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Quantum Industry Collaborations and Educational Outreach: A NM Quantum Ecosystem Overview

Tuesday, August 26th, 2025

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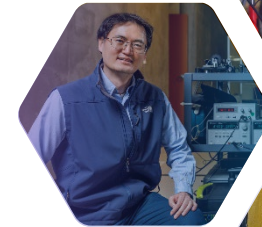
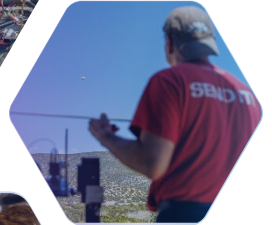
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BOTTOM LINE UP FRONT

- Quantum information science is an **emerging technology field** that is critical for economic and national security
- New Mexico has a decades long history of **leadership and collaboration** in quantum and partnerships are driving new innovations today
- Strategic **public-private partnerships, investments,** and **ecosystem support** will pave the way for continued leadership and prosperity
- We have a world class **quantum workforce** with programs in place to reach students from K-Career

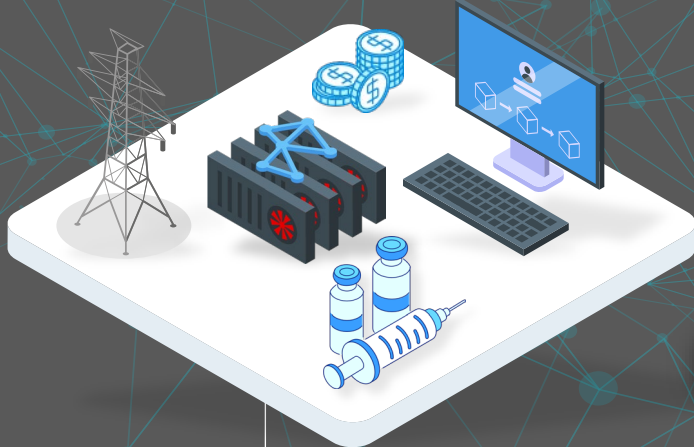


QUANTUM INFORMATION SCIENCE AND TECHNOLOGY WILL HAVE BROAD IMPACT ACROSS MANY SECTORS



Quantum Computing

A new computing paradigm that will help us solve problems in completely new ways



DRUG DESIGN
OPTIMIZE THE ENERGY GRID

FRAUD DETECTION IN FINANCIAL MARKETS

Quantum Sensing

Atomic level sensors that will greatly enhance sensing capabilities



QUANTUM ENHANCED NAVIGATION
SUBSURFACE EXPLORATION

Quantum Communication

Provable secure communication and new communication protocols



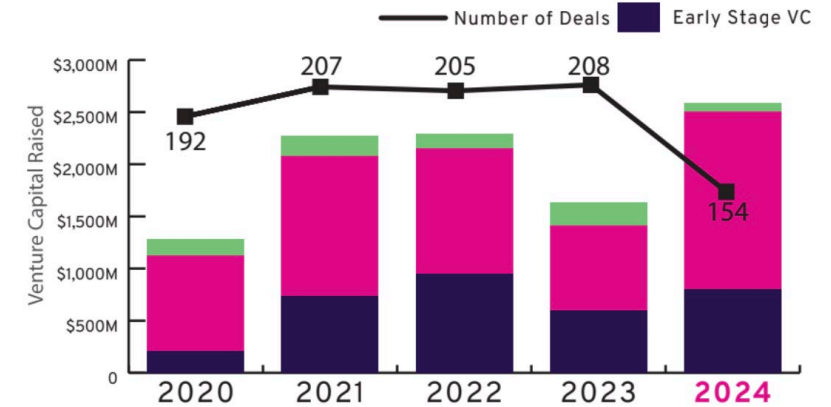
ULTRA-SECURE COMMUNICATIONS
ENERGY EFFICIENT COMMUNICATIONS



QUANTUM IS A CRITICAL EMERGING TECHNOLOGY FOR ECONOMIC AND NATIONAL SECURITY

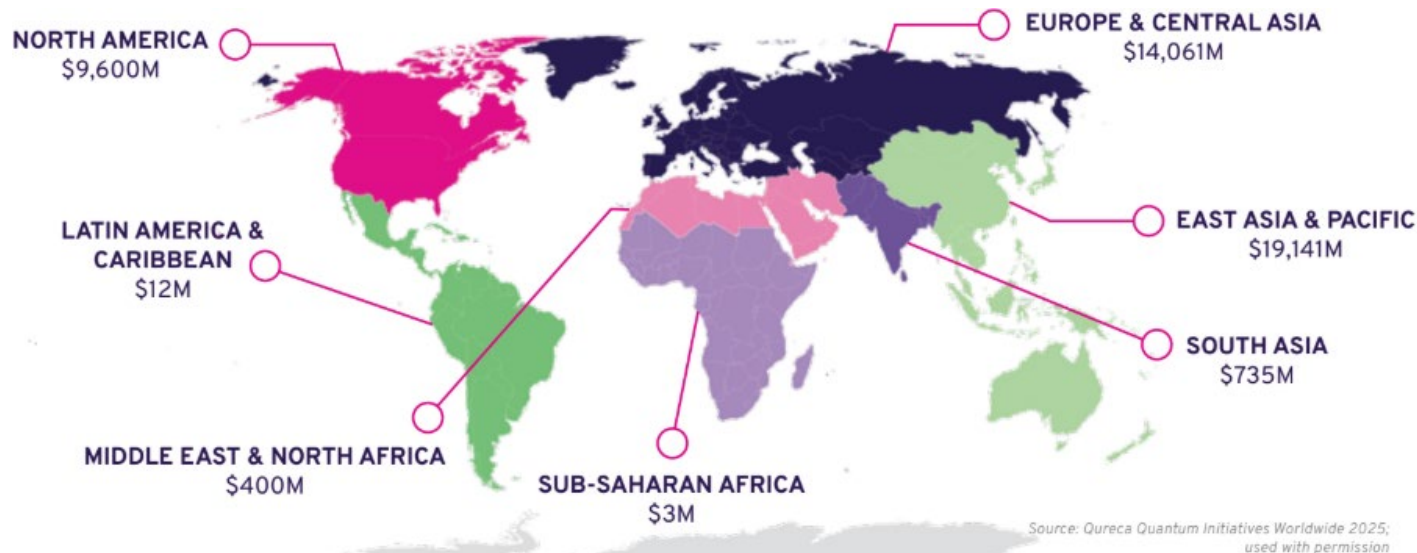
- Countries across the world are making big bets on quantum due to it's potential impacts across sectors
- 58% increase in funding from 2023 to 2024 went to 54 fewer deals, highlighting maturation of quantum startups and their technology.
- There are significant benefits for the regions that reach these technologies first

Venture Capital Raised and Number of Deals by Year*



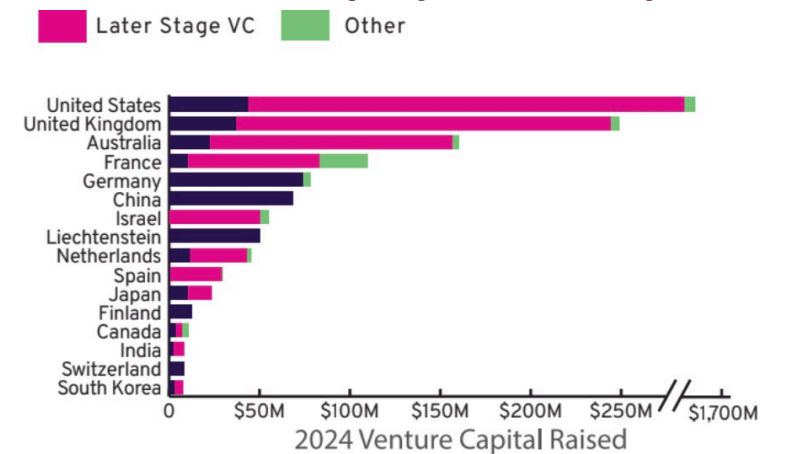
Source: PitchBook Data, Inc.; used with permission

