



Sandia  
National  
Laboratories

SAND2019-7100PE

# Minority Serving Institute Program Advanced Manufacturing Network Consortium Sandia National Laboratories



PRESENTED BY

Stan Atcitty, Ph.D.



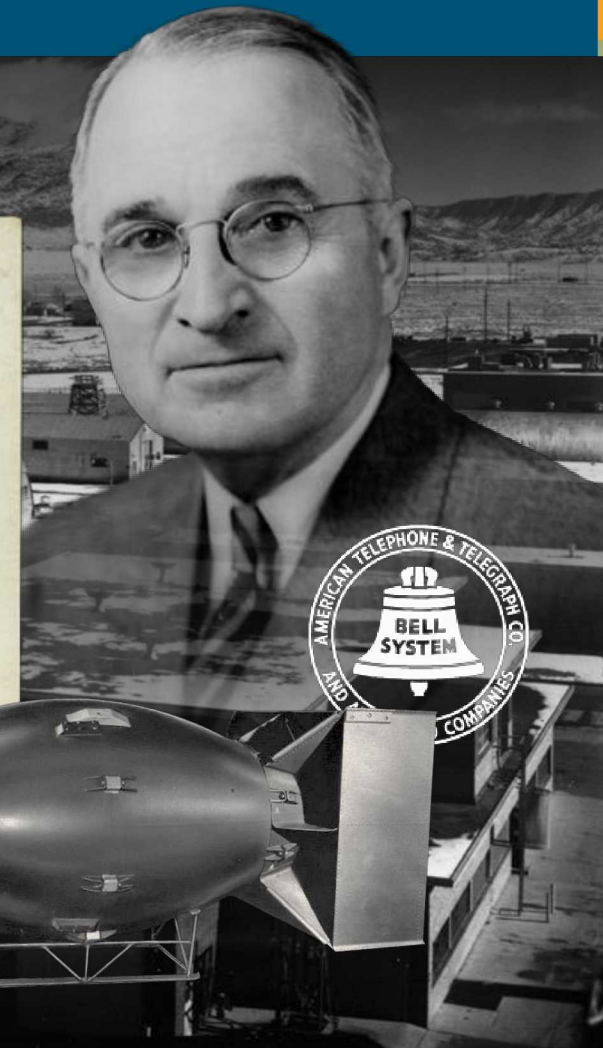
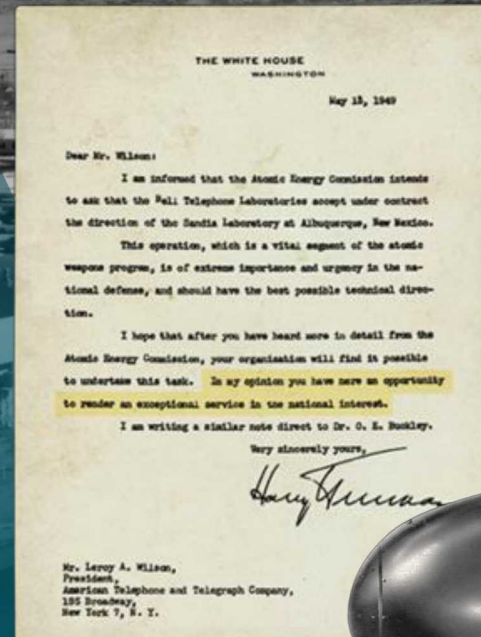
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# SANDIA'S HISTORY IS TRACED TO THE MANHATTAN PROJECT



*...In my opinion you have here an opportunity to render an exceptional service in the national interest.*

- July 1945  
Los Alamos creates Z Division
- Nonnuclear component engineering
- November 1, 1949  
Sandia Laboratory established
- AT&T: 1949–1993
- Martin Marietta: 1993–1995
- Lockheed Martin: 1995–2017
- Honeywell: 2017–present





# SANDIA IS A FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTER MANAGED AND OPERATED BY

National Technology & Engineering  
Solutions of Sandia, LLC, a wholly  
owned subsidiary of Honeywell  
International Inc.: 2017 – present

