New Mexico EPSCoR

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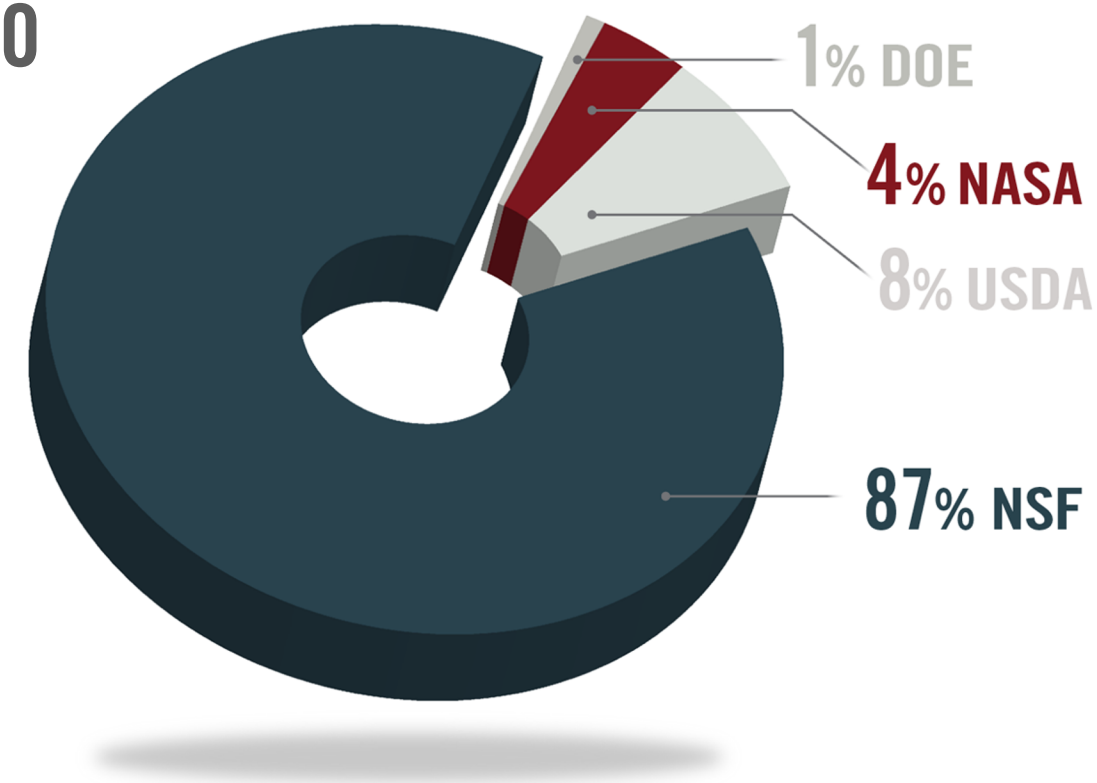
Science Technology and Telecommunications Committee meeting
University of New Mexico, 8th July 2022

A jurisdiction is eligible to participate in NSF EPSCoR if their most recent 5-year level of total NSF funding is equal to or less than 0.75% of the total NSF budget. Jurisdictions above 0.75% but less than 0.80% are allowed to remain EPSCoR-eligible for up to 5 years.