Public Investments in Quantum Technology by Region*



Source: Qureca Quantum Initiatives Worldwide 2025; used with permission

2024 Venture Capital Leaders by Quantum Company HQ Country*

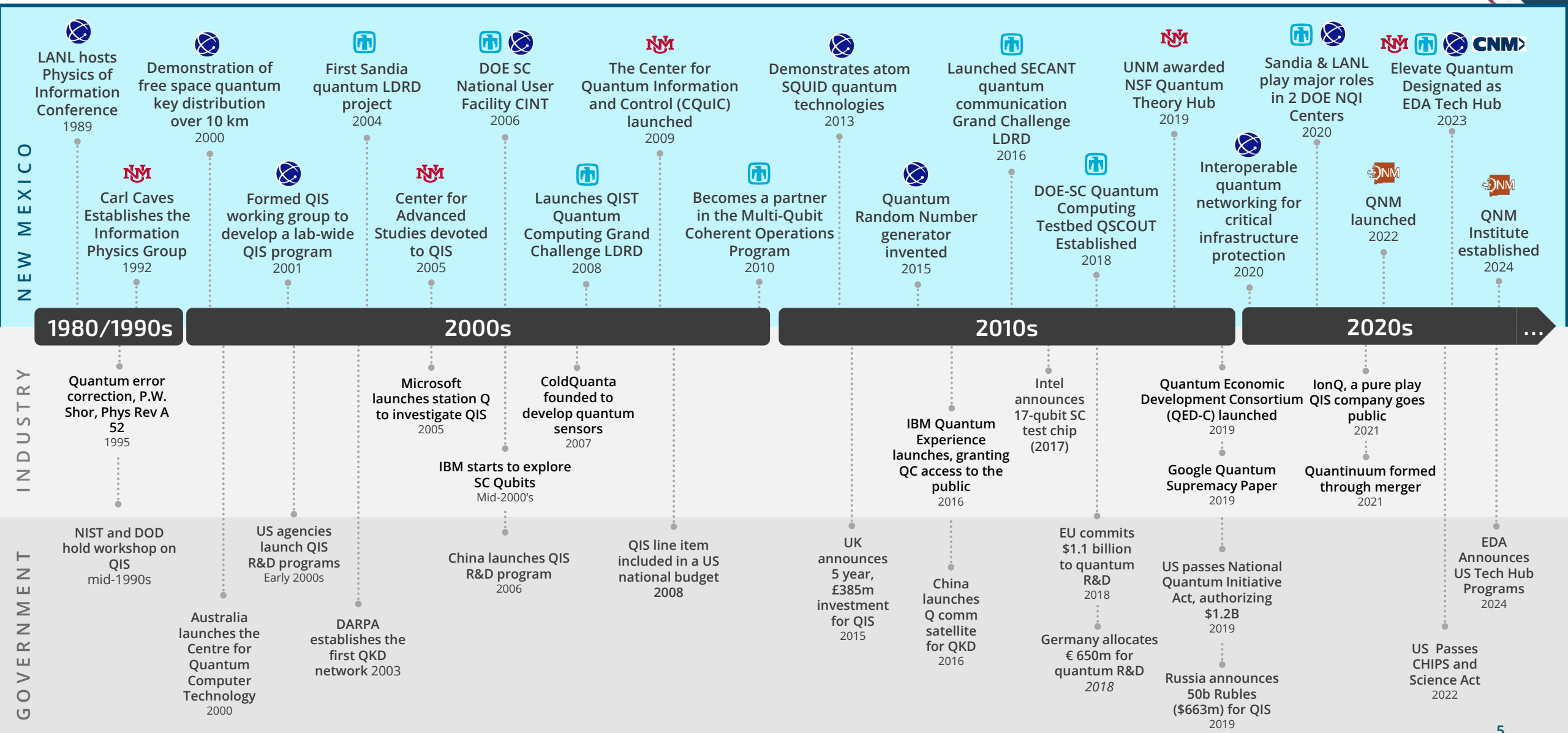


Source: PitchBook Data, Inc.; used with permission

*QED-C "State of the Global Quantum Industry" Report, 2025

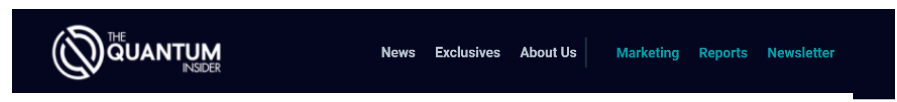


NM HAS BEEN A LEADER IN QUANTUM TECH DECADES





NEW MEXICO IS ALREADY LEADING THE WAY.



Tomorrow's quantum hotbeds? 7 U.S. cities that could incubate the next great quantum



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CIO JOURNAL

New Mexico Wants to Be the Heart of Quantum Computing

Partnerships between the state, its universities and its national labs demonstrate the Mountain West's ambitions in quantum technology

By Belle Lin [Follow](#)
April 22, 2025 3:58 pm ET



JANUARY, 2024

The University of New Mexico launches the Quantum New Mexico Institute



MAY, 2024

New Mexico Community College receives federal funding to launch rare quantum learning lab and training program

New Mexico's Quantum Moonshot named NSF Regional Innovation Engines semifinalist

Albuquerque, NM – July 14, 2025 – The National Science Foundation (NSF) has selected Quantum Moonshot, led by Elevate Quantum – in partnership with the New Mexico Economic Development Department, Sandia National Laboratories, Los Alamos National Laboratory, and the University of New Mexico – as one of only 29 semifinalists in the flagship Regional Innovation Engines program, positioning the Mountain West to secure up to \$160 million over the next decade to translate quantum breakthroughs into jobs, companies, and national-security capabilities.



MARCH, 2024

Governor Polis and Governor Lujan Grisham urge the Department Of Commerce to fund the Regional Quantum Partnership

QUANTUM HAS THE POTENTIAL TO IMPACT ALL OF NM



Oil and Gas Efficiency

- Quantum sensing for enhanced sub-surface exploration
- Quantum computing to optimize production

Applied R&D



- Quantum computing for material development
- Quantum sensing for enhanced patient care



