New Mexico EPSCoR

Advancing Collaborative Research Excellence in New Mexico

Annual Report 2023

Cover Image: NM SMART Grid Center faculty member Olga Lavrova and students at NMSU microgrid testbed

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From New Mexico EPSCoR

Leadership

Ganesh Balakrishnan
Director

Selena Connealy
Associate Director

We're pleased to share this NM EPSCoR Annual Report that demonstrates the impact of EPSCoR investment in our state. Our Track-1 project, NM SMART Grid Center (2018–2023), was successful across many dimensions including research, education, and broadening participation. Congratulations to the leaders of the other EPSCoR projects in NM that were funded in 2023—we look forward to your success!

Diversity & Inclusion Statement

The diversity of the people of New Mexico has been a source of innovation and creativity throughout our state's history. NM EPSCoR respects and values diversity of all types, including race, ethnicity, national origin, age, gender identity, sexual orientation, education, socioeconomic status, ability, and more.

We see diversity as a source of strength, and we strive to create an inclusive, collaborative, and equitable environment where everyone can realize their full potential. NM EPSCoR particularly acknowledges the acute need to remove barriers to the recruitment, retention, and advancement of talented students, faculty, and staff from historically excluded populations that are currently underrepresented.

NM EPSCoR State Office

Ganesh Balakrishnan
Director & Principal Investigator

Andra Kiscaden
Senior Business Manager

Brittney Van Der Werff
Communication & Outreach Manager

Selena Connealy
Associate Director

Dustin Allen
Systems & Network Analyst

Isis Serna
Website Administrator

EPSCoR overview

New Mexico's Established Program to Stimulate Competitive Research (NM EPSCoR) was established in 2000 and is funded by the National Science Foundation (NSF) to advance the state's capacity to conduct scientific research while cultivating a diverse, well-qualified STEM workforce. The DOD, DOE, USDA, and NASA also have EPSCoR programs.

EPSCoR eligibility has resulted in over $245 million in federal investment in New Mexico since 2000

- **83%** NSF
- **1%** DOD
- **3%** DOE
- **4%** NASA
- **9%** USDA
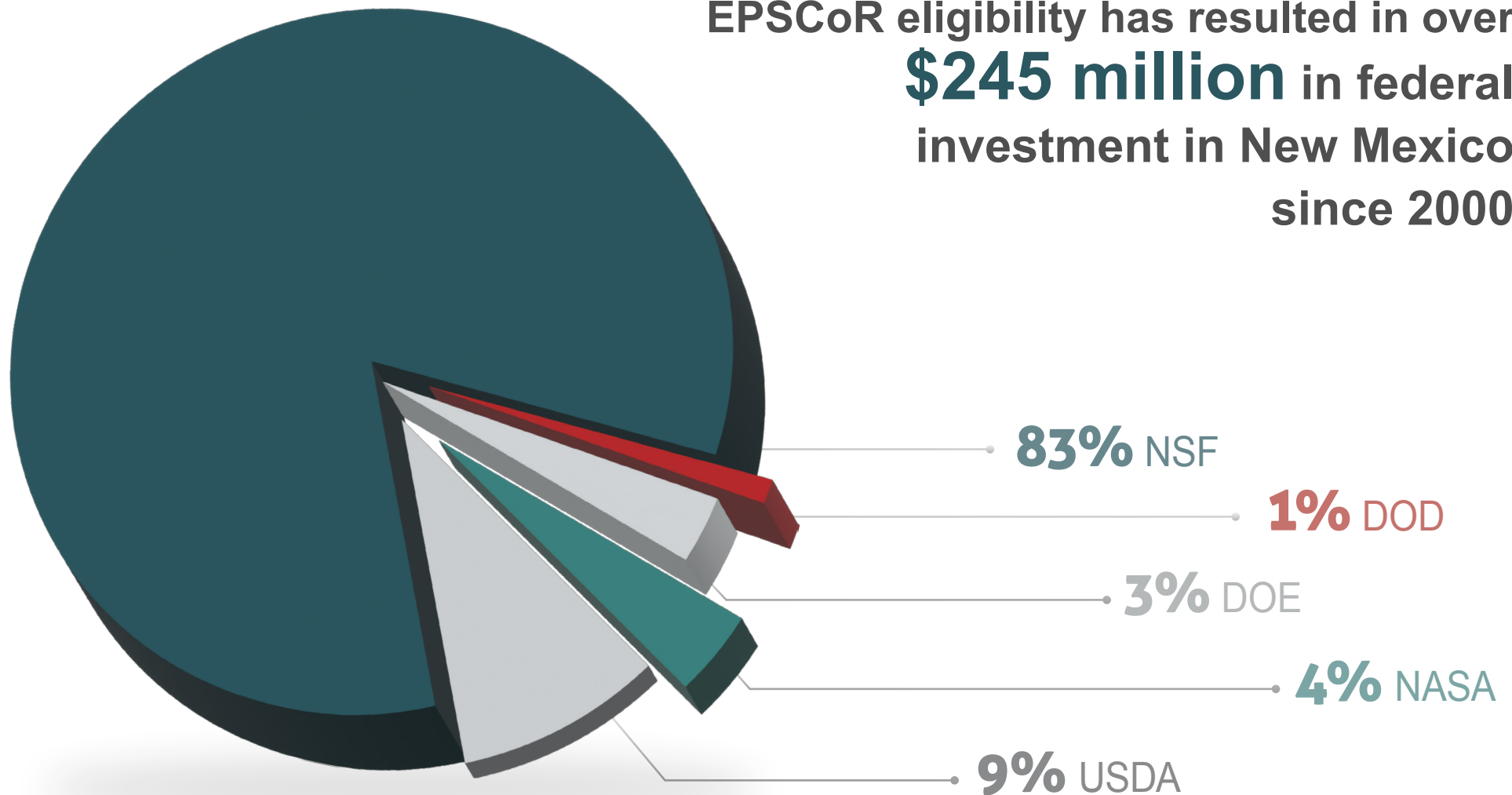
NM EPSCoR impacts