Government owned, contractor  
operated



## SANDIA HAS FACILITIES ACROSS THE NATION

### Activity locations

- Kauai, Hawaii
- Waste Isolation Pilot Plant, Carlsbad, New Mexico
- Pantex Plant, Amarillo, Texas
- Tonopah, Nevada

### Main sites

- Albuquerque, New Mexico
- Livermore, California

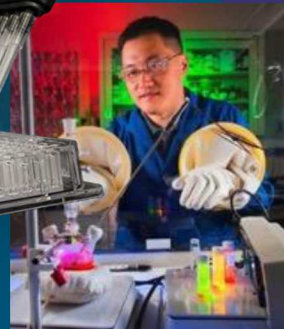


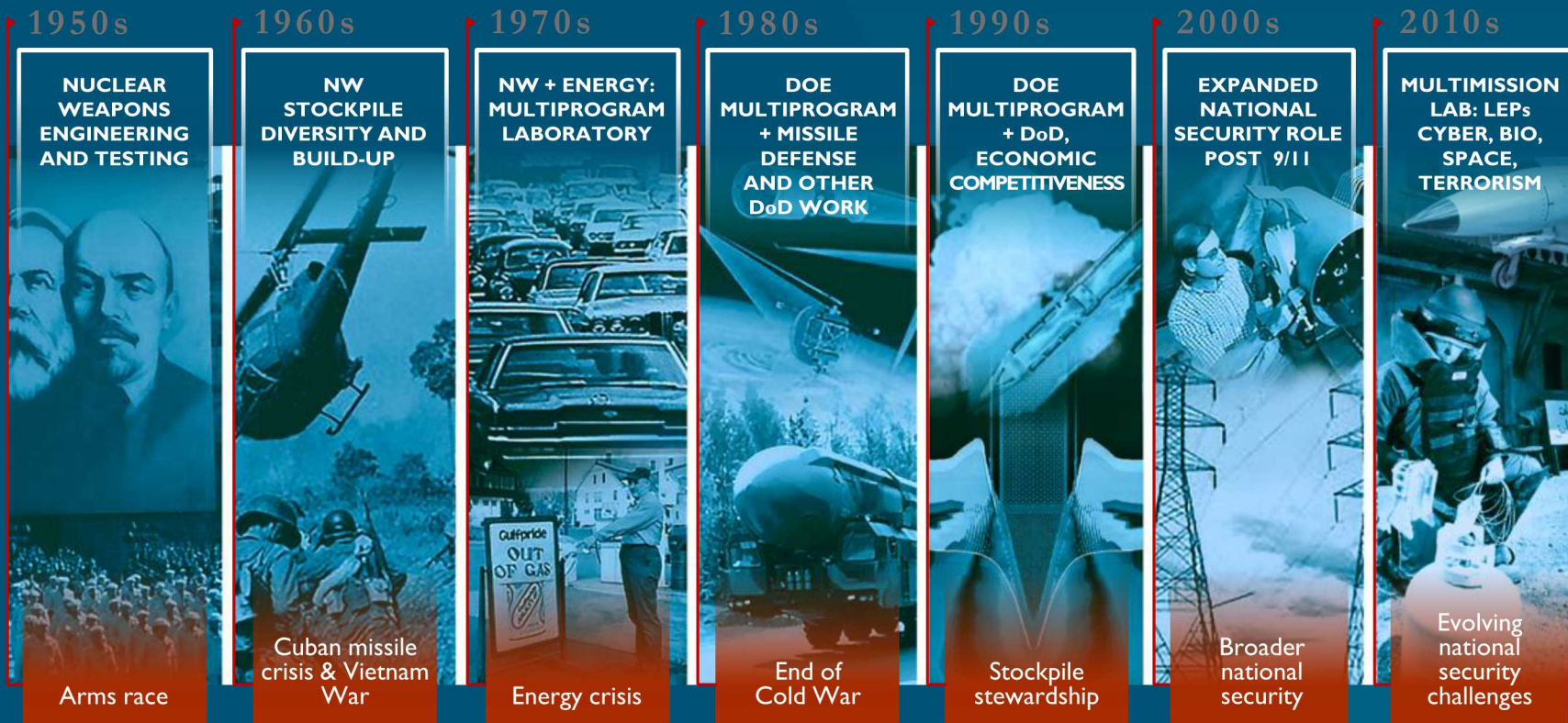