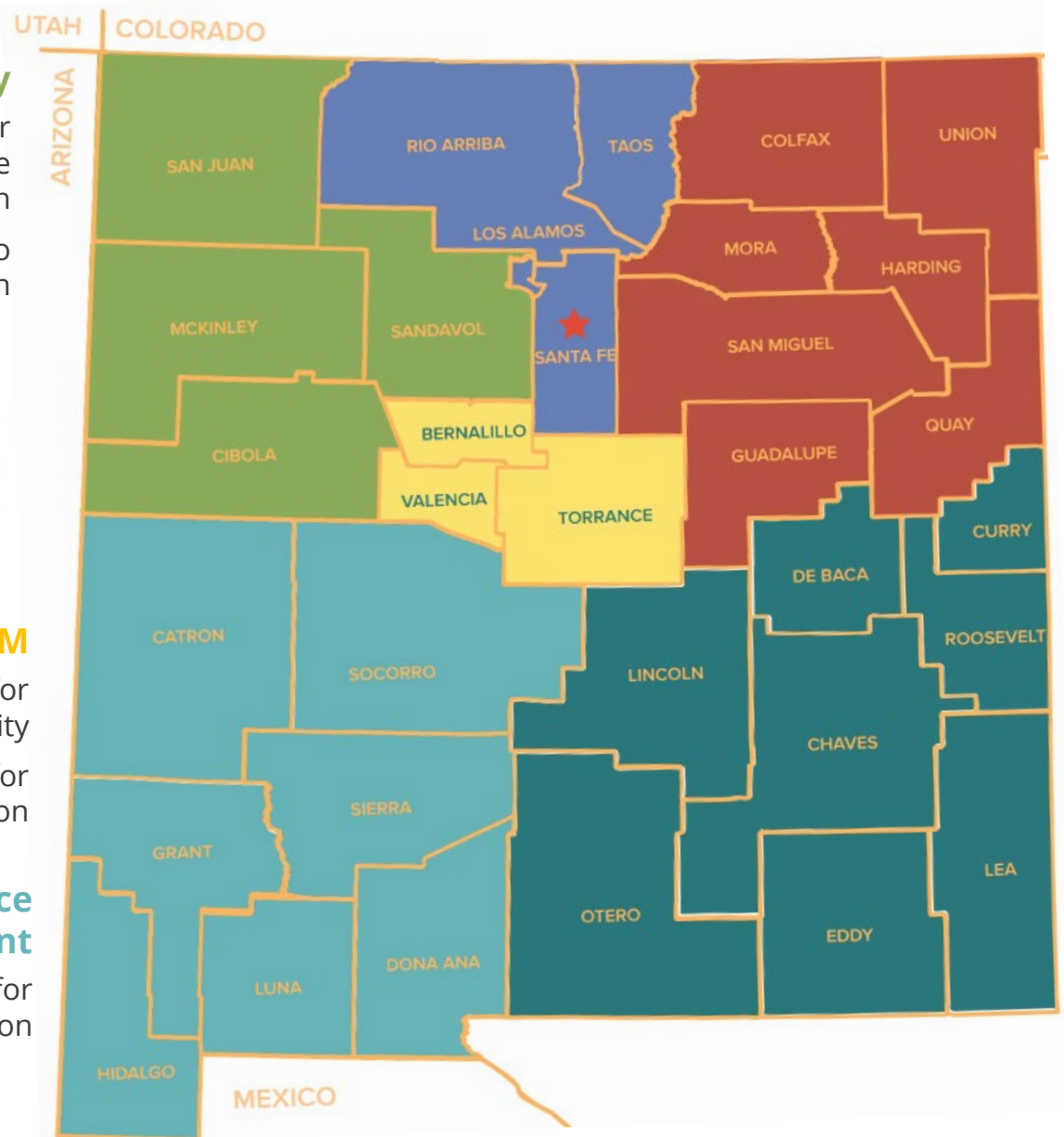
Cybersecurity and IM

- Quantum computing for enhanced data security
- Quantum networking for secure communication



Natural Resource Management

- Quantum sensing for mineral deposit exploration



Sustainable Agriculture

- Quantum sensing for environmental monitoring
- Quantum computing for crop resiliency



Efficient Energy Production

- Quantum computing for grid optimization
- Quantum computing for wind farm layout optimization



Aerospace and Defense

- Quantum sensing for enhanced navigation
- Quantum computing for detailed simulation





QUANTUM INFORMATION SCIENCE AT SANDIA



Provide trusted, threat-informed pathfinder technology for national security

Quantum System Engineering and Integration



Quantum Fabrication & Advanced Facilities (MESA, CINT)



Quantum Algorithms and Applications



Quantum Economic Development



National Thought Leadership





SANDIA IS EXPLORING WAYS TO ACCELERATE INNOVATION

Enhancing partnerships and access to quantum experts for collaborators

Quantum Foundry Facility (Q2F)

- Fill current technology gaps and democratize access to quantum technology platforms through MESA.

Quantum Demonstration Facility (QDF)

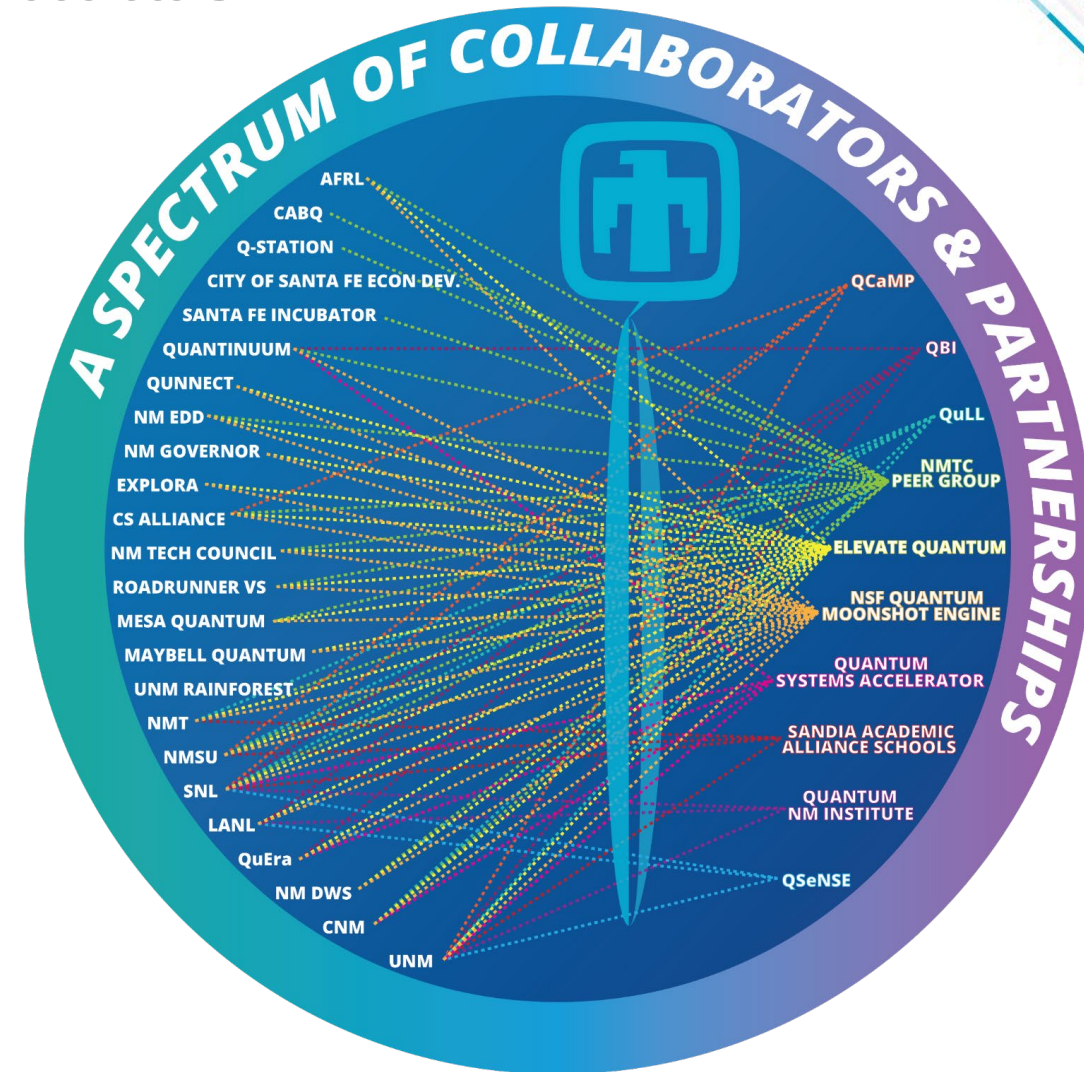
- Accelerate quantum commercialization, draw industry to NM, demonstrate new business opportunities, train the next generation workforce.

Quantum Lab Embedded Entrepreneur Program (QLEEP)

- Support early-stage quantum startups by embedding technical founders into the national lab ecosystem.

Elevate Quantum Packaging Facility

- Public-private led and operated chip-based packaging facility to support quantum information science technologies.



