Technology21

Creating High-Value Jobs For All New Mexicans

A Science and Technology Roadmap
For New Mexico's Future

EPSCoR Mtg 11/20/08

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Primary Goal

- *Significantly increase number of high-paying jobs for New Mexicans across the entire State*

  - *NM ranks 8th in unemployment rate (4.1% in July 08)*
  - *NM ranks 44th in per capita income (2006)*

⇒ **Need better paying jobs, especially in rural areas**

*Clean and green high-tech jobs provide
the best way to increase standard of living
of all New Mexicans*

*We have the resources to create better jobs
across all of New Mexico:*

*Extensive renewable energy resources
$6B/yr Federal R&D investment at
our universities and national laboratories*

S&T Plan Goals

1) Determine priorities for state investments to translate Federal R&D investments into the commercial sector
   – *Prioritization provides significant challenges*
   – *Priorities determined primarily by market pull*

2) Develop model for making investments through a coordinated and sustained program.
   New Mexico currently invests in:
   – Energy Innovation
   – Water Innovation
   – Supercomputing
   – Specific R&D projects

3) Goal is to develop sustained program of targeted investments in late-stage R&D
   • Coordinate State S&T investments from Federal basic R&D, to mid- and late-stage to commercialization
   • Include workforce development and education aspects

Technology Basis for Growth
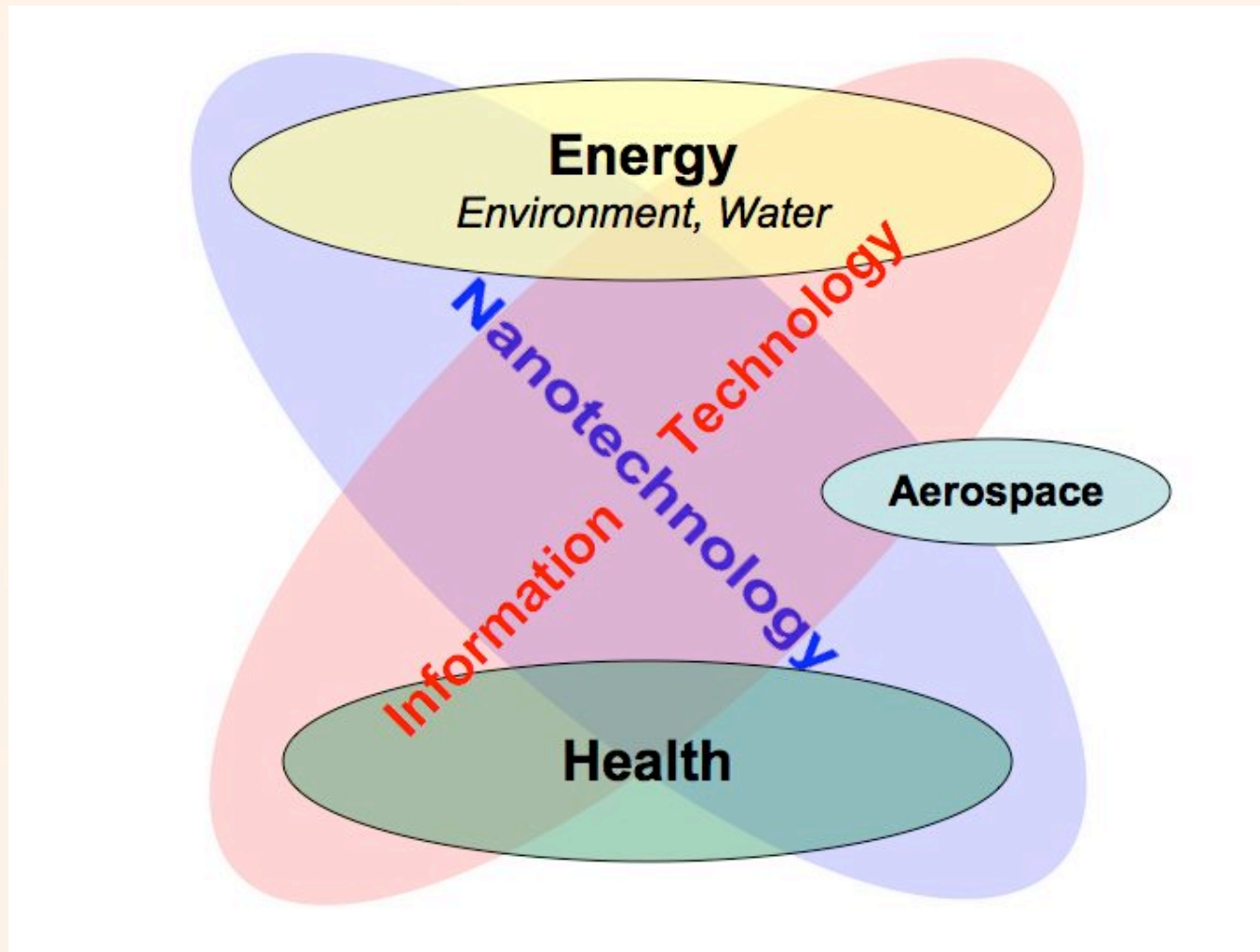
Create and fund Technology 21 Center to drive innovation