NM EPSCoR investment in New Mexico since 2000

$85 million

NM EPSCoR since 2000...

25
NM higher ed institutions directly involved

32
university faculty hired

$7.2M
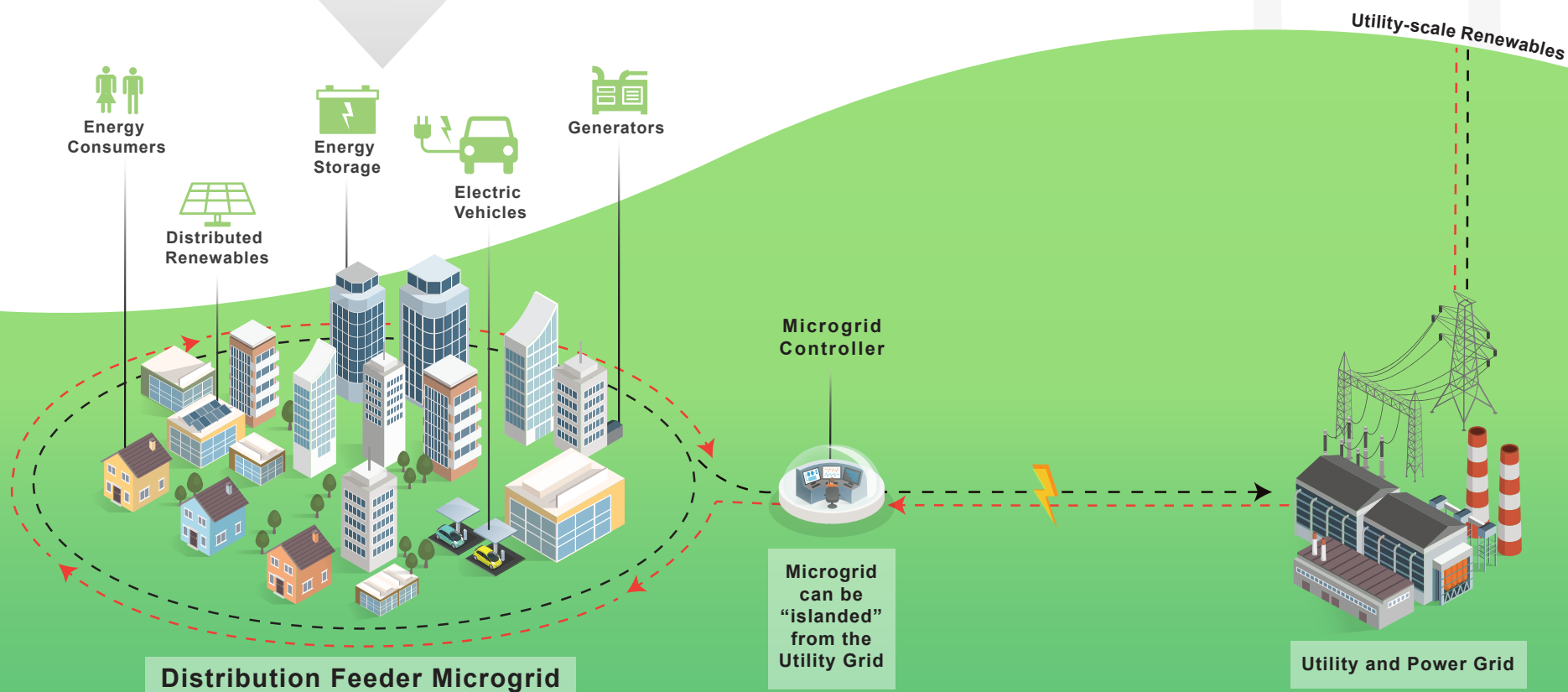scientific & computing equipment purchased