**Representative list of collaborators and projects.*



SANDIA IS COMMITTED TO COLLABORATIONS THAT SUPPORT A GROWING QIS ECOSYSTEM



Mission: expand research & development, enhance workforce development, and promote efforts to advance the local and regional quantum ecosystem to meet the nation's economic and national security goals

- UNM launched the **QNM Institute** in January of 2024, in close partnership with Sandia and LANL
- Currently expanding **workforce** and **economic development** programs with partners across NM



Mission: Secure the Mountain West's position as the global epicenter for quantum technologies

- **120+ members, industry led**, includes Sandia, LANL, AFRL, UNM, CNM, NMSU, NMT, and more
- Selected as 1 of 12 Phase 2 participants, unlocking **\$127M of funding** for the region
- NM partners establishing a **packaging facility** for quantum tech and will lead **workforce programs**

The New Mexico Quantum Moonshot –
Grand Challenges for US National & Economic Security
Regional Innovation Engine

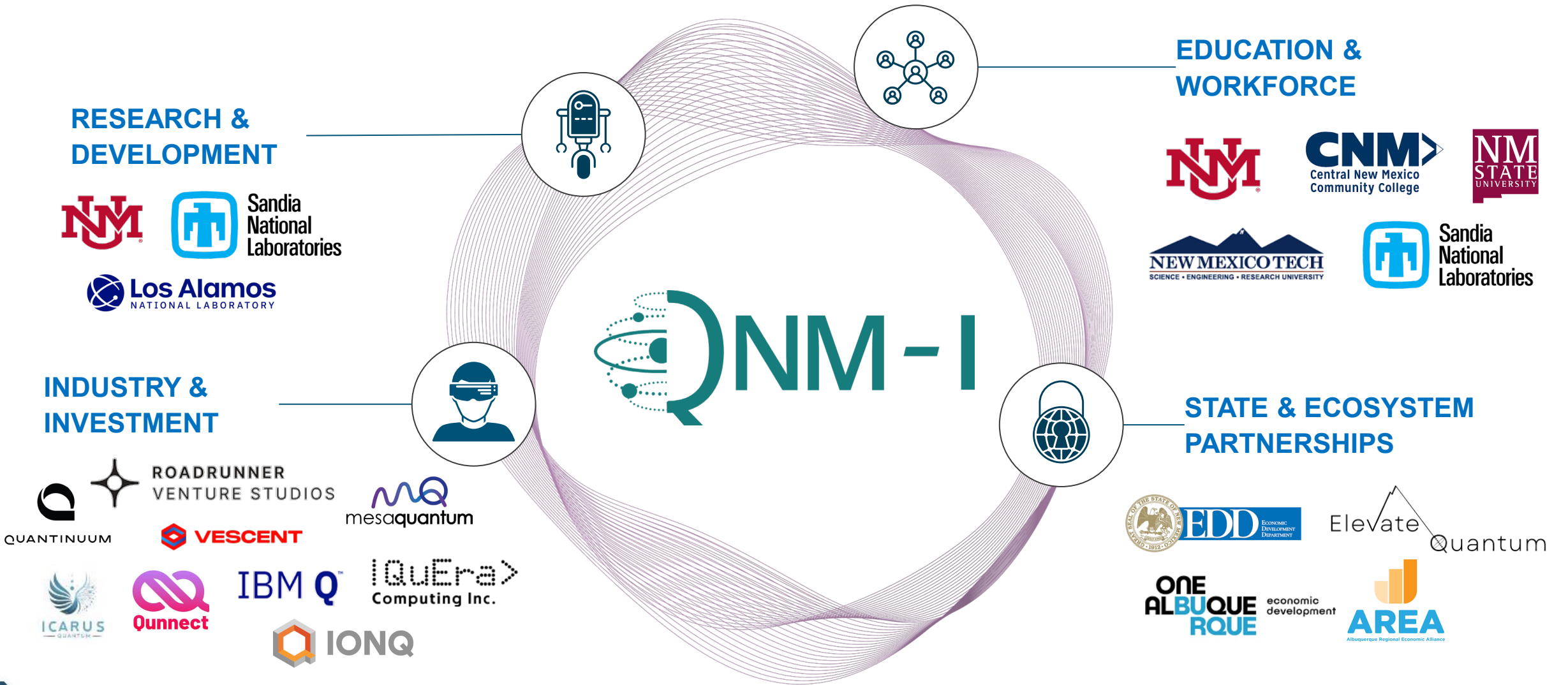
Program goal: Translate quantum breakthroughs to enhance economic development and sustain national security.

- One of 29 **semi-finalists** competing for up to 10 awards (\$160M/10 years)
- Led by **Elevate Quantum New Mexico** with partnerships across NM and the Mountain West
- Technical focus areas across q. sensing, networking, and computing, all supported by place based capacity building



QUANTUM NEW MEXICO INSTITUTE

Bringing partners together to accelerate quantum innovation and commercialization for NM



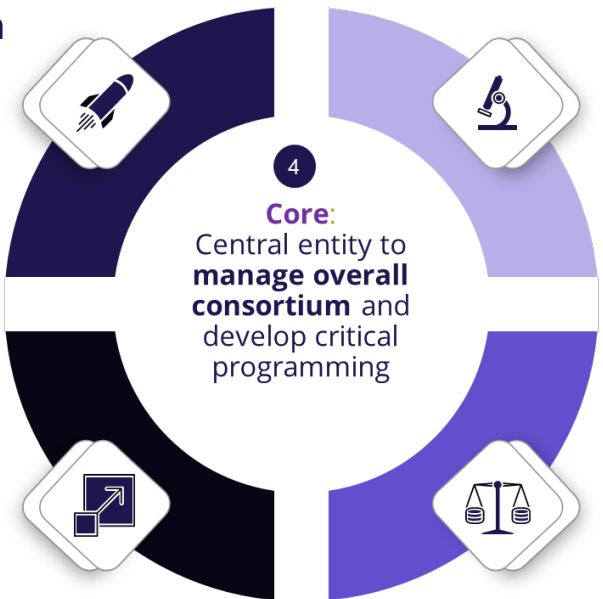


ELEVATE QUANTUM IS CONTINUING TO GROW AND PROVIDE IMPACT FOR THE MOUNTAIN WEST

The largest regional consortium in the world – 140+ organizations, 90% local – stand ready to deliver for the US

CREATE: Open-access commercial quantum fabs/labs

Quantum Packaging Facility (UNM, Sandia)

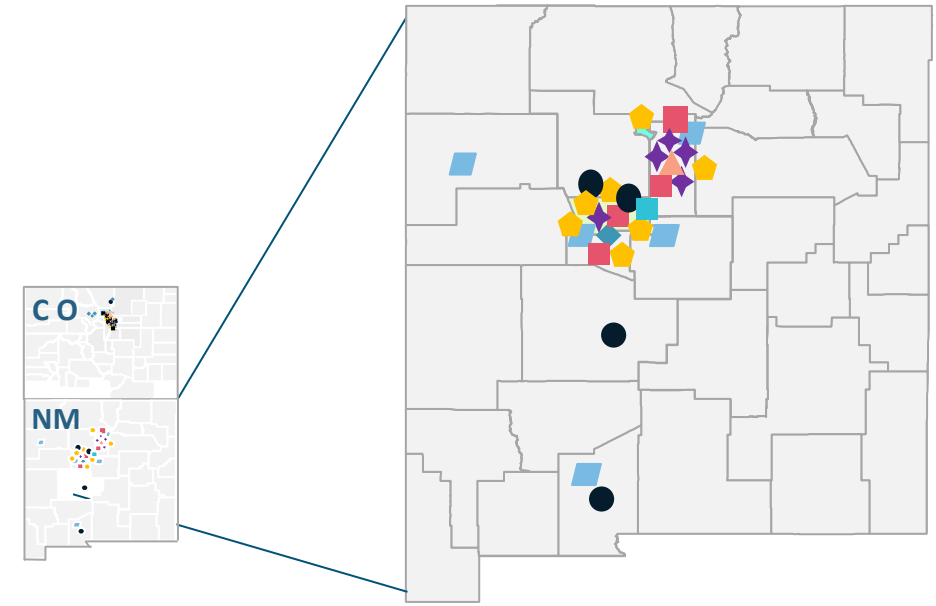


ACCELERATE (Launch): Accelerator programs to commercialize technology & form new quantum businesses

ACCELERATE (Scale): Programs to facilitate scaleups by through **multi-dimensional support**

INCLUDE: Industry-informed, accessible, skilled, and inclusive quantum education ecosystem

Quantum Learning Lab (CNM/Sandia/UNM)