State	FY17 Total	FY18 Total	FY19 Total	FY20 Total	FY21 Total	2017-2021 Total	EPSCoR Total	Federal Total	Adjusted $	% of Total $
(Drill to Inst)	Amt $k	Amt $k	Amt $k	Amt $k	Amt $k	Amt $k	Amt $k		Amt $k	
Grand Total	$7,016,546	$7,457,851	$7,734,408	$7,799,302	$8,169,835	$38,177,942	$693,376	$785,955	$36,698,61	100.00%
Other	$18,894	$23,354	$27,131	$21,735	$22,869	$113,983	-	-	-	-
US Total	$6,997,652	$7,434,497	$7,707,277	$7,777,567	$8,146,966	$38,063,959	$693,376	$785,955	$36,698,61	100.00%
Guam	$2,516	-	$1,210	$4,490	$5,457	$13,673	$10,709	-	$2,964	0.01%
Virgin Islands	$5,109	$6,304	$2,922	$8,149	$8,842	$31,326	$17,935	-	$13,391	0.04%
Vermont	$15,665	$19,389	$6,118	$17,360	$12,103	$70,635	$22,881	-	$47,754	0.13%
South Dakota	$14,822	$15,021	$20,290	$19,570	$16,323	$86,026	$36,798	-	$49,228	0.13%
North Dakota	$13,434	$16,051	$8,671	$19,927	$25,074	$83,157	$23,797	-	$59,360	0.16%
West Virginia	$14,347	$15,959	$15,125	$17,222	$19,917	$82,570	$19,186	$695	$62,689	0.17%
Puerto Rico	$10,285	$19,488	$19,355	$23,623	$18,977	$91,728	$15,301	-	$76,427	0.21%
Wyoming	$13,344	$17,068	$28,525	$26,333	$17,722	$102,992	$20,889	-	$82,103	0.22%
Mississippi	$20,946	$21,791	$24,514	$19,826	$31,258	$118,335	$20,286	$1,159	$96,890	0.26%
Maine	$22,314	$33,440	$25,013	$29,236	$26,074	$136,077	$38,481	-	$97,596	0.27%
Idaho	$24,701	$24,745	$30,765	$25,426	$34,790	$140,427	$38,733	-	$101,694	0.28%
Arkansas	$15,411	$28,979	$19,720	$27,031	$33,841	$124,982	$22,699	-	$102,283	0.28%
Nevada	$18,375	$22,091	$25,951	$26,783	$29,940	$123,140	$7,419	-	$115,721	0.32%
Kentucky	$30,048	$32,887	$32,034	$41,422	$38,574	$174,965	$29,670	-	$145,295	0.40%
Nebraska	$37,926	$34,167	$41,761	$25,166	$39,216	$178,236	$31,976	-	$146,260	0.40%
Montana	$31,780	$30,567	$31,487	$38,541	$39,671	$172,046	$22,762	-	$149,284	0.41%
Oklahoma	$40,468	$24,624	$31,122	$37,208	$41,665	$175,087	$18,309	$2,701	$154,077	0.42%
New Hampshire	$40,038	$38,751	$41,947	$42,904	$33,275	$196,915	$30,330	$4,754	$161,831	0.44%
Delaware	$25,204	$36,652	$41,135	$44,312	$46,509	$193,812	$24,291	-	$169,521	0.46%
Kansas	$41,596	$41,173	$37,956	$44,239	$40,410	$205,374	$34,930	-	$170,444	0.46%
Louisiana	$36,916	$42,513	$39,207	$46,391	$62,140	$227,167	$34,770	-	$192,397	0.52%
South Carolina	$75,564	$64,019	$67,592	$55,752	$68,959	$331,886	$35,468	$83,943	$212,475	0.58%
Hawaii	$45,167	$45,314	$54,175	$49,016	$57,273	$250,945	$19,112	-	$231,833	0.63%
Rhode Island	$49,387	$43,605	$56,491	$51,046	$60,554	$261,083	$28,684	-	$232,399	0.63%
New Mexico	$51,704	$46,030	$45,758	$59,651	$55,250	$258,393	$23,853	$1,907	$232,633	0.63%
Alaska	$46,325	$45,032	$62,202	$61,168	$56,053	$270,780	$23,697	-	$247,083	0.67%
Iowa	$47,675	$50,677	$45,637	$51,742	$57,905	$253,636	$1,288	-	$252,348	0.69%
Alabama	$51,155	$60,140	$58,987	$69,095	$63,484	$302,861	$31,122	-	$271,739	0.74%

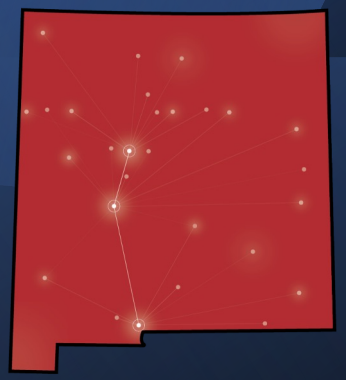
EPSCoR eligibility has resulted in over **$207 million** in federal investment in New Mexico since 2000



STTC meeting, UNM

The NM EPSCoR State Office

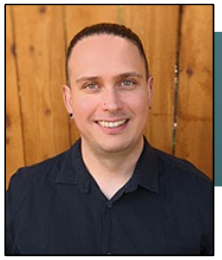
"Advancing Collaborative Research Excellence in New Mexico"



- The NM EPSCoR state office is hosted by the University of New Mexico.
- The office is a state-wide research resource.
- We provide research, education and outreach support for all institutions in the state of New Mexico. This includes 2-year, 4-year and graduate degree granting institutions. It also includes Tribal Colleges and Universities.
- Our goal is to maximize the flow of federal grants to New Mexican Colleges and Universities, with a focus on the National Science Foundation.
- We manage the $24 M five-year track-1 EPSCoR grant that allows the state to develop research infrastructure and capacity in strategic areas. This is one of NSF's largest center grants.
- We work to create a unified team of New Mexican academics and federal laboratory scientists to target strategic areas for the state.
- We work closely with the State Government of New Mexico to create a high-tech and sustainable economy for the state.
- We work with our partners to create a high-tech workforce for the state.
- We conduct technology and science outreach to all New Mexicans.