## OUR PRIORITIES CREATE A VISION FOR THE FUTURE

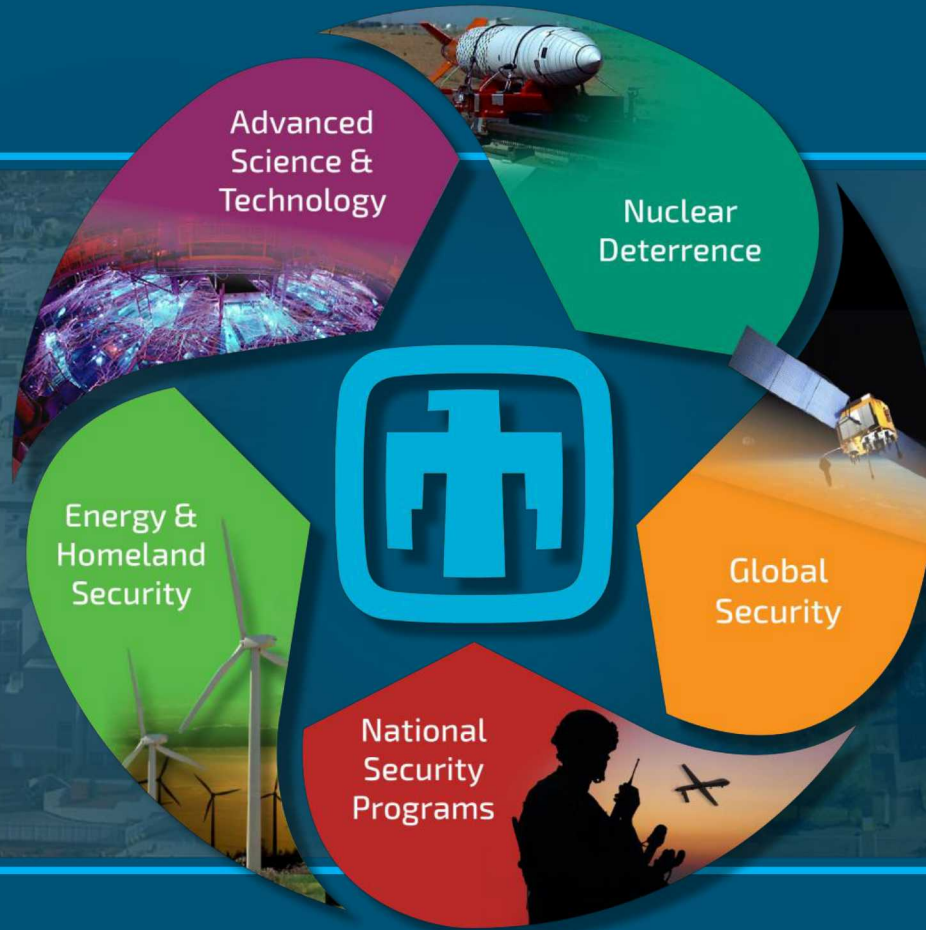
- Deliver **quality engineering, science, and technology** in the most efficient way possible
- **Safety and security** are top of mind
- **Collaboration** is vital – inside and outside the Labs
- Sustain a **diverse and inclusive** Laboratories culture
- **Think strategically:** What might the world look like in 20 to 30 years?