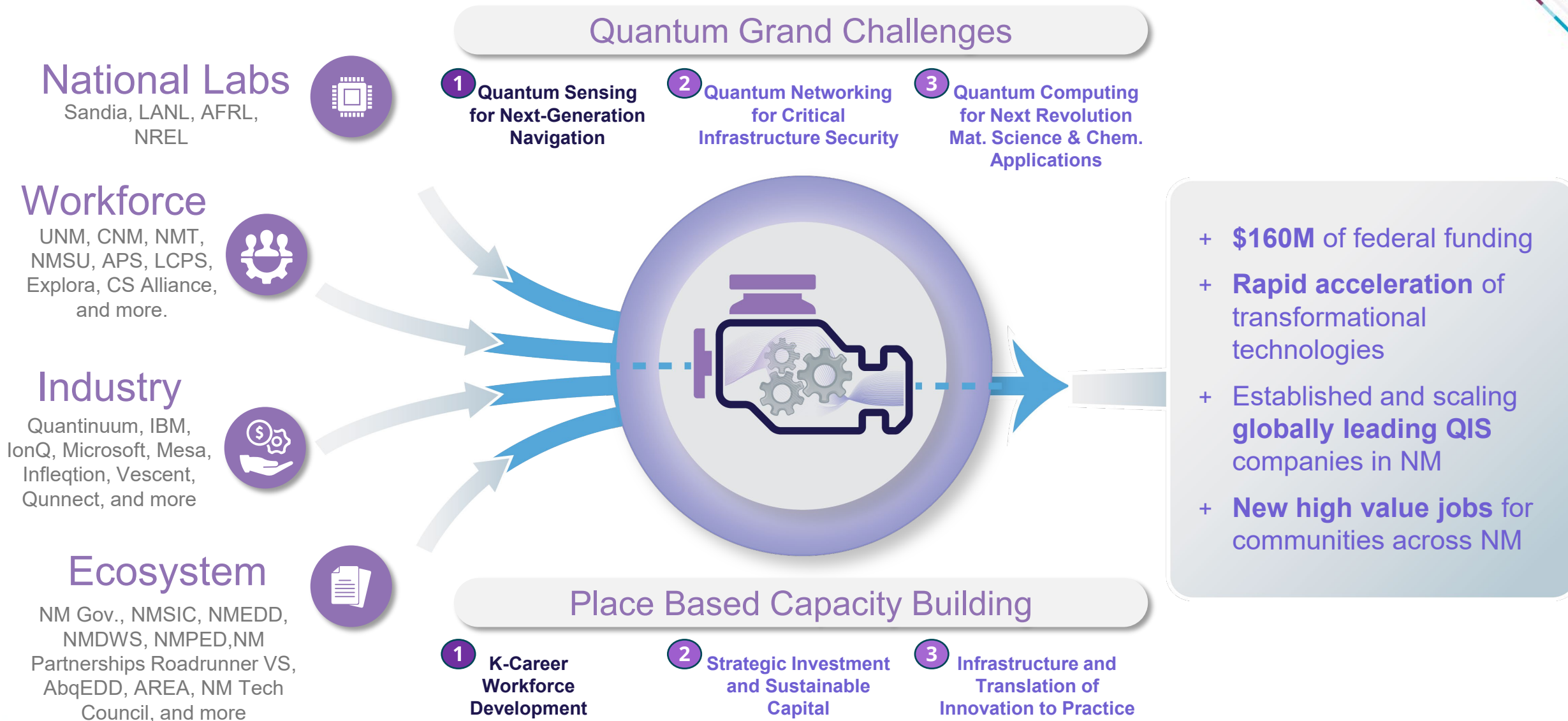


EQ partners include organizations like:

- ◆ **State/Local Government**
 - Governor of New Mexico
 - Albuquerque Economic Development Department
 - New Mexico Economic Development Department
 - NM Dept. of Workforce Solutions
 - NM Public Education Dept
 - North Central New Mexico Economic Development District
- ▲ **Industry/Firms**
 - Maybell Quantum
 - Mesa Quantum Systems
 - Quantinuum
 - Quera
 - Qconnect
 - STAR Cryoelectronics
- **Econ Dev / Capital**
 - America's Frontier Fund*
 - Albuquerque Regional Economic Alliance
 - Quantonation*
 - Roadrunner Venture Studio
 - Santa Fe Office Economic Development
 - Santa Fe Business Incubator
- ◆ **Labor/Workforce Org.**
 - EQ Workforce Collaborative
 - Unitary Fund
- **K-12 STEM Partner**
 - Albuquerque Public Schools
 - Computer Science Alliance
 - Explora Science Center and Childrens Musuem
 - Gallup-McKinley County Schools
 - Las Cruces Public Schools
- **Higher Education**
 - Central New Mexico Community College
 - New Mexico State University
 - New Mexico Tech
 - University of New Mexico
- ◆ **Additional Entities**
 - Air Force Research Lab
 - Los Alamos National Lab
 - Sandia National Laboratory
 - New Mexico EPSCoR Office
 - New Mexico Technology Council
 - New Mexico Partnerships
 - STEM Santa Fe



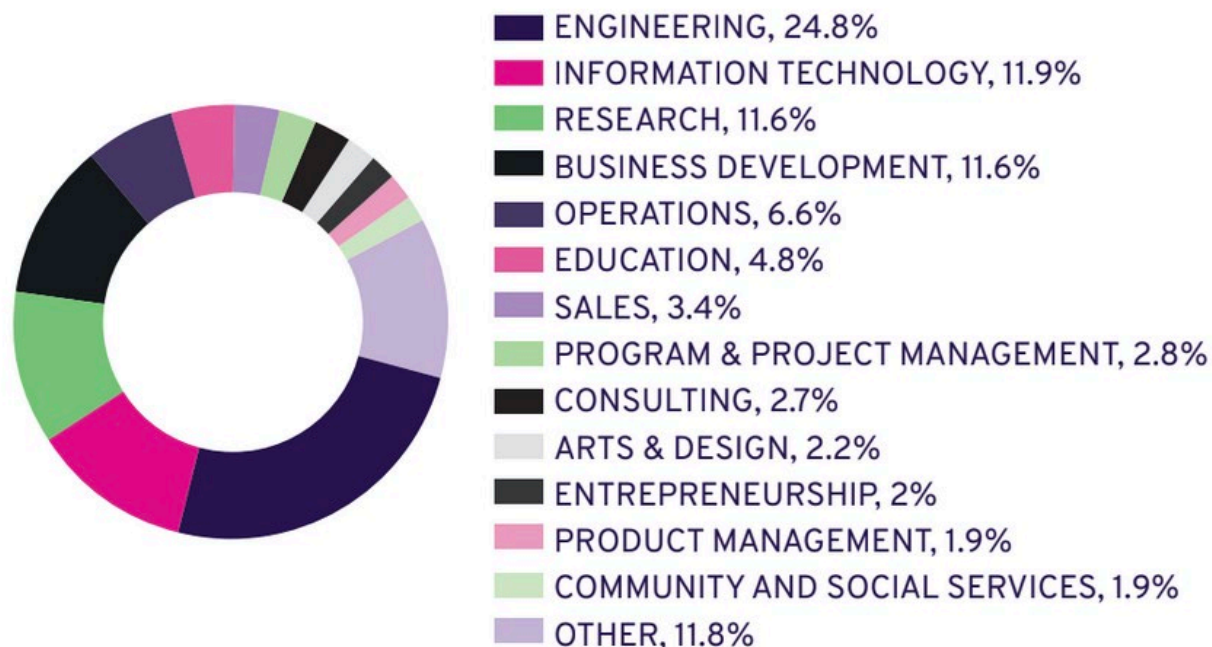
THE QUANTUM MOONSHOT ENGINE WILL ACCELERATE QUANTUM ECOSYSTEM DEVELOPMENT IN NEW MEXICO