S&T Plan Core Areas

Aerospace
 Strengths in aerospace and space sciences, remote sensing, astronomy
 Grow avionics, Spaceport America, remote sensing

Biotechnology
 Strengths in genomics, computational biology, neuroscience, diagnostics
 Grow genomics, neuroscience, medical diagnostics and therapeutics

Energy, Environment, and Water
 Strengths in clean coal, solar, wind, biofuels, fuel cells, sequestration, storage
 Grow solar, wind, algal biodiesel, fuel cells, smart grid, energy storage
 Important issues are water, environment, climate change

Information Technology
 Strengths in high performance computing, digital film, homeland security
 Grow supercomputing, digital film, homeland security

Nanotechnology
 Strengths in micro electrical-mechanical systems (MEMS) and nano systems
 Grow MEMS, nano-bio, sensors, nano-materials

New Mexico Computing Applications Center

Founding Members

State of New Mexico
University of New Mexico, New Mexico State University,
New Mexico Institute of Mining and Technology,
Los Alamos National Laboratory, Sandia National Laboratories

NEW MEXICO
COMPUTING
APPLICATIONS
CENTER

Primary Directions

Major draw is scientific talent at our national labs & universities

It's about the people, not the computer.

- Technology-based economic development and support
  - *Provide R&D support needed for NM businesses to grow*
  - *Attract large companies to NM*
  - *National and international partnerships*

- Education and workforce development
  - *K-12 - support STEM education (student internships and scholarships)*
  - *University education and research (develop our future S&T workforce)*
  - *Support professional development for teachers*
  - *Educate the public about STEM*

- Assistance to NM communities in solving problems
  - *Health, water, environment, clean energy, traffic, …*
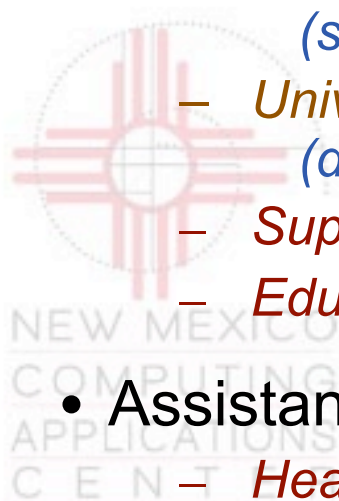
Status

- Developed business plan and market analysis
  - *Only U.S. computing center targeting Technology-Based Economic Development*

- *12th fastest computer in the world (Top 500 Nov '08)*
  - *Includes three 2.1 Teraflop exemplars at universities*