# SANDIA HAS FIVE MAJOR PROGRAM PORTFOLIOS



## Energy Research

ARPAe, BES Chem Sciences, ASCR, CINT, Geo Bio Science, BES Material Science

## Climate & Environment

Measurement & Modeling, Carbon Management, Water & Environment, and Biofuels

## Renewable Systems & Energy Infrastructure

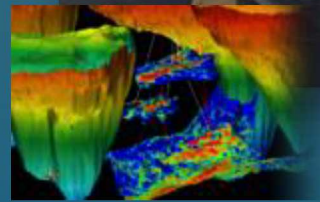
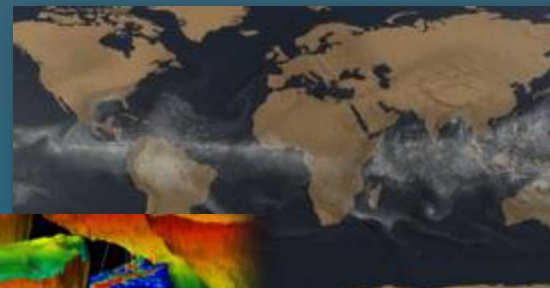
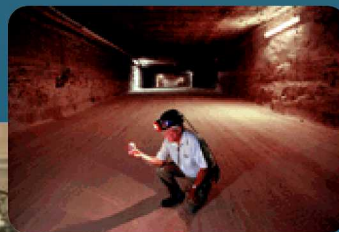
Renewable Energy, Energy Efficiency, Grid and Storage Systems

## Nuclear Energy & Fuel Cycle

Commercial Nuclear Power & Fuel, Nuclear Energy Safety & Security, DOE Managed Nuclear Waste Disposal

## Transportation Energy & Systems

Vehicle Technologies, Biomass, Fuel Cells & Hydrogen Technology





# SANDIA'S WORKFORCE IS GROWING



9

Staff has grown by over 3,000 since 2009 to meet all mission needs



10,940  
New  
Mexico

1,316  
California





## DIVERSITY AND INCLUSION ARE STRATEGIC ADVANTAGES TO SANDIA

Sandia's leadership is dedicated to attracting, hiring, and retaining a diverse workforce, and building an inclusive environment

Sandia strives to increase the pool of diverse candidates

- Close collaboration with hiring managers
- Partnership with Sandia's Affirmative Action Employee Resource Groups to recruit, mentor, and support career development
- Expanded diversity outreach activities at targeted schools
- Recruiting at National Diversity Conferences





# Why is US DOE Office of Electricity and Sandia is interested in power electronics R&D?

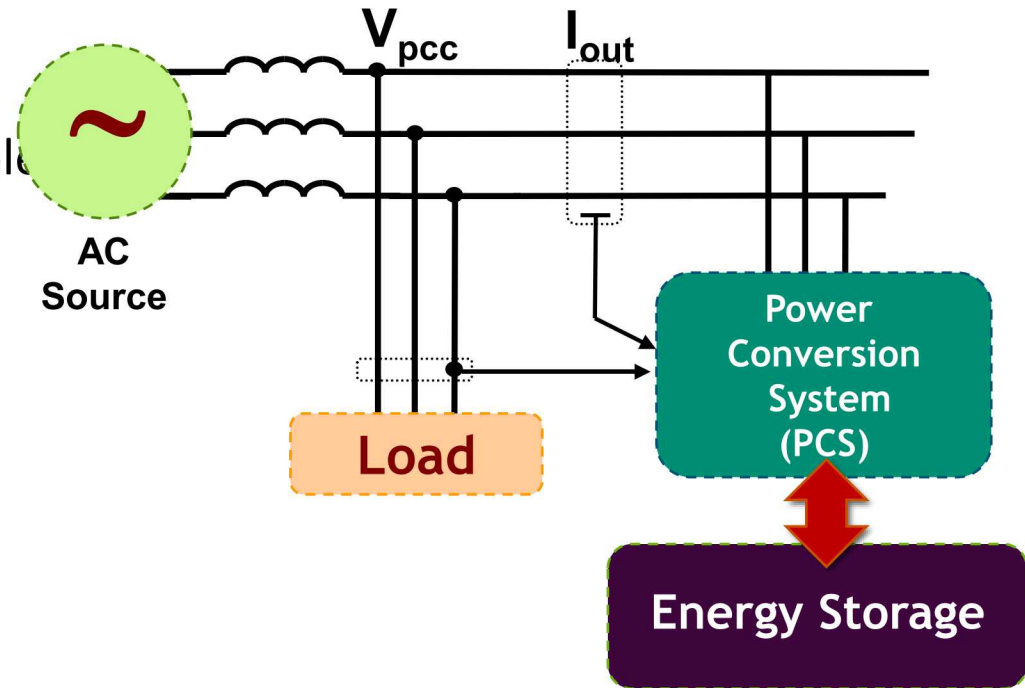


## Needs:

- Reduce install cost/kW
- Decrease size and weight especially for transportable systems
- Improve integration control
- Increase reliability
- Increase efficiency

