



“Horizon” Technology Research at Sandia National Laboratories

Presented to

**Science, Technology, & Telecommunications Committee
Santa Fe, NM**

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Outline

- **Laboratory Directed R&D (LDRD) program at Sandia**
- **LDRD projects as example “horizon technologies”**
- **Sandia Science & Technology Park**
- **New Mexico Small Business Assistance Program**
- **Entrepreneurial Separation to Transfer Technology Program at Sandia**

“Horizon” technologies (Gordon Meeks)

Technologies that Sandia is working on that the STTC should be aware of that could potentially impact/boost the high tech industry along the Rio Grande corridor.



LDRD is vitally important to Sandia

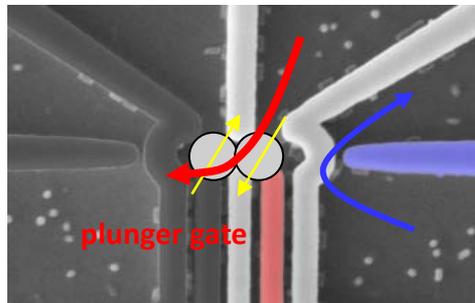
- The Laboratory Directed Research and Development (LDRD) Program was authorized by Congress*, with oversight by DOE/NNSA, and strategic guidance by the Labs' Director
- LDRD is the Labs' sole source of discretionary R&D funds for staff-generated, innovative ST&E**
- LDRD creates the future of the Labs by:
 - Advancing the frontiers of science and technology
 - Enabling and supporting our Labs' national security missions

*National Defense Authorization Act for FY 1991 (P.L. 101-510, Section 3132)

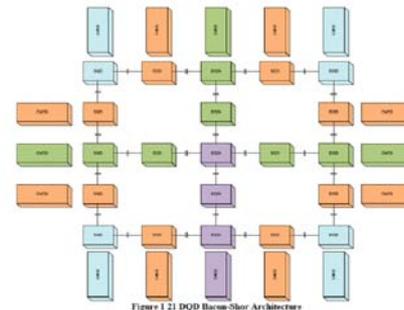
** Energy Research and Development Administration Authorization Act for FY 1977 (P.L. 95-39, Section 303)

Quantum Information Science and Technology project resulted in next generation computing leadership

Quantum computing is expected to provide exponential speed-up over classical computing, but to date the hardware components of such a system do not exist.



Physical Qubit & Native Gate Set



Logical Qubit Architecture

Exploration & Development of Air-Bearing Heat Exchanger Technology

If successful, this technology could have significant impact on energy use and efficiency:

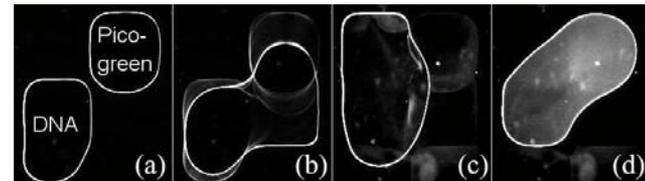
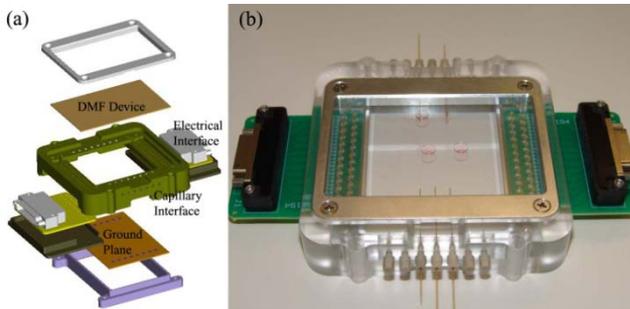
- Extend range of electrical vehicles
- Solve thermal brick wall problem (IT sector)
- Provide more efficient air conditioning, heat pumps, and refrigeration
- Reduce electricity demand load spikes



Proof-of-concept experiments demonstrated a factor of 30 improvement in heat transfer per unit heat exchanger area.