- $18.7M in funding from the State to date
  - *Funding Request over 5 years:*
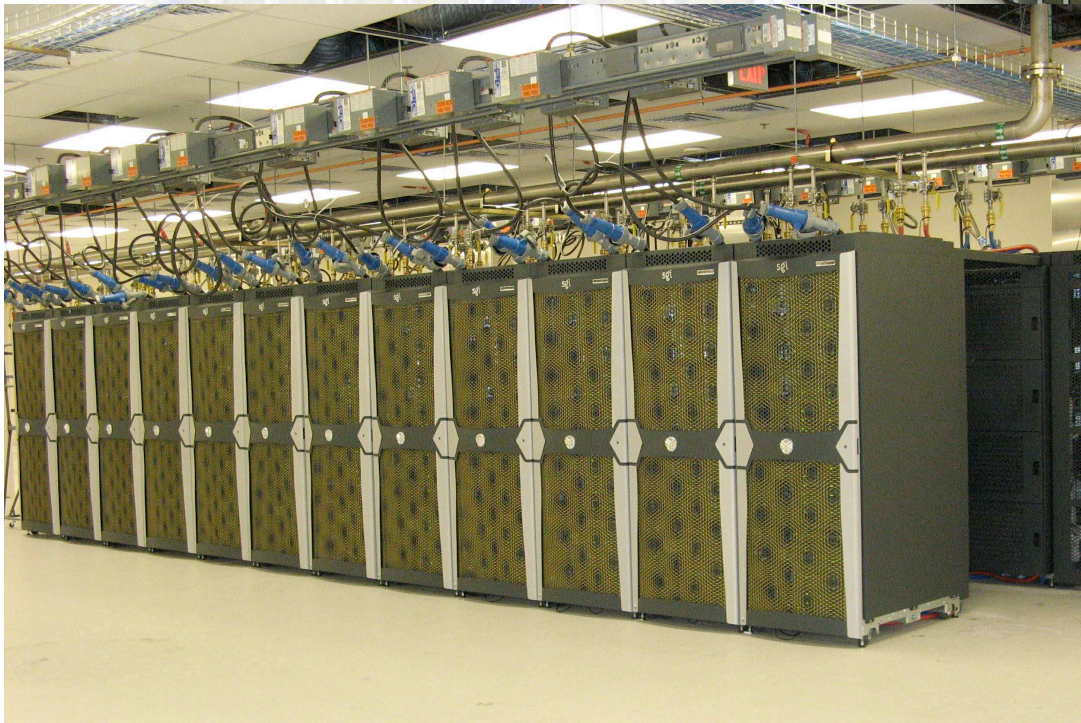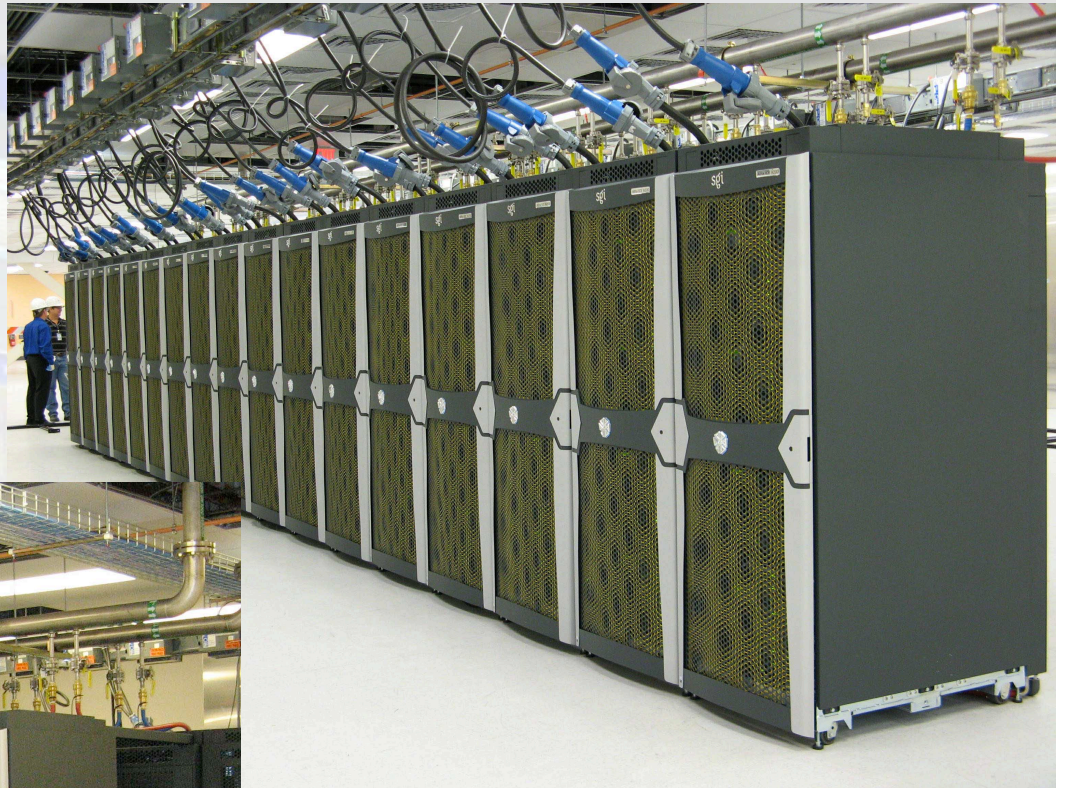   - *$36M total from State of NM +*
    - *$59M from other sources*