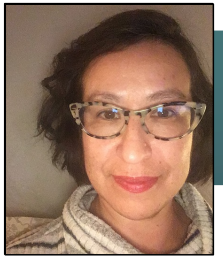
NM EPSCoR State Office Staff

Selena Connealy
Associate Director



Dustin Allen
Systems & Network Analyst

Andra Kiscaden
Senior Business Manager



Isis Serna
Website Administrator

Sara Pichette
Education & Outreach Specialist

Brittney Van Der Werff
Communication & Outreach Specialist

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Stephanie Rodriguez
Cabinet Secretary, New Mexico Higher Education Department

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Director, Office of Science & Technology, Economic Development Department

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District 57, Sandoval County

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Manager of Advanced Technology and Strategy, PNM Resources
Bill Kipnis
Senior Energy and Water Project Developer, Siemens Industry, Inc

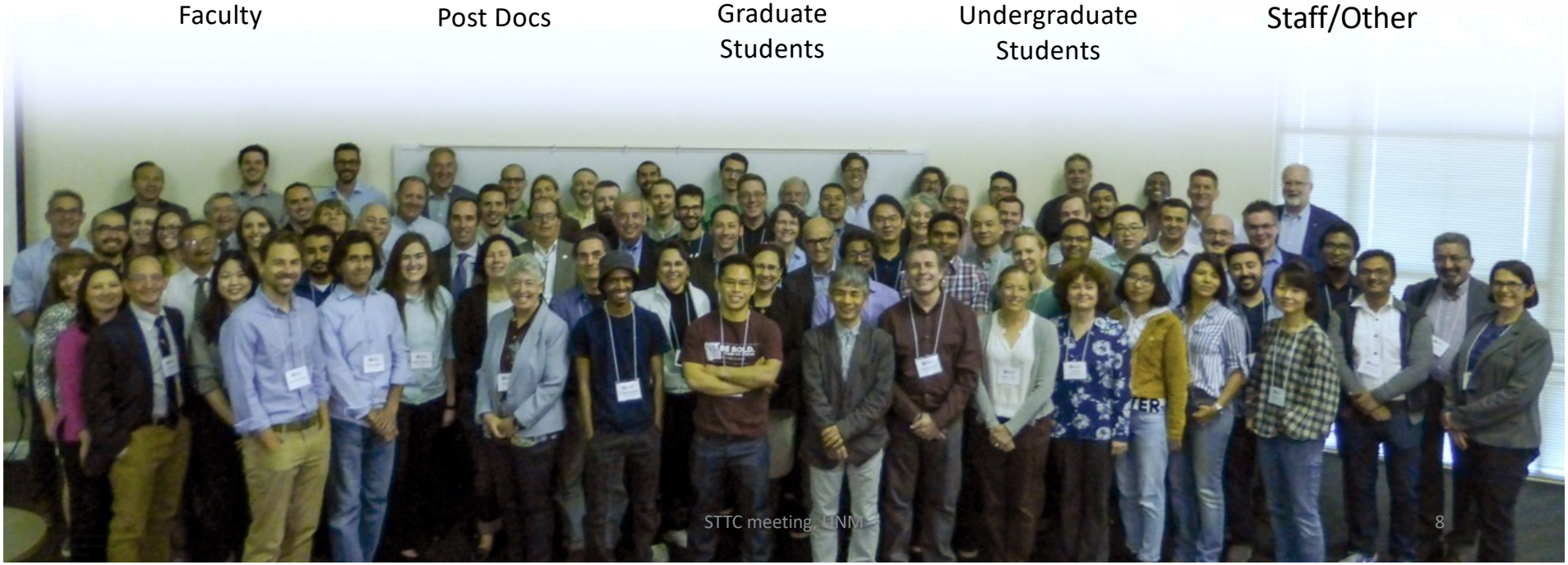
STATE EPSCOR OFFICE (EX-OFFICIO)
Ganesh Balakrishnan
NM EPSCoR State Director

New Mexico
SMART Grid Center

New Mexico EPSCoR

NM SMART Grid Center Team

47	9	109	65	31
Faculty	Post Docs	Graduate Students	Undergraduate Students	Staff/Other



Participating Institutions & Roles

- 3 research universities
- 1 community college
- 2 national laboratories
- 1 museum
- 1 non-profit
- 9 industry partners