1,938
project participants

NM SMART GRID CENTER
overview

The NM SMART Grid Center was a 5-year, $24-million NSF EPSCoR Track-1 research and human infrastructure project from 2018 to 2023 investigating the fundamental challenges to transition existing electricity transmission and distributed energy infrastructure into a SMART (Sustainable, Modular, Adaptive, Resilient, Transactive) grid.

Our mission was accomplished by developing research capacity and education programs to support a modern electric grid, building on the principles of **Distribution Feeder Microgrids (DFMs)** with a focus on architecture, networking, decision-support, and deployment, and by empowering a future workforce through industry partnerships, education, and public outreach. Primary project partners included: The University of New Mexico (UNM), New Mexico State University (NMSU), New Mexico Tech (NMT), Santa Fe Community College (SFCC) and Explora Science Center.

Energy Consumers

Distributed Renewables

Energy Storage

Electric Vehicles

Generators

Utility-scale Renewables

Microgrid Controller

Microgrid can be "islanded" from the Utility Grid

Distribution Feeder Microgrid

Utility and Power Grid

details

over $103M
IN EXTERNAL FUNDING AWARDED

Of the 293 project participants, 50% identified as female or from an underrepresented minority group

5:1
RETURN ON INVESTMENT

$9M — YR 1

$27M — YR 2

$22M — YR 3

$23M — YR 4

$25M — YR 5
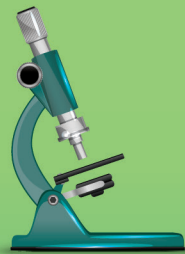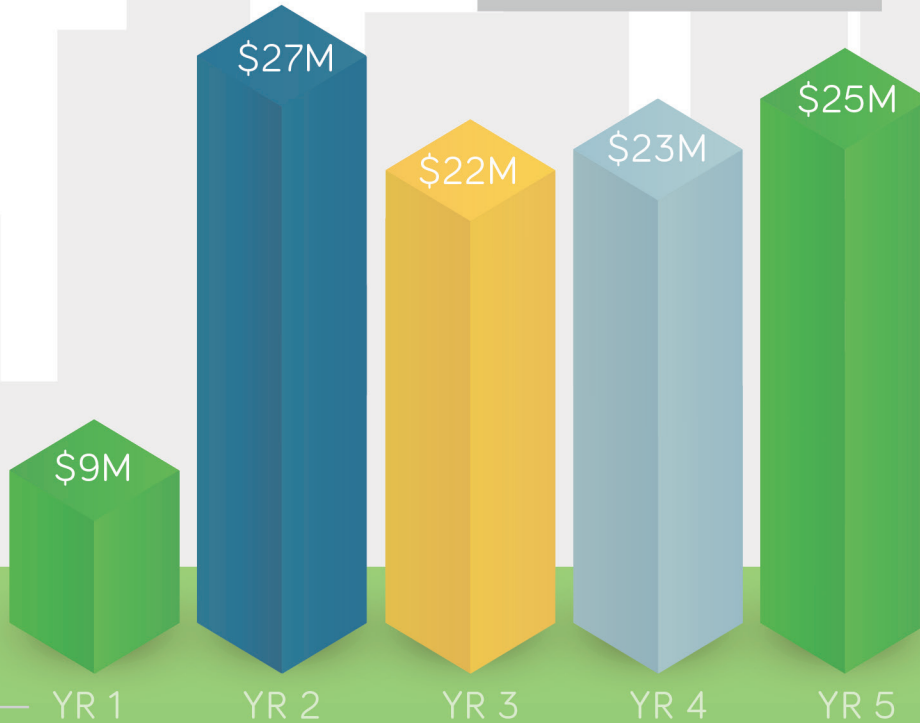
More than $1M in equipment to support smart grid research in New Mexico