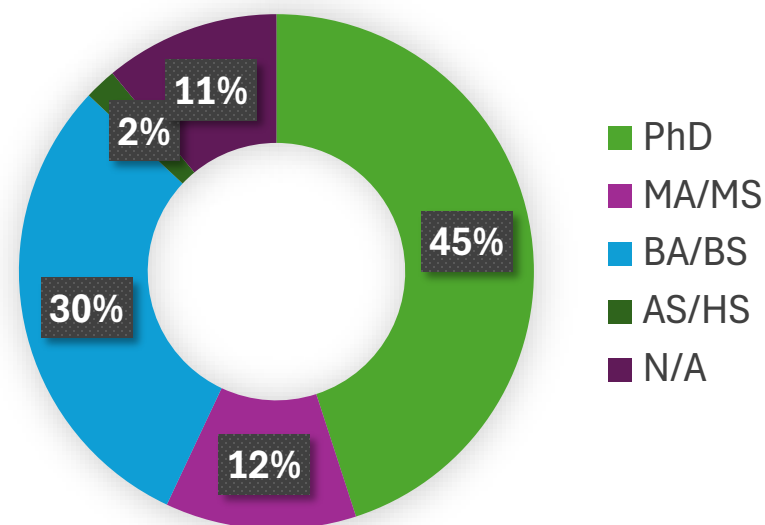
QUANTUM JOBS ARE MULTIDISCIPLINARY AND DO NOT REQUIRE A PHD

QUANTUM WORKFORCE BY ROLE



QED-C "State of the Global Quantum Industry" Report, 2025

QUANTUM WORKFORCE BY DEGREE



Results from a quantum workforce hiring survey for the months on open job postings in the US sorted by keyword N=991. of May 2021 - January of 2022. Data collected using Lightcast.

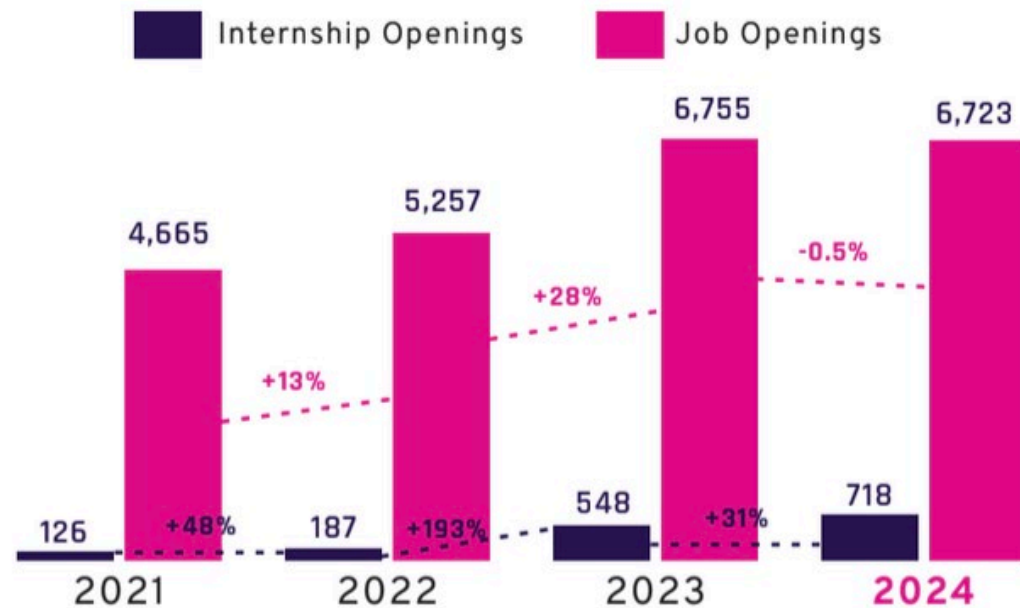


QUANTUM WORKFORCE: SUPPLY AND DEMAND

Study by a group examining job opportunities in the Mountain West found that

- Currently there is only one qualified candidate for every three quantum job openings
- 80% of current “Quantum” job listings require non-quantum skills
- Current job postings are more hardware focused (~60%) than software focused
- By 2034 there could be a workforce gap of ~77,000 workers in the region

QUANTUM RELATED OPENINGS BY POSITION TYPE



Future Outlook

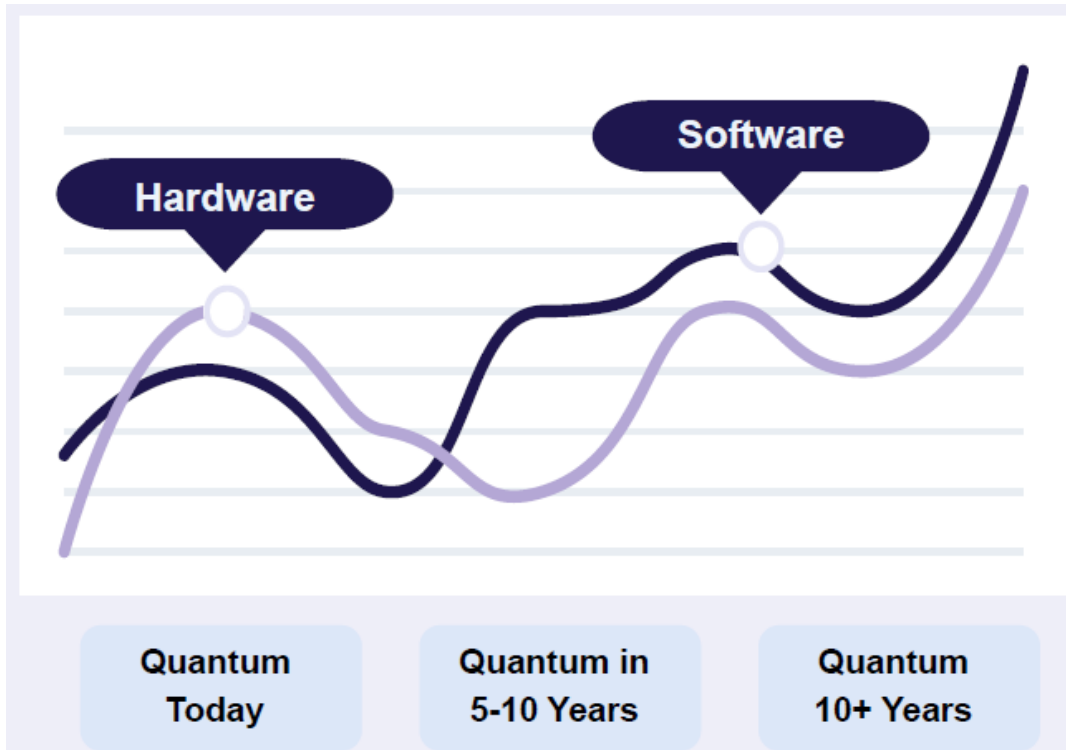
- Additional jobs will emerge that we didn't expect
- As quantum systems mature job demand will likely shift to be more software focused
- Continued shift towards the ability to enter the field without an advanced degree
- Expanding need for business acumen and support for QIS industry

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*Figure is notional only. Figure courtesy of Delivery Associates, © Copyright 2024. All rights reserved.



PARTNERS ACROSS NEW MEXICO ARE HELPING PREPARE THE NEXT GENERATION QUANTUM WORKFORCE

- QCaMP has introduced quantum to hundreds of high school teachers and students
- QuLL will be a first of its kind quantum technician training program led by CNM
- Summer schools and internships have engaged hundreds of undergrad & graduate students

Traditional higher education pathways: UNM, NMSU, NMT, CNM →

Highschool


Associates & Certificates

Bachelors


Graduate

Postdoc

Additional quantum workforce opportunities

 **QuanTime NM**
K-12 Classroom Activities


 **QCaMP**
High school teacher & student camps

 **QU-REACH**
Quantum Undergraduate Research Experience At CHTM

 **Qu-Drive: Quantum material summer program**


 **Quantum Computing Summer School Fellowships**


  **QIS Internship Programs**

 **QPAQT**
Quantum Photonics and Quantum Tech Graduate (QPAQT) program

 **QNM Quantum Fellowships**

 **Gil Herrera Postdoctoral Fellowship in QIS**

 **Quantum Learning Lab (QuLL)**
Hands on training for NM students

 **Elevate Quantum Workforce Collaborative (EQWC) - Full spectrum workforce collaborative**

QUANTIME NEW MEXICO!