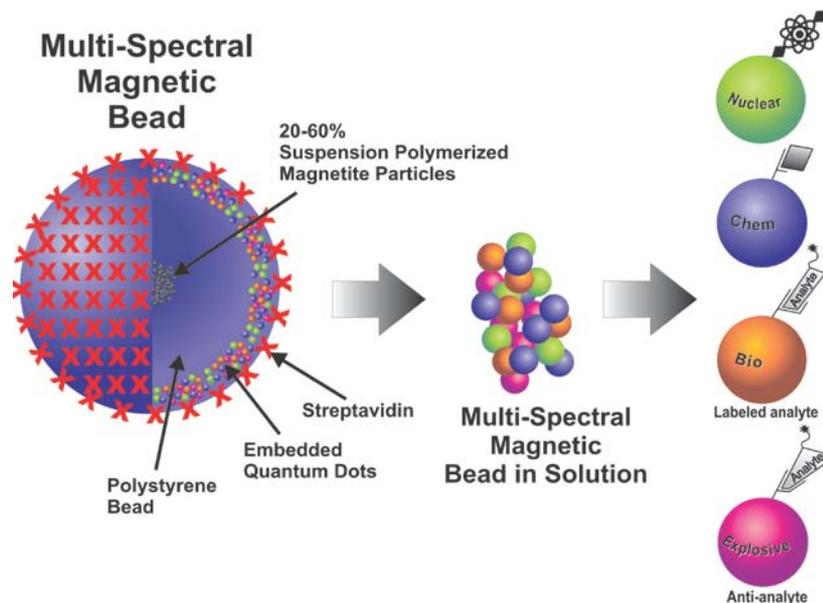
Rapid threat organism recognition (RapTOR) project is developing tools to identify biothreats

Rapid threat organism recognition (RapTOR) is developing a new, rapid, and powerful approach for identifying unknown pathogens, thus preventing or containing outbreaks in their earliest stages.



BioWarfare/Infectious disease detection microsystem to rapidly detect botulism in milk

Clear path to a detector capable of simultaneously identifying a vast number of different agents: chemical, biological and radionuclides.

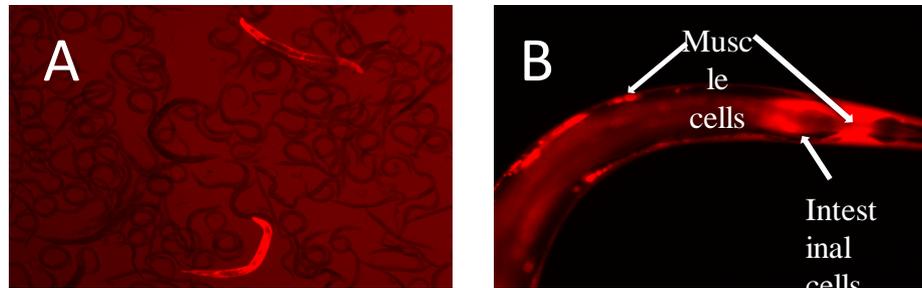


- Double-blind field test for BONT-A simulant with no false positives in raw milk
- Demonstrated 10^{-17} molar sensitivity

***C. elegans*-Based Foam may be used for Rapid On-Site Detection of Residual Live Virus**

Recovery from a critical release of a biological agent requires slow, labor-intensive “clearance sampling” and uses significant laboratory space.

C. elegans-based foam can be applied directly to the contaminated area for quick and accurate detection of any and all residual live virus by means of a fluorescent signal.



***C. elegans*-Based Foam for Rapid On-Site Detection of Residual Live Virus**

Sunshine-to-Petrol project is using solar energy for synfuel production

Energy sources that do not produce CO₂ emissions are becoming increasingly scarce. Solar power could be used to convert CO₂ to synthetic fuels.