Project researchers published a total of 229 publications across 178 journals

Over the course of this five-year award, project members had 82 external awards funded

NM SMART GRID CENTER
research impacts

111

STUDENT
GRADUATIONS

undergrad, masters, and phd

14

INTERNS FUNDED

to work at NM energy employers
at the city, state, and national level

110

PROFESSIONAL
PRESENTATIONS

by project participants

9

NEW FACULTY
HIRED

with 100% retention

| details

205
collaborations
developed

5
NSF CAREER AWARDS
awarded to
project-supported faculty

11
MENTORS
recognized for
outstanding
mentorship

12
SEED
AWARDS
FUNDED

79
undergrad
students

117
graduate
students

9
postdoctoral
scholars

SUPPORTED THROUGH THIS PROJECT

NM SMART GRID CENTER
human infrastructure

79%

OF STUDENTS

from our summer undergraduate
program identified as female or from
an underrepresented minority group

20K
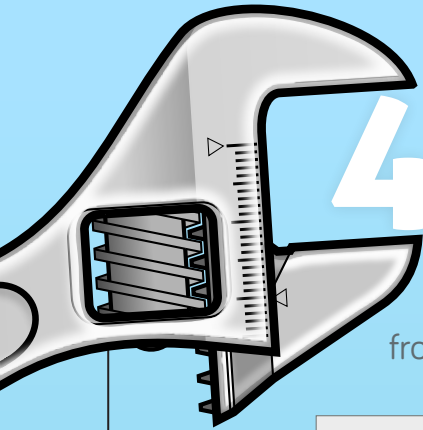
PEOPLE REACHED

through project outreach activities

38

SCI COMM FELLOWS

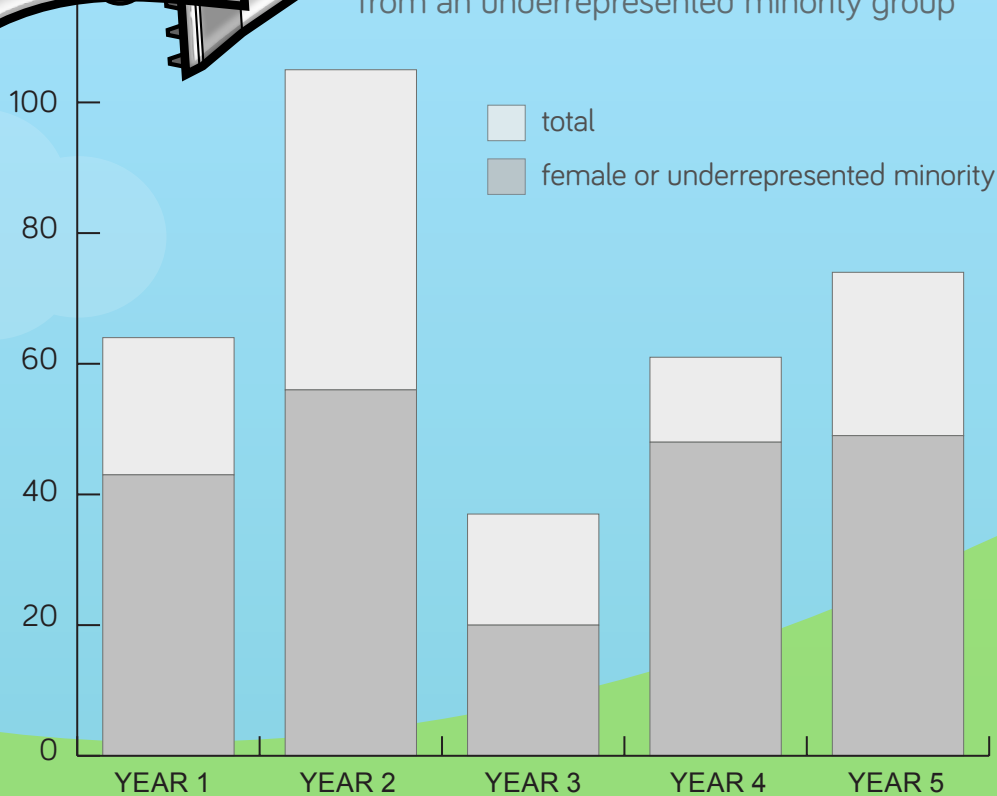trained by experts from
Explora Science Center

| details

400+ STUDENTS TRAINED

in data, software, or library carpentry, 63% of whom identified as female or from an underrepresented minority group