## Focus:

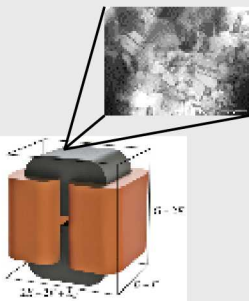
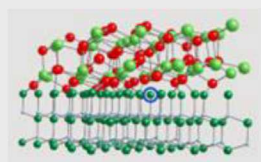
- Interface optimization between power electronics and electrochemistry
- Development of advanced power converters using SiC and GaN
- Reliability of WBG Power Converters
- Improved energy storage safety through power electronics



**The PCS is a key component of the energy storage system. It can represent 20 to 60% of the total system cost.**



## Materials R&amp;D



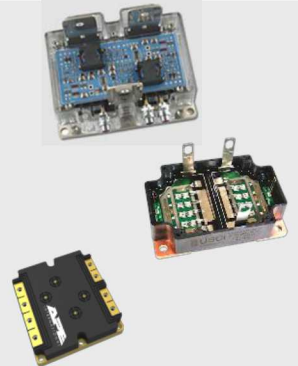
- Gate Oxide R&D
- Advanced Magnetics

## Devices



- ETO
- SiC Thyristors
- Monolithically integrated SiC transistors
- WBG Characterization & Reliability
- High energy dielectric capacitors

## Power Modules



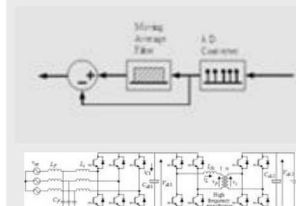
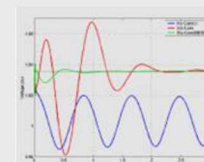
- SiC High Temp/density Power Module
- HV SiC JFET Module
- HV, HT Reworkable SiC half-bridge modules

## Power Conversion System



- Dstatcom plus energy storage for wind energy
- Optically isolated MW Inverter
- High density inverter with integrated thermal management
- High temp power inverter