Research

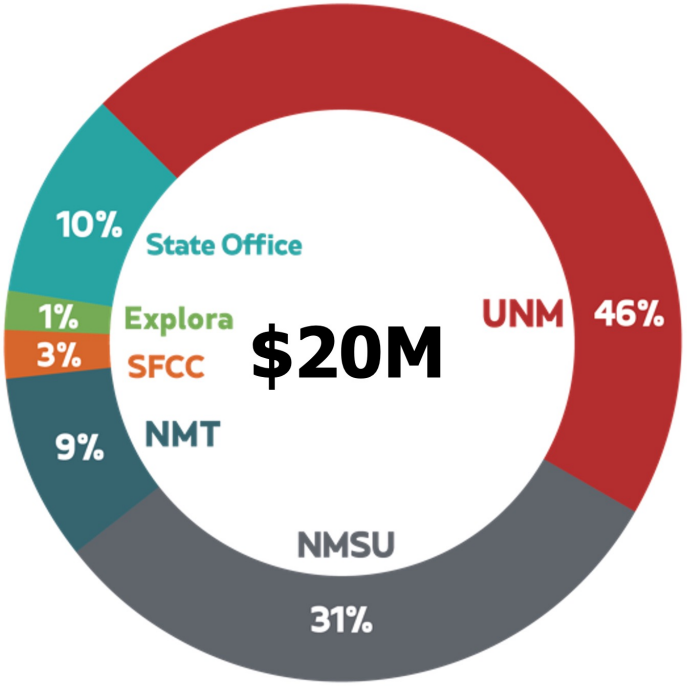
Partnering and Sustainability

Workforce Development & Education/Outreach

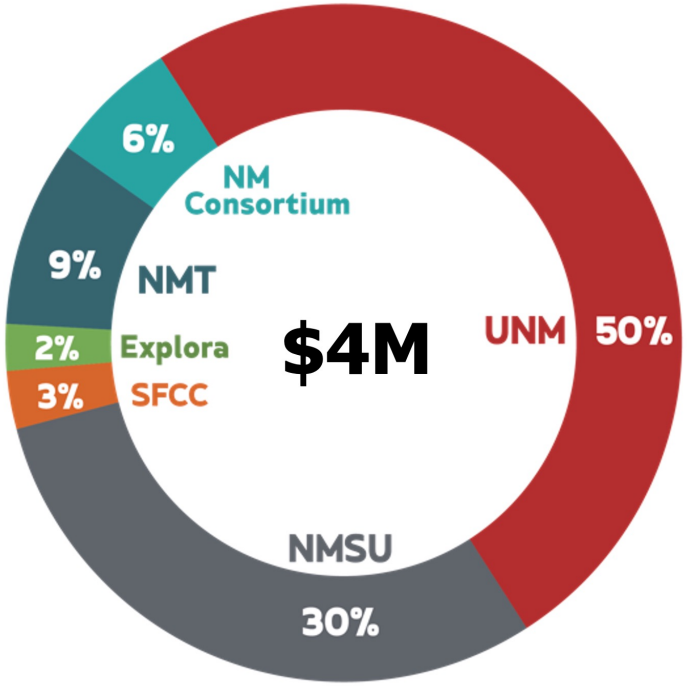
Emera Technologies · PNM · El Paso Electric · ORACLE · New Mexico CONSORTIUM · EPRI ELECTRIC POWER RESEARCH INSTITUTE · NREL 40 1977 - 2017 · SIEMENS · KIT CARSON Electric Cooperative