Legend:
- total
- female or underrepresented minority

Bar chart (Students Trained by Year):

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
total	64	105	37	61	74
female or underrepresented minority	43	56	20	48	49

(Y-axis: 0, 20, 40, 60, 80, 100)

INSTRUCTORS TRAINED
in data, software, or library carpentry

43

27 MEET A SCIENTIST EVENTS
with middle and high school students

2 NEW CERTIFICATE PROGRAMS
created at SFCC and four new courses to train smart and microgrid professionals

47 EDUCATIONAL TOOLKITS
distributed to teachers, educators, and librarians across New Mexico

CURRENT EPSCOR AWARDS
in New Mexico

NSF Track 1: New Mexico SMART Grid Center: Sustainable, Modular, Adaptive, Resilient, and Transactive
PI: Ganesh Balakrishnan, UNM ● *Co-PI: Selena Connealy, UNM*
$24,000,000 (2018–2023)

NSF Track 2: Tri-state Research Institute of Manufacturing for Managing CO_2
PI: Xiao-Dong Zhou, ULL ● *Co-PIs: Meng Zhou, NMSU; Shuya Wei, UNM*
$6,000,000 (2021–2025)

NSF Track 2: Laying the Foundation for Scalable Quantum Photonic Technologies
PI: Ganesh Balakrishnan, UNM ● *Co-PIs: Chitraeema Chakraborty & Matthew Doty, UD; Tara Drake & Marek Osinski, UNM*
$6,000,000 (2022–2026)

NSF Track 4: Technology Development for the Next-Generation of Ground-Based Cosmic Microwave Background Instrumentation at Argonne National Laboratory
PI: Darcy Barron, UNM
$125,061 (2021–2024)

NSF Track 4: Robust, Predictive, and Learning Guidance Algorithms for On-Orbit Servicing and Assembly Using Multiple Space Systems
PI: Hyeongjun Park, NMSU
$180,463 (2023–2024)

NSF Track 4: Insights into Pathogenicity of Chlorine-Stressed Bacteria Using Combined In Vitro Assays and Metatranscriptomics
PI:Yanyan Zhang, NMSU
$216,478 (2023–2025)

NSF Track 4: Rational Design and Engineering of Composite Electrolytes for All-solid-state Li-S Batteries
PI: *Shuya Wei, UNM*
$202,433 (2023–2025)

NSF Track 4: Process-Structure-Property Relationship of the Hybrid Manufactured Multifunctional Mechano-Luminescence-Optoelectronic Fibers
PI: *Donghyeon Ryu, NMT*
$299,807 (2024–2025)

NSF Track 4: Bluer and Hotter: From Ultraviolet to X-ray Diagnostics of the Circumgalactic Medium
PI: *Joseph Burchett, NMSU*
$226,917 (2024–2025)

NSF: INCLUDES: Cultivating Indigenous Research Communities for Leadership in Education and STEM (CIRCLES) Alliance
PI: *Aaron Thomas, UMT* ● **NM PI:** *Selena Connealy, UNM;* **NM Co-PI:** *Lani Tsinnajinnie, UNM*
$10,000,000 (2022–2027)

DOE: Integrating Catchment Expansion-Contraction Dynamics into Cross-Continental Hydro-biogeochemical Predictions
PI: *Alexandra Webster, UNM*
(2023–2026)

DOE: Use of Carbonyl as an Infrared Reporter for Probing the Nature of Charges in Donor-Acceptor Type Conjugated Molecules
PI: *Juchao Yan, ENMU* ● **Co-PIs:** *Sandra Biedron, UNM; Marat Talipov, NMSU*
$749,976 (2022–2025)

DOD: Quantum Information Science and Engineering (QISE)
PI: *Ellen Fisher, UNM*
$1,000,000 (2023)

DOD: New Mexico Basic Research Center of Excellence for Hypersonic Sensor Development and Testing
PI: *Luis Cifuentes, NMSU*
$1,000,000 (2022)

New Mexico
EPSCoR

Advancing Collaborative Research Excellence in New Mexico

The mission of New Mexico's Established Program to Stimulate Competitive Research (NM EPSCoR) is to build the state's capacity to conduct scientific research while cultivating a diverse, well-qualified STEM workforce. We envision New Mexico as a contributor to the national and global STEM research enterprise and one that promotes innovation and economic development.