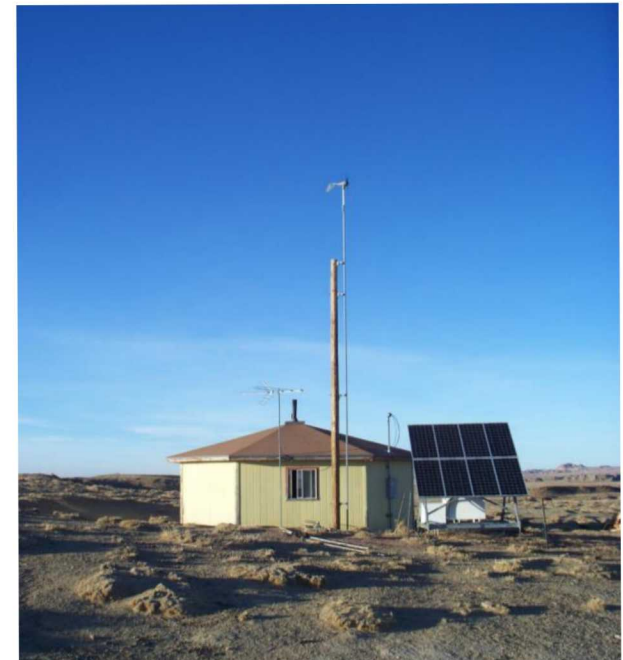
## Applications

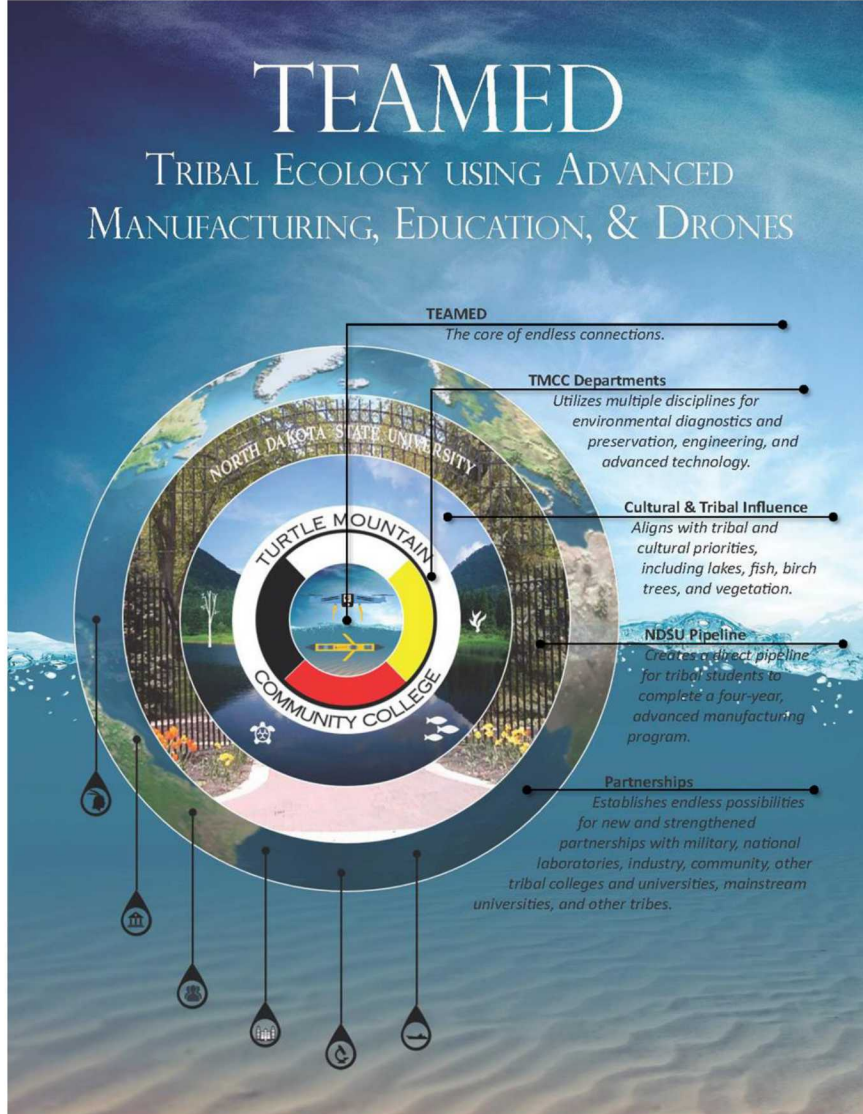


- FACTS and Energy Storage
- Power smoothing and control for renewables
- Dual active bridge for advanced energy storage system designs



## Remote Power Systems – Tribal Lands





TEAMED concept grew out of TMCC

Sandia SMEs: Stan Atcitty, Jeri Timlin, Tom Reichardt

- NDSU faculty introductions: Sreekala Bajwa, John Nowatski, Alimohammad Shirzadifar, Xin (Rex) Sun – Department of Agricultural and Biosystems Engineering
- TM Community High School and TMCC's environmental engineering outreach presentations

*Note: The letter "E" in TEAMED is flexible. "E" can easily be migrated to "Engineering" to be general.*





CANKDESKA CIKANA  
COMMUNITY COLLEGE  
Spirit Lake Dakota Nation  
*Start Here • Go Anywhere*



# TEAMED

## TRIBAL ECOLOGY USING ADVANCED MANUFACTURING, EDUCATION, & DRONES

### TEAMED

*The core of endless connections.*

#### CCCC Departments

*Utilizes multiple disciplines for environmental diagnostics and preservation, engineering, and advanced technology.*

#### Cultural & Tribal Influence

*Aligns with tribal and cultural priorities, including lakes, fish, and vegetation.*

#### NDSU Pipeline

*Creates a direct pipeline for tribal students to complete a four-year, advanced manufacturing program.*