Project Budgeting

Budget by Institution



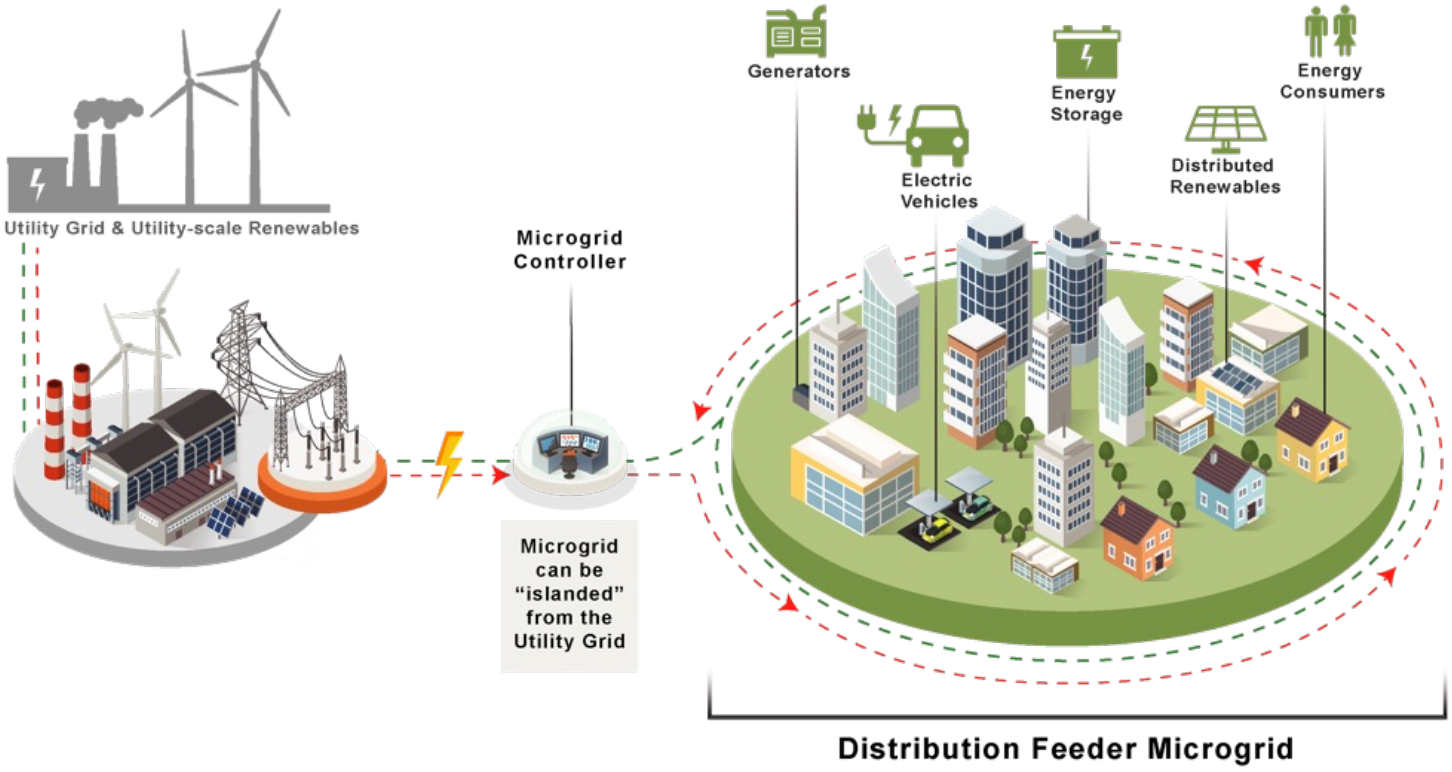
Cost-Share by Institution



Starting 2023 the $4M cost-share will be provided by the State of NM through the Technology Enhancement Fund.

The NM SMART Grid Center Overview

Sustainable, Modular, Adaptive, Resilient, Transactive



The NM SMART Grid Center Overview

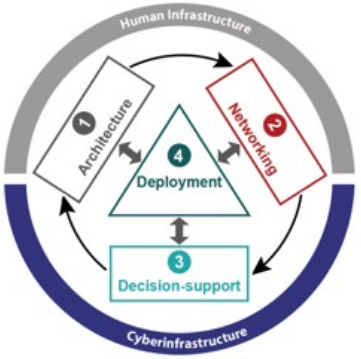
Vision

A modern, secure, and sustainable electric grid supported by a diverse, next generation workforce.

Mission

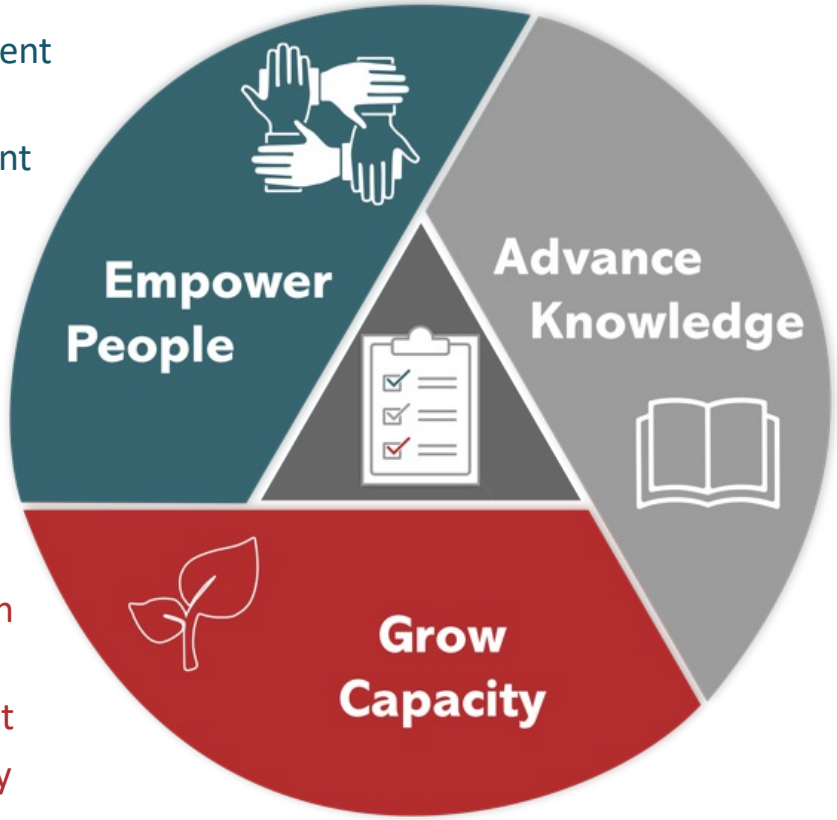
Investigate the fundamental challenges to transition existing transmission and distributed energy infrastructure into a SMART* grid and develop supporting knowledge, national talent, and an informed public.