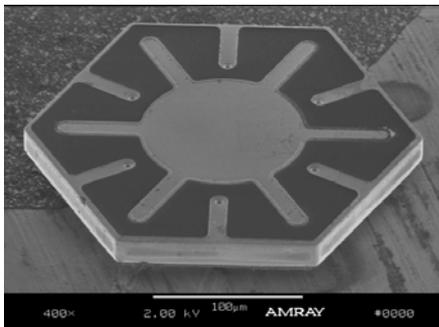


Recycling CO₂ into Fuel



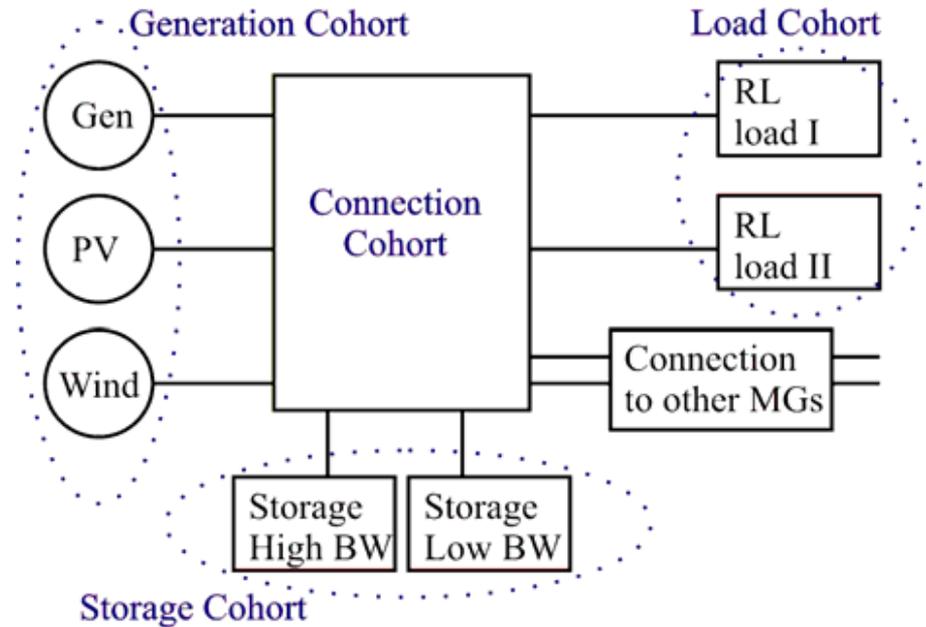
Greater Than 50% Efficient Photovoltaic Solar Cells project shows promise for enhanced photovoltaics

Monolithic photovoltaic cells typically produce solar conversion efficiencies in the 20% range. Stacked individually-grown and connected junctions, each sensitive to a different region of the solar spectrum, are being evaluated for greater PV system efficiencies.



Enabling Secure, Scalable Microgrids with High Penetration Renewables

Enable high penetration levels of stochastic renewable sources, with a reliability, resiliency, security, and cost that is equal to or better than the U.S. grid of today.