NEW MEXICO
COMPUTING
APPLICATIONS
CENTER

Computing System

SGI Altix ICE 8200 Cluster
172 Teraflops
14,336 3 GHz Cores
28 TB Local Memory
172 TB File Storage
10 GigE connectivity

Located at
Intel Fab 7 Plant
in Rio Rancho, NM

Gateways for New Mexico

Gateways at at all public colleges across New Mexico (44 sites) with High Definition video conferencing and 3D stereo visualization

Gateways are envisioned outside of New Mexico

*The Center is about connecting people, science, education and jobs*

Networks

The NMCAC provides networks on several levels:

- Network of university and lab staff joint appointments
- Network with gateway institutions
  - Each campus serves both as a gateway to the Center and as a gateway to the public, local K-12 schools, local businesses, and communities.
- Network to national and international institutions
- Network of databases, algorithms, codes
- Physical communications network:
  - NMCAC, telehealth, schools, libraries, museums, local telcoms, Qwest, state agencies, businesses, community groups, fiber-to-the-home, …

Plans

- Targeting R&D companies, foundations, Federal grants, directed state projects to meet Center goals
    - *Some early successes*

- Developing efforts to support educational activities in New Mexico (distance education, …)

- Started providing cycles to Center members in May

- Formation of Center
    - *Was incorporated in July as nonprofit*
    - *Joint appointments with labs and universities*
    - *Looking to build strategic relationships*
    - *Full operations started September 19*

- Determine killer applications for Technology 21
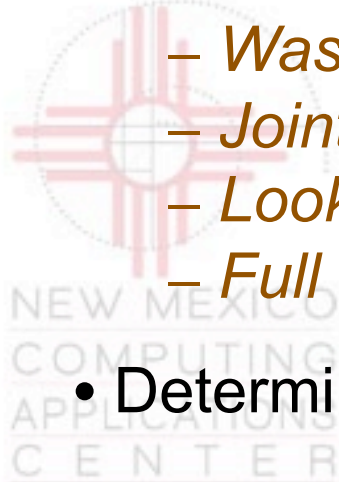
Killer Applications