#### Partnerships

*Establishes endless possibilities for new and strengthened partnerships with military, national laboratories, industry, community, other tribal colleges and universities, mainstream universities, and other tribes.*

Sandia SMEs: Stan Atcitty, Jerilyn Timlin and Tom Reichardt

## Remote Sensing of Algae Growth in Waterways

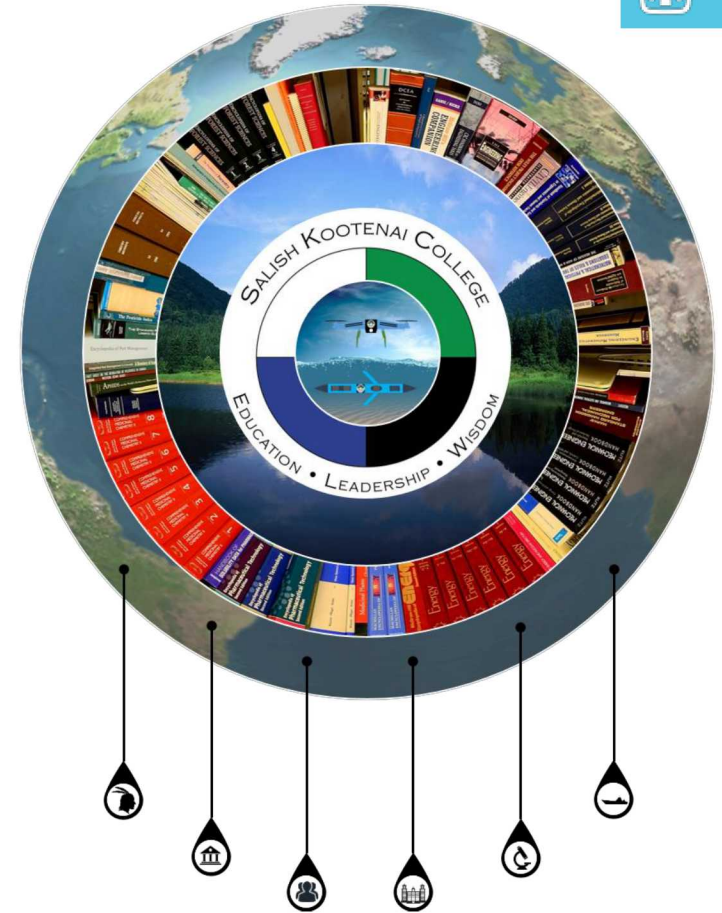
### Optical sensors technology

- Bio sensing
- Sensor design criteria
- Data analysis
- Drone-based design of algal blooms as a case-study (ecology and farming)
- Teleconference with NSDU next week