QuanTime was developed by the National Q-12 Education Partnership to engage K-12 learners with activities that introduce students to quantum science, opening opportunities and pathways to quantum careers. <https://q12education.org/quantime>

MADE TO FIT

QuanTime activities each take 45-60 minutes so that they can be completed within a single class period.

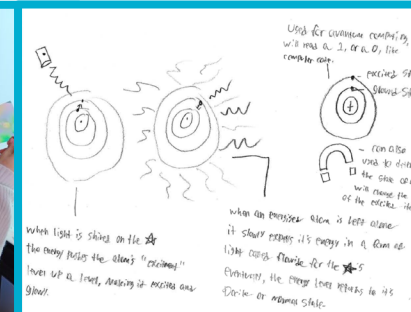
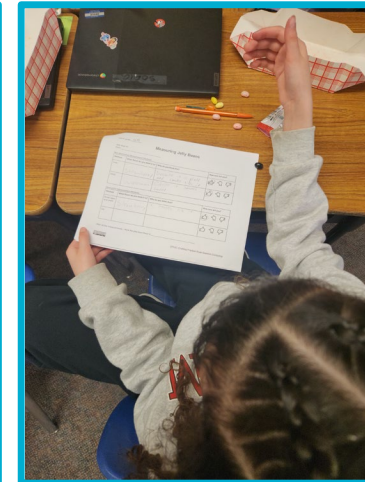
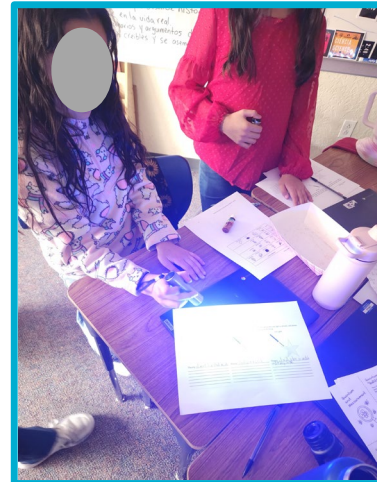
ENGAGING

Activities are designed to be a fun way for teachers and students to play around with quantum concepts.

QUANTIME NM:

- Led by **CS Alliance**, **APS**, and **Sandia**, with many community partners from across the region.
- **Kickoff event at Explora!** attended by **538 community members**. **14** Quantum booths were staffed by **9** researchers, **8** teachers, and **21** students.
- **6 PD Sessions** held to support **6** different activities. **52** teachers attended
- **Kits provided** to **34** teachers for classroom implementation, **24** implemented in their classroom reaching **711** students
- PD sessions were recorded and posted to our websites. **Kits are <\$5/student.**

<https://www.QuanTimeNM.org>

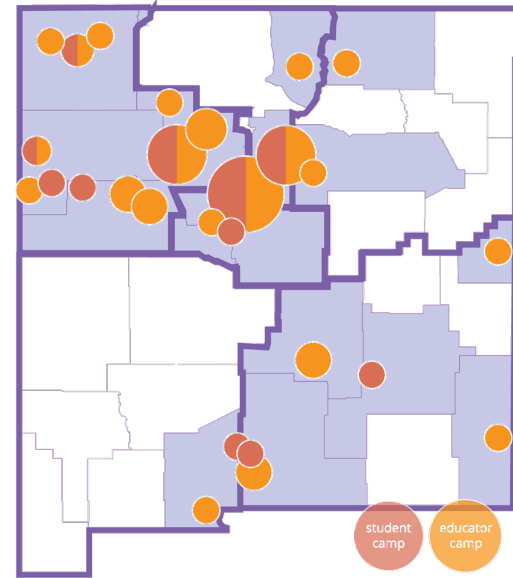




QUANTUM COMPUTING, MATHEMATICS, & PHYSICS CAMP (QCaMP)

WHAT IS QCaMP?

- Summer camps for high school and community college students, and teachers aimed at introducing participants to quantum concepts and career opportunities.



QCaMP in NM: 2022-2025
16 counties
~7,585 total reach
75 QCaMP educators
85 QCaMP students

QCaMP GOALS AND GUIDING PRINCIPLES

- **Goal: Reduce barriers.** Stipends for participants. No prerequisites! Hands-on puzzles/experiments throughout.
- **Goal:** Give teachers tools to **introduce quantum** to their students, allowing us to **expand the QIS workforce.**
- **Goal:** Provide exposure to and **get students excited** about a career in QIS at a critical decision point.

2021: Sandia & LBNL participate in ORISE's JSTI program - 10 Students

2023: QCaMP expands to a week-long hybrid program - 42 Students & 16 Teachers

2024: QCaMP 1-Day Workshop at St. Vincent College - 28 K-12 Teachers

2024: Hybrid Teacher QCaMP expands across 5 states - 83 Teachers

2025: Hybrid Teacher QCaMP expands to 8 states - 131 Teachers

490+ Direct Participants (cumulative)

2022: Sandia/LBNL launch week-long virtual QCaMP - 32 Students & 20 Teachers

2023: QCaMP @ CNM 2-day Bridge Program - 22 Community College Students

2024: QCaMP @ CNM 2-day Bridge Program - 15 Community College Students

2024: Student QCaMP expands to 4 week in-person camp - 42 students

2025: 4-week in-person Student QCaMP held - 39 Students

QCaMP is made possible by partners across NM! Sandia (lead), LANL, UNM, NMSU, CS Alliance, and more



QUANTUM LEARNING LAB (QuLL) & TECHNICIAN TRAINING PROGRAM

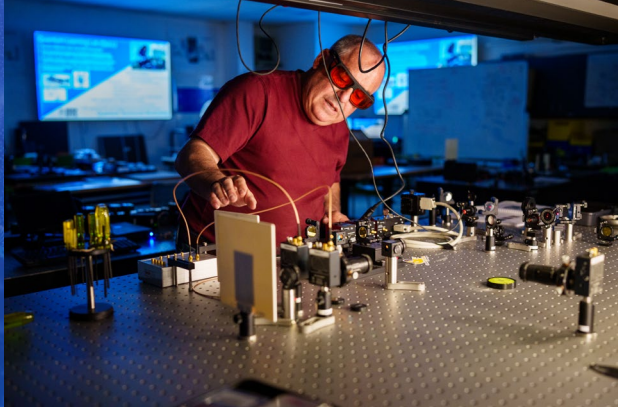
- Many of the skills valued in quantum jobs are already taught in other contexts and **do not require prerequisite math or science experience**:

General Technical Lab Skills
Wiring & Soldering
Vacuum Systems
Optics

Measurement
CAD/Solidworks
Safety
Quantum Concepts

Welding
Machining
Spectroscopy
Laser Alignment & Locking

- **Hands-on training** is one of the **most important skillsets** for a quantum-ready workforce
- Sandia is partnered with **CNM-I** to develop a **10-week bootcamp** to prepare New Mexicans for high paying technician roles in quantum industry
- First bootcamp will begin in Fall 2025 and ensure **skill alignment with adjacent industries**, including photonics, semiconductors, solar cells/photovoltaics, manufacturing...



Photos of Brian Rashap in the QuLL at CNM Ingenuity's FUSE Makerspace in downtown Albuquerque. Photos courtesy of Craig Fritz.

THE FUTURE IS QUANTUM



Quantum Technologies are Critical: Prioritizing efforts to realize advanced quantum technologies across strategic technology areas is critical for economic and national security.

Interdisciplinary Collaboration: Success hinges on partnerships across national laboratories, academia, industry, and ecosystem partners.

Empowering Innovation: By democratizing access to quantum technologies, we enable diverse stakeholders to contribute to groundbreaking advancements.

Future-Ready Workforce: Investing in education and workforce development is crucial for cultivating the next generation of quantum leaders.



THANK YOU!