*Sustainable, Modular, Adaptive, Resilient, Transactive



Other Project Elements

- Workforce Development
- Education & Human Resource Development
- Diversity & Inclusion



- Seed Funding & Emerging Areas
- Communication & Dissemination

- Partnerships
- Collaboration
- Economic Development
- Sustainability

Workforce Development

Faculty & Post Docs

Team Science Leadership Training

Early Career Leadership Workshop

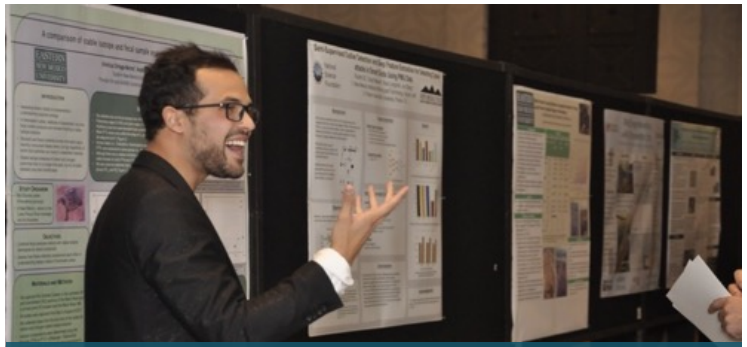
- 68 faculty and postdocs

Data & Software Training

NM Cyberinfrastructure Training

- Trained 19 instructors
- Hosted 9 workshops
- Engaged 170 learners

Workforce Development



STEM Students

NM Research Symposium

- 250 students
- Posters and oral presentations
- *NM Journal of Science*

STEM Advancement Program

- 36 undergraduate students from NM colleges

Grid Professionals

Smart and Microgrid Training Center @ Santa Fe Community College

- 4 new courses
- 3 new or updated certificates
- Updated AAS degree

Distributed Energy Summits (3)

Education & Outreach

Science Communication

Fellows Training

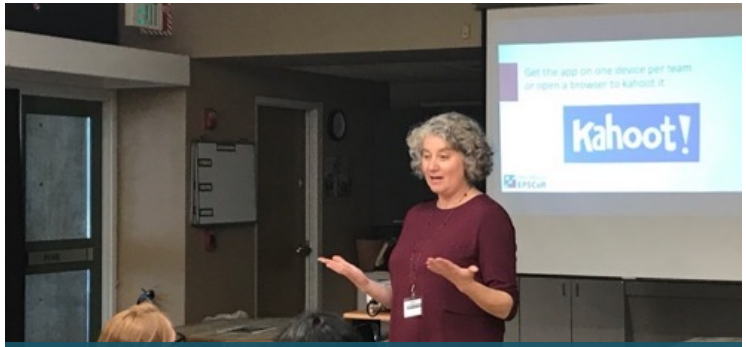
- 2019: 12 faculty & grad students
- 2020: 15 faculty & grad students

Smart Grid Exhibit

Explora Teen Center

- What is a smart grid?
- How does electricity get to your house?
- What kinds of jobs are in the power sector?
- Videos featuring NM SMART Grid Center researchers

Education & Outreach



Teen Programs

Science Fiesta

Teen Science Cafe

- "Energizing Our Future" presented by Dawn Walaitis, NMT

Meet a Scientist

- 150 people at synchronous events
- 630 YouTube views

2019 (In person)

- 75 STEM organizations
- 1,500 participants

2020 (Virtual)

- 125 STEM organizations
- 3,400 participants

Diversity & Inclusion

Programs

STEM Advancement Program

Seed Awards

CIRCLES ALLIANCE

Supporting Native STEM

- $1M Award from NSF
- Montana, Idaho, North Dakota, South Dakota, Wyoming, New Mexico
- Mission: increase engagement, involvement, and success of Native and Alaska Native students in STEM