Microgrid organization: conceptual schematic



Technology-Based Economic Development Programs



**SANDIA SCIENCE &
TECHNOLOGY PARK**



NMSBA

Los Alamos National Laboratory
Sandia National Laboratories

ESTTT

*Entrepreneurial Separation
to Transfer Technology*

The SS&TP

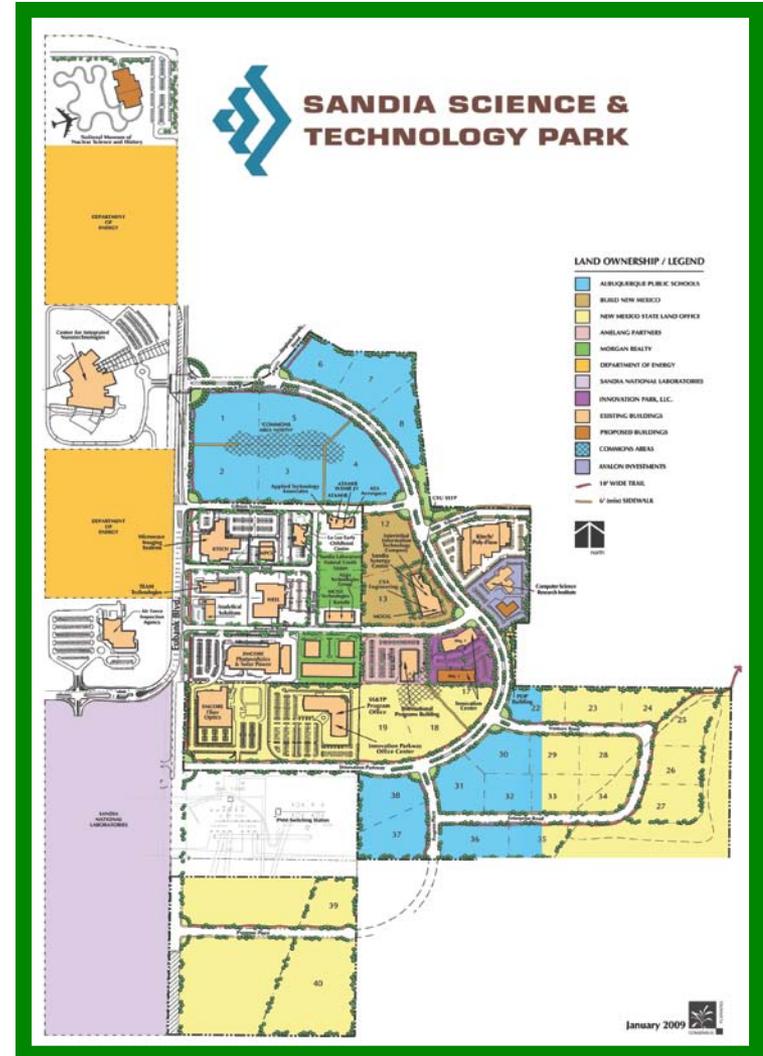


North
**SANDIA SCIENCE & TECHNOLOGY PARK
 and MANZANO MESA
 VICINITY**

LAND OWNERSHIP / LEGEND

- | | |
|------------------------------|----------------------|
| ALBUQUERQUE PUBLIC SCHOOLS | INNOVATION PARK, LLC |
| BUILD NEW MEXICO | EXISTING BUILDINGS |
| NEW MEXICO STATE LAND | PROPOSED BUILDINGS |
| AMELANG PARTNERS | AVALON INVESTMENTS |
| MORGAN REALTY | COMMONS AREAS |
| DEPARTMENT OF ENERGY | 10' WIDE TRAIL |
| SANDIA NATIONAL LABORATORIES | 6' (min) SIDEWALK |

January 2009



**SANDIA SCIENCE &
 TECHNOLOGY PARK**

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History of the Park

- **Founded in 1998**
- **Partnership Tool for Sandia**
 - **Create Joint Research and Development**
 - **Commercialize Technologies**
 - **Develop Business**
 - **Strengthen Supplier Relations**
 - **Foster Economic Development**
- **Sandia Science and Technology Park Development Corporation, a nonprofit entity, was established to manage and develop the Park**

New Mexico

Small Business Assistance



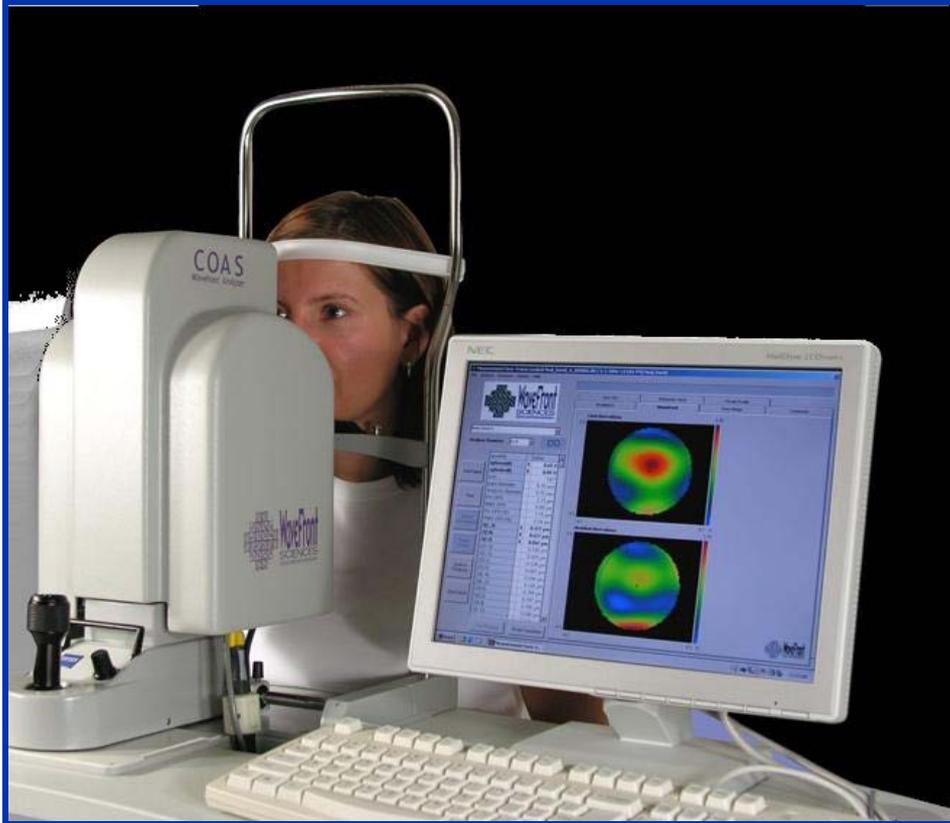
- Governed by the Laboratory Partnership with Small Business Tax Credit Act (a New Mexico State Law)
- Public/Private Partnership with Sandia National Laboratories, Los Alamos National Laboratory, State of New Mexico, and New Mexico Small Businesses
- Allows up to \$2.4M per lab per year in assistances and tax credits
- Must be a New Mexico for-profit small business to qualify
- Companies in rural counties are eligible for \$20K per business each year/urban counties are eligible for \$10K per business each year