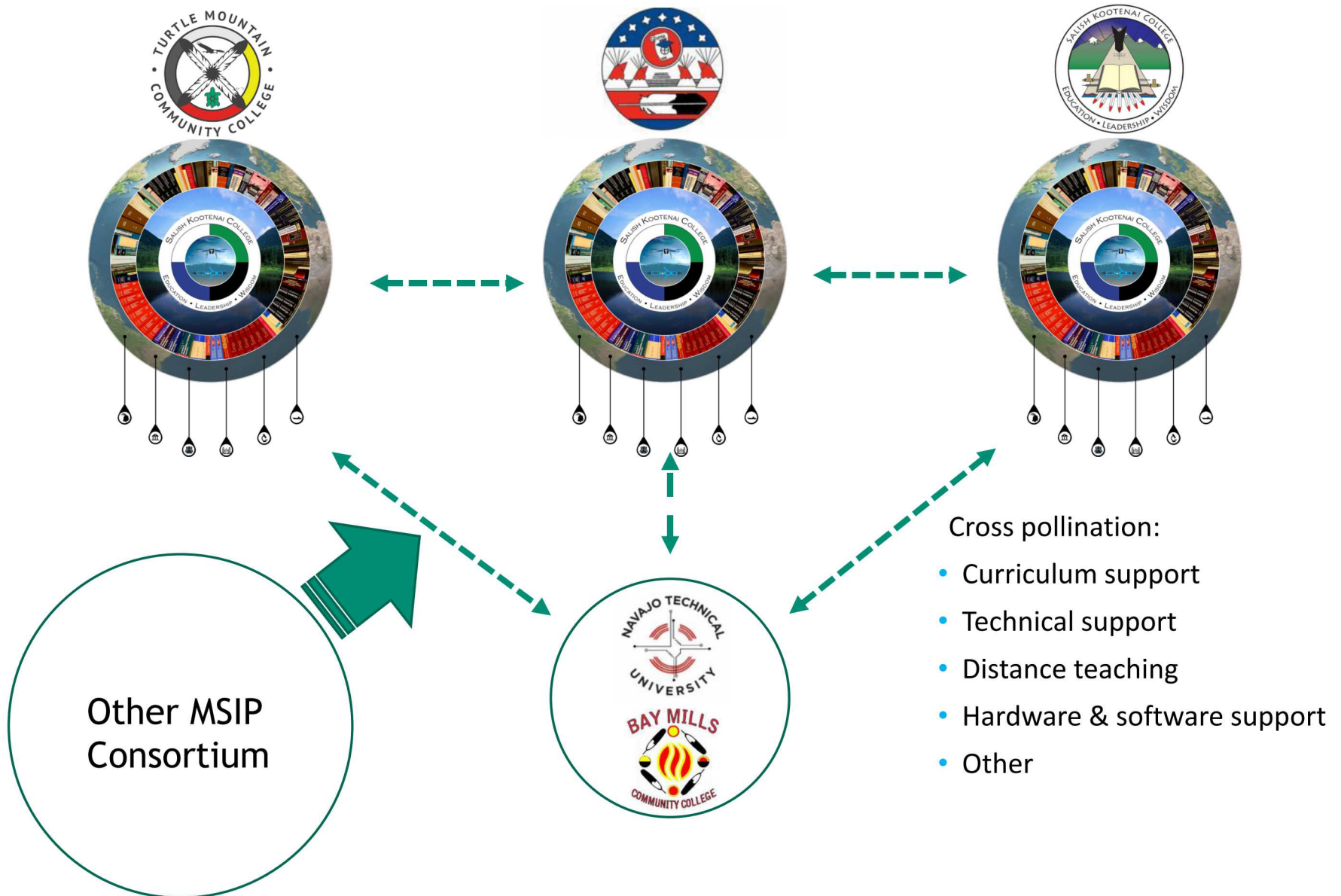


Sandia SMEs: Stan Atcitty, Jeri Timlin, Tom Reichardt, and Charles Carter

- SKC embraced the TEAMED concept
- Underwater Drone focus
- Charles Carter SME, Complex Reliability Analysis on BisonSat II
- Polson High School and Two Eagle River School Outreach









## NNSA Minority Serving Institute Program



## Office of Indian Energy Policy and Programs

## Sandia Summer Internship Program

## Advanced Manufacturing Network Initiative







## Summer 2018

- Gordon North Piegan, Blackfeet Tribe, EE, Montana State University, SKC transfer student – **First-ever NNSA MSIP American Indian summer student!**



## Summer 2019

- Isnala N. Roan Eagle, Oglala Sioux Tribe, ME, Cankdeska Cikana Community College
- Roy Rafael, Navajo Tribe, EE, Navajo Tech University
- Brett Alberts, Sprit Lake Dakota Tribe, Computer Information Technology and Pre Engineering, United Tribe Technical College



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Start Here • Go Anywhere



**Gordon North Piegan** - *“My overall experience at Sandia National Laboratories was once in a lifetime. I would describe it as one of the most challenging yet rewarding endeavors I have been a part of. The idea that from the very start that I contributed to projects that have the potential to change the world was truly inspiring. However, it was not only the work that was rewarding, but the people I could meet. Sandia had one of the most diverse workforces I have ever been a part of. The Native American community made me feel right at home and other minorities here allowed me to truly see the world from a new perspective.”*



## **Stanley Atcitty (Stan), Ph.D.**

**Distinguish Member of Technical Staff**

**Energy Storage Technology and Systems Dept. 08811**

**Sandia National Laboratories**

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