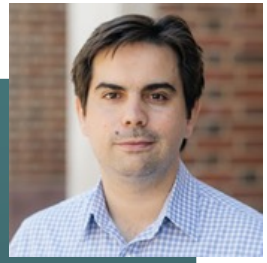
Seed Funding & Emerging Areas: Progress

Year 1 ($100,000 total)
- Caitano da Silva, NMT
- Xiang Sun, UNM

Year 2 ($150,000 total)
- Nathan Jackson, UNM
- Eirini Tsiropoulou, UNM
- Frank Currie, SFCC

Year 3 ($250,000 total)
- Sihua Shao, NMT
- Kooktae Lee, NMT
- Jamal Mamkhezri, NMSU
- Xiang Sun, UNM
- Tatiana Timofeeva, NMHU

Towards Quantitative Understanding of Lightning Disruptive Effects for Protection of SMART Grids



Caitano da Silva
Assistant Professor, NMT

- 2 undergraduate students
- 1 graduate student
- 2 peer-reviewed publications
- 9 presentations
- NSF CAREER award

Partnerships & Collaborators: 56

25 Universities (31 individuals)

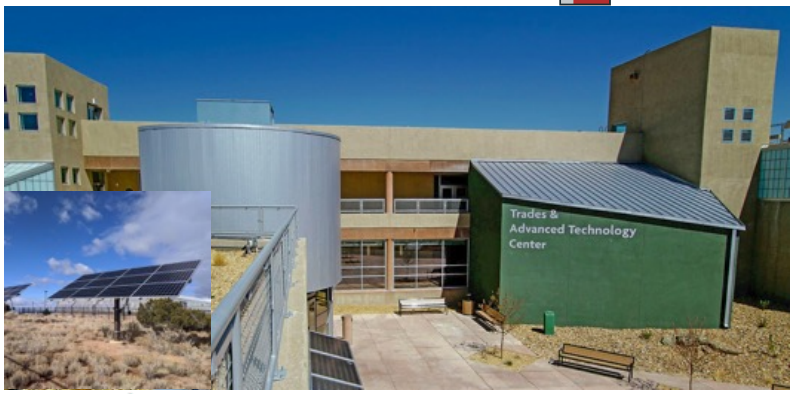
5 National Labs (7 individuals)

11 Businesses (11 individuals)

6 State Gov't & NGOs (7 individuals)

Sustainability: Progress

$82M from
47 individual grants



21

New faculty hires:

Ali Bidram
Assistant Professor
UNM ECE

Tuan Le
Assistant Professor
NMSU CS

Olga Lavrova
Associate Professor
NMSU ECE

Frank Currie
SFCC Distributed Energy Systems Program

Yuting Yang
Assistant Professor
UNM Economics

Claus Danielson
Assistant Professor
UNM ME

Sihua Shao
Assistant Professor
NMT EE

Fengyu Wang
Assistant Professor
NMSU ECE

Project Successes by the Numbers

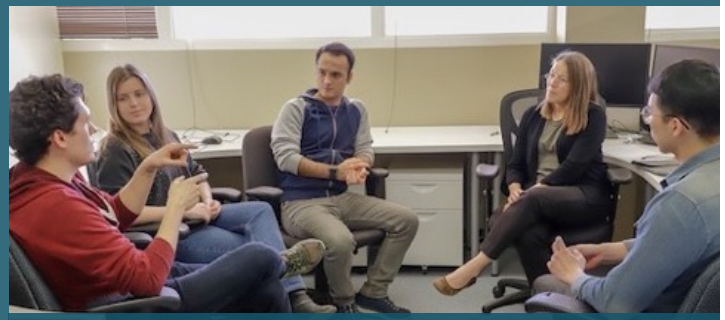
4.5:1
return on investment

$82M
external funding awarded

177
peer-reviewed papers published or accepted

7
patents

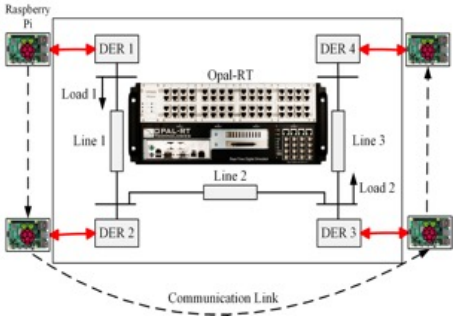
iCREDITS Phase II
NSF CREST $5M/5 year PI: Pontelli NMSU



Cognitive Autonomy for Human CPS
NSF CPS Frontier $5.5M/5 years PI: Oishi UNM

A sustainable approach to grid research

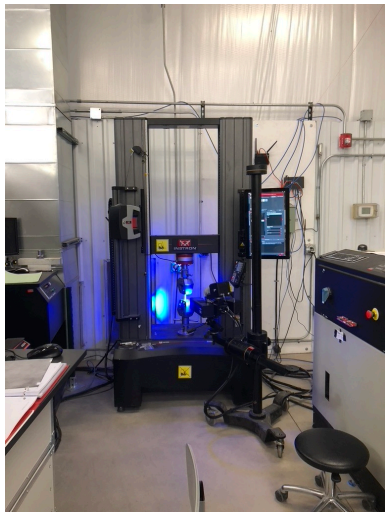
Cross-project Integration, Synthesis, and Validation Across Scales