- Applications envisioned in four areas:
  - Large-scale systems *(energy, water, climate, …)*
  - Social modeling *(community planning, threat response, …)*
  - Molecular-scale systems *(biotech, nanotech, …)*
  - Information processing *(digital media, networks, …)*

- *Possible long-term goals:*
  - *Integrated model of energy, water, climate, infrastructure, … based on geospatial database with satellite imagery, 3-D visualization, and analysis tools.*
  - *Developing genomic basis for personalized medicine*

- *Possible first focus area: Green Grid*

The Green Grid Initiative

Make New Mexico a national leader in developing and demonstrating the next-generation "Green Grid" - a smart energy grid with variable and intermittent renewable energy

Fits within the State Science and Tech Plan and would be overseen by EDD through a technology development center.

This potential initiative could:
- Bring significant Federal R&D investment to NM
- Develop new smart grid technologies that will lead to clean manufacturing of Green Grid components in NM
- Bring VC investment into NM to build out the first Green Grid system in the U.S.

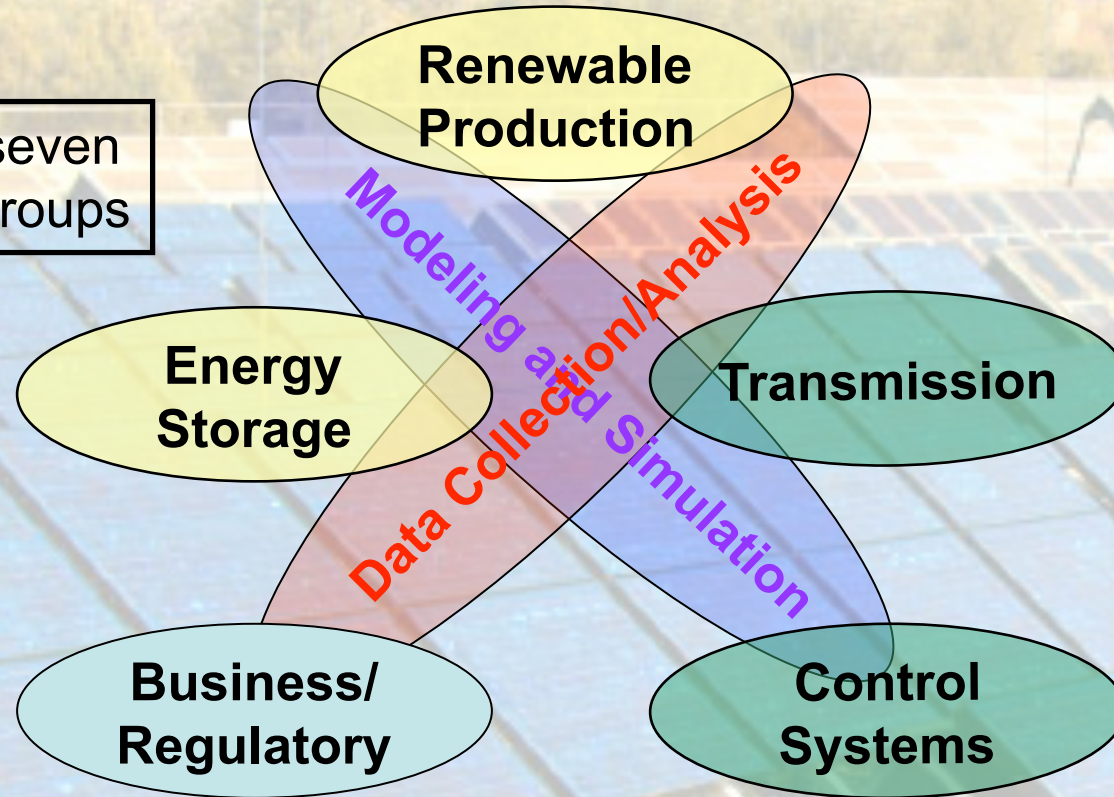GREEN GRID CONCEPT

BY LISA SENA-HENDERSON