NMSBA Joint Program Results

	2000-2009	2009
Number of Assistances Provided	2666	320
Number of Unique Businesses Assisted	1597	112
Number of Counties Supported (out of 33)	32	25
Dollar Value of Assistances to Companies	\$20.7M	\$4.3M

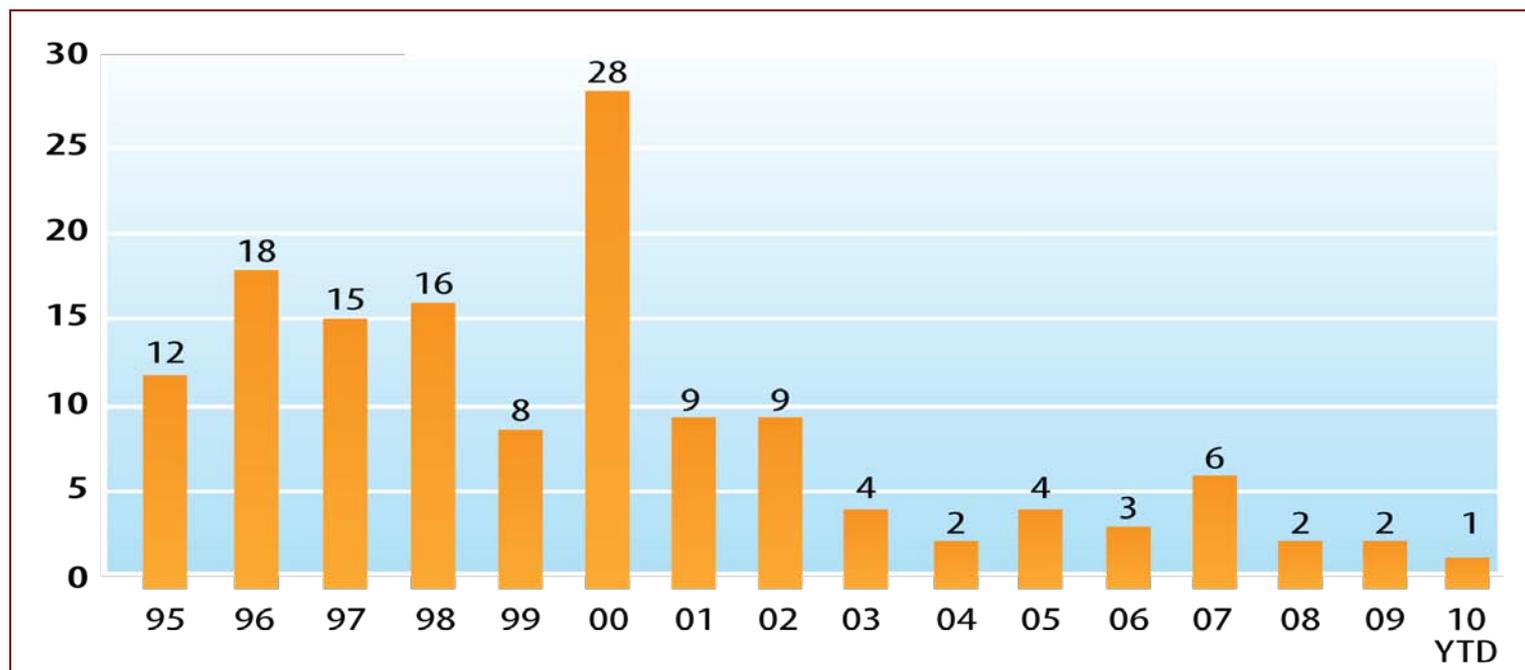
Entrepreneurial Separation to Transfer Technology (ESTT)



- **Entrepreneurs terminate Sandia employment**
 - **Term of separation is two years with the option to request a third year**
 - **Entrepreneurs are guaranteed reinstatement by Sandia if they return before ESTT expiration**
- **Participants may start up or help expand technology businesses**

ESTT Program Results

Separations of People by Calendar Year (139 Total)



	In NM	Outside NM	Total
ESTT Start-up Companies	38	6	44
ESTT Expansion Companies	20	27	47

91 Companies have benefitted from the ESTT Program



Questions?