RII Track 1 project: Center for Research Excellence in Additive Technology and Education (CREATE) (2023 – 2028)

- **$ 20 Million from NSF, $ 4 Million from the State of New Mexico.**
- Additive manufacturing or 3D printing has the potential to play a key role in New Mexico's economy.
- Has the ability to disrupt space industry, medical industry, defense and improve supply chain issues.
- New Mexico is turning into a hub for metal 3D printing with companies such as Optomec and IDS emerging as world leaders in the field.
- The key benefit to a state like New Mexico is the ability to setup these manufacturing hubs remotely.
- Did you know that one of the most advanced metal 3D printing facilities in the state and in the country is in Crownpoint, NM at Navajo Tech?

Navajo Tech Additive Manufacturing Center (Scott Halliday)



What is proposed in CREATE?

- CREATE is based on a uniquely New Mexican success story.
- CREATE proposes to setup 3D printing infrastructure at UNM, NMSU, NMT and Navajo Tech that is primarily based on NM's own metal printing technologies.
- Unlike traditional manufacturing that is based on a very linear optimization process and trial and error, we will employ machine learning and artificial intelligence for rapid material discovery.
- Strong engagement of local industry and national labs.
- Distributed manufacturing will allow for creation of designs in one location and secure manufacturing at another – ideal for NM.
- Secure distribution of designs will allow for more privacy in medical applications and security in national defense uses. Possibility for use of technologies such as blockchain.
- Possibility for having the first TCU graduate program in engineering from NM.

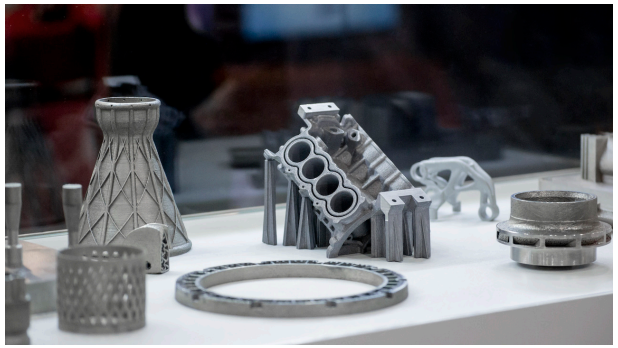
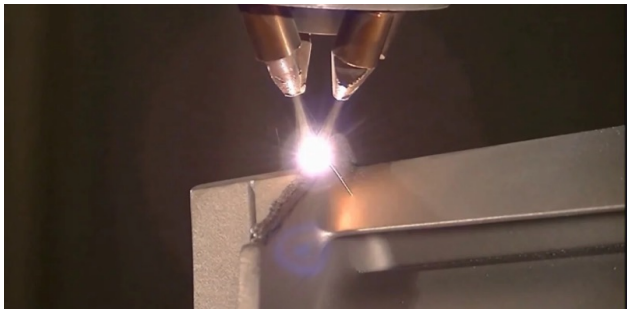


Image from space.com

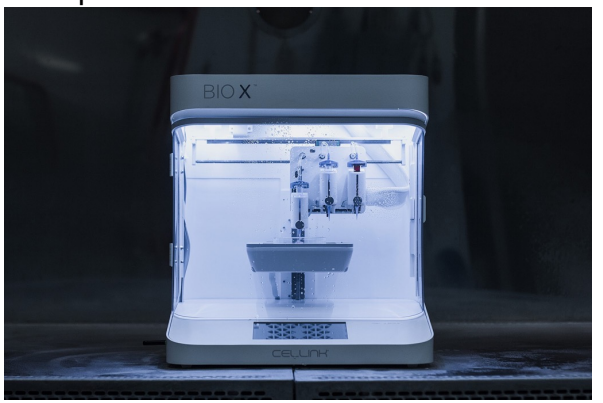
Jabil.com

Distributed Intelligent Additive Manufacturing

OPTOMEC LENS
metal printer



Bio printer



Ceramic printing

NM EPSCoR's future directions – some final thoughts

Cultivating high impact topics for future centers. Ex – dryland resilience, quantum information technology, electric grid technology, additive manufacturing, etc.

Ability to engage more institutions in NM in a sustained manner.

Sustaining centers that we need beyond the funding period.

Thank you for supporting NM EPSCoR.