QIS IS A NATIONAL STRATEGIC PRIORITY

There is strong bipartisan support to rapidly develop and support Quantum Information Science and Technologies (QIST)

- **National Quantum Initiative (NQI)**: Passed in 2018, this bill authorized \$1.15B over 5 years to support an all of government approach to sustain national and economic security. *NQI Reauthorization legislation to extend 5 more years pending*
- **National Defense Authorization Act (NDAA)**: Passed yearly, legislation authorizes the DOD to carry out QIST R&D
- **CHIPS and Science Act of 2022**: Authorizes additional funding for QIST infrastructure, R&D, and workforce development programs.

Government Agencies are supporting large programs to advance QIST

- **Department of Energy** (e.g. DOE/SC, NNSA, ARPA-E)
- **Department of Defense** (e.g. DARPA, Microelectronics Commons)
- **Intelligence Community** (e.g. IARPA)
- **National Science Foundation** (e.g. QLCIs, Regional Innovation Engines)
- **National Institute of Standards & Technologies** (e.g. QED-C, PQC, etc.)

What our Leaders are saying...



“ This is the era of bits, neurons, and qubits. When combined, these computing revolutions could unlock unprecedented capabilities. ”

- Dario Gil, DOE Under Secretary for Science

“

“...I hope in the next four years, we're going to see the fusion of scalable quantum computing and AI, and we're going to have a different world with different possibilities.”

”

-Chris Wright, DOE Secretary of Energy

QUANTUM FOUNDRY FACILITY (Q2F)

QUANTUM ACCESSIBILITY | CUSTOM SOLUTIONS | ADVANCED INTEGRATION

To support the quantum innovation ecosystem, Sandia is launching the Quantum Foundry Facility (Q2F) to democratize access to state-of-the-art quantum technology platforms.

Q2F offers fully customizable surface electrode ion trap platform:

- High optical access “bow-tie” shape
- Backside loading holes
- Through trap loading slots
- Custom top-metal layout
- Hybrid integrated shunt capacitors
- 100 pin CPGA, LGA packages
- 10 mm x 6 mm standard design area
- Low-profile wirebonds to enable optical access



Future Offerings Include

Monolithic and hybrid integration of advanced technologies for photonic and optic technologies.

Timeline

1st lot launched May
2025

Fabrication
release in August
2025

Packaging in
process
September 2025

Devices ready for
use in October

Email quantum@sandia.gov for
additional information

QUANTUM DEMONSTRATION FACILITY (QDF)

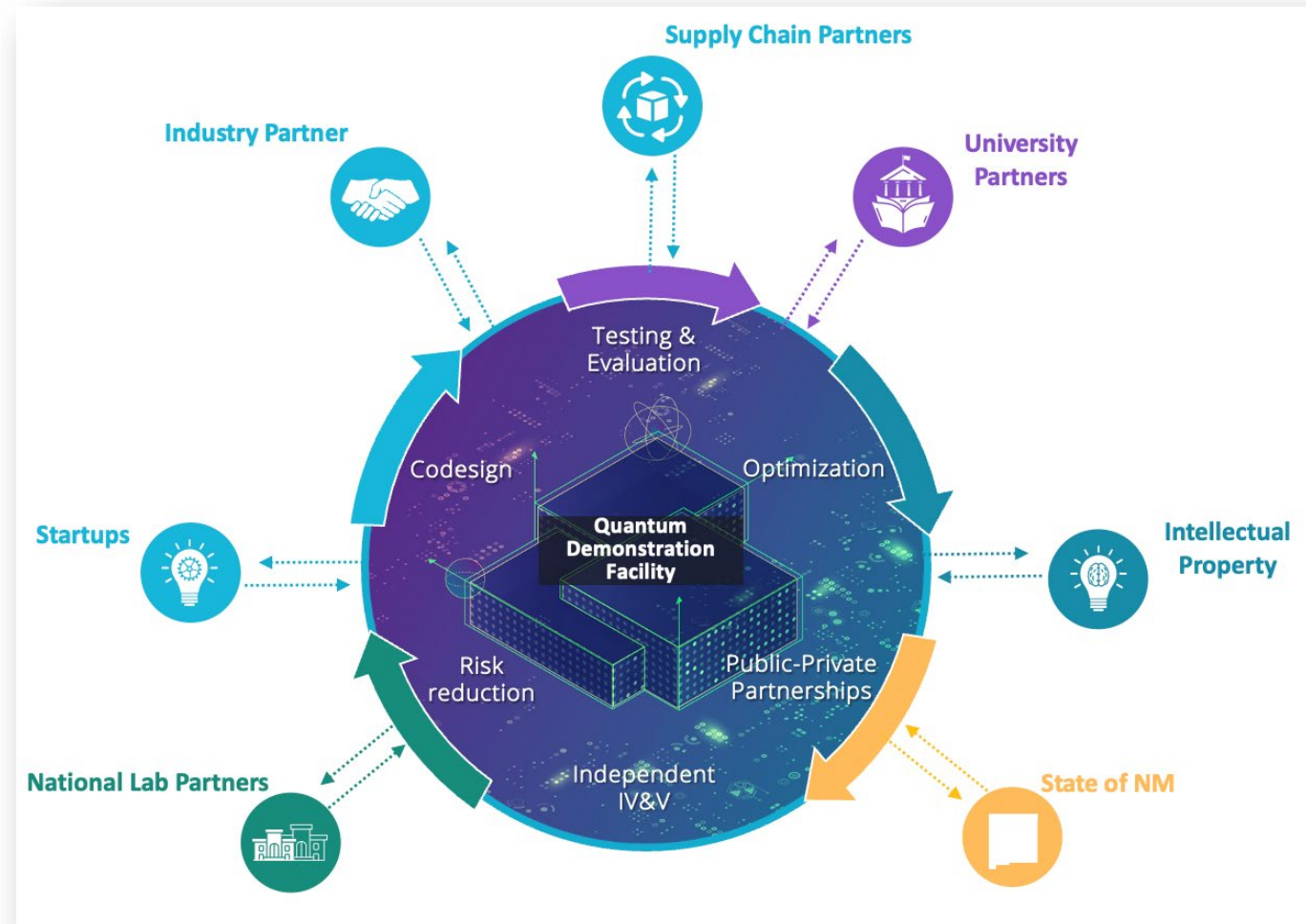
Accelerate quantum innovation and commercialization by utilizing public-private partnerships that leverage national lab expertise and capabilities to help industry partners advance their technologies.

The QDF will provide services and expertise in:

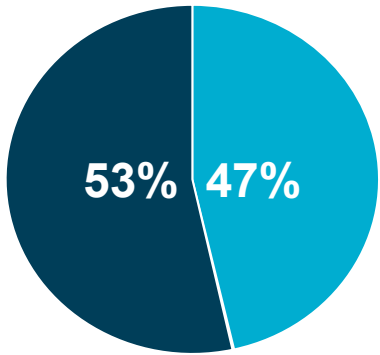
- Co-design (proxy applications)
- Testing, Evaluation, and Optimization
- Independent Verification, and Validation (IV&V)
- Risk Reduction
- Design for X (manufacturing, security, assembly, service, etc.)

The QDF will help demonstrate:

- New quantum system capabilities
- Business opportunities and spin-outs
- Use cases for NM and our USG partners
- Career and workforce development opportunities



QUANTUM IS CUTTING EDGE, BUT JOBS ARE BECOMING MORE ACCESSIBLE TO ALL



Today, half of quantum jobs don't require advanced degrees

Share of technician jobs expected to double in 5 yrs

2x



The average quantum job pays >\$125,000/yr

Frame:

Skills: Fabrication/Welding
Education: Trade/CC

Gas Handling:

Skills: Welding/Pipfitting
Education: Trade/CC

Vacuum system:

Skills: Pipe fitting
Education: Trade/CC

Thermalization plates:

Skills: Machining/Welding
Education: Trade/CC

Quantum wiring assembly:

Skills: Soldering
Education: Trade/CC

Wire tree validation:

Skills: VNA/Oscilloscope
Education: BS/MS

Cryogenic system assembly

Skills: Vacuum brazing/welding
Education Requirement: Trade/CC

Processor Installation:

Skills: AWG/CE
Education Requirement: PhD

Algo/Software:

Skills: Math/programming
Education Requirement: PhD

