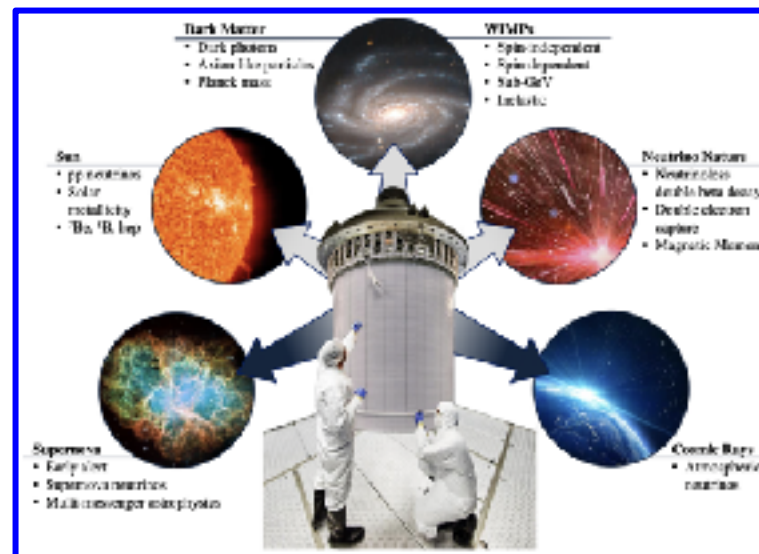
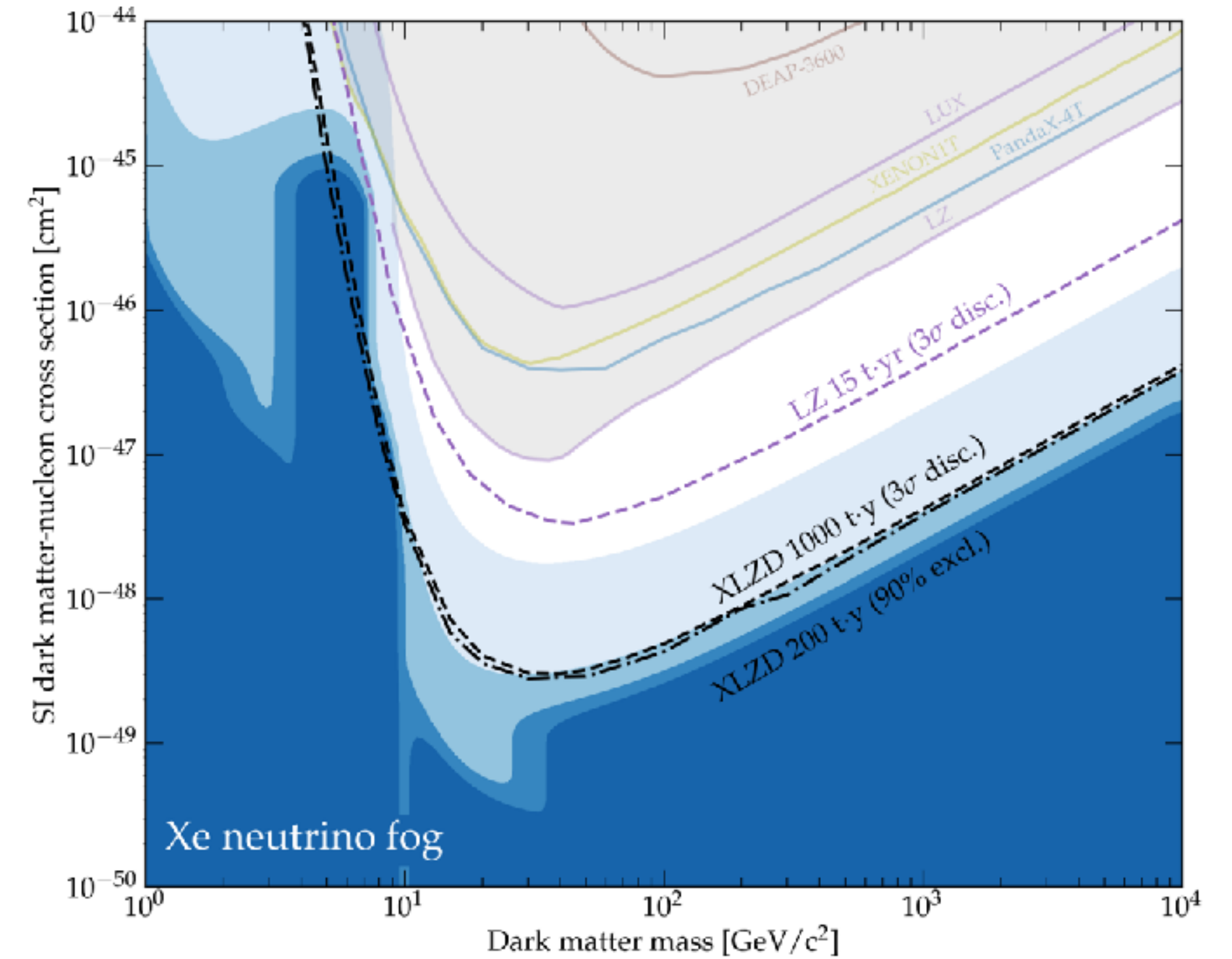
US-based Schedule with Science Starting in 2032



XLZD Summary

XLZD: the definitive WIMP search

- WIMP discovery space (or follow up!)
- Scientific breadth - exciting additional goals
- XLZD is timely - merger of expert teams
 - International planning underway
- Technical readiness - risks defined and tractable
 - Opportunities for coordinated R&D
 - Leveraging growing knowledge from LZ and XENONnT
- Site to be determined



If WIMPs exist above the systematic limit of astrophysical neutrinos, XLZD will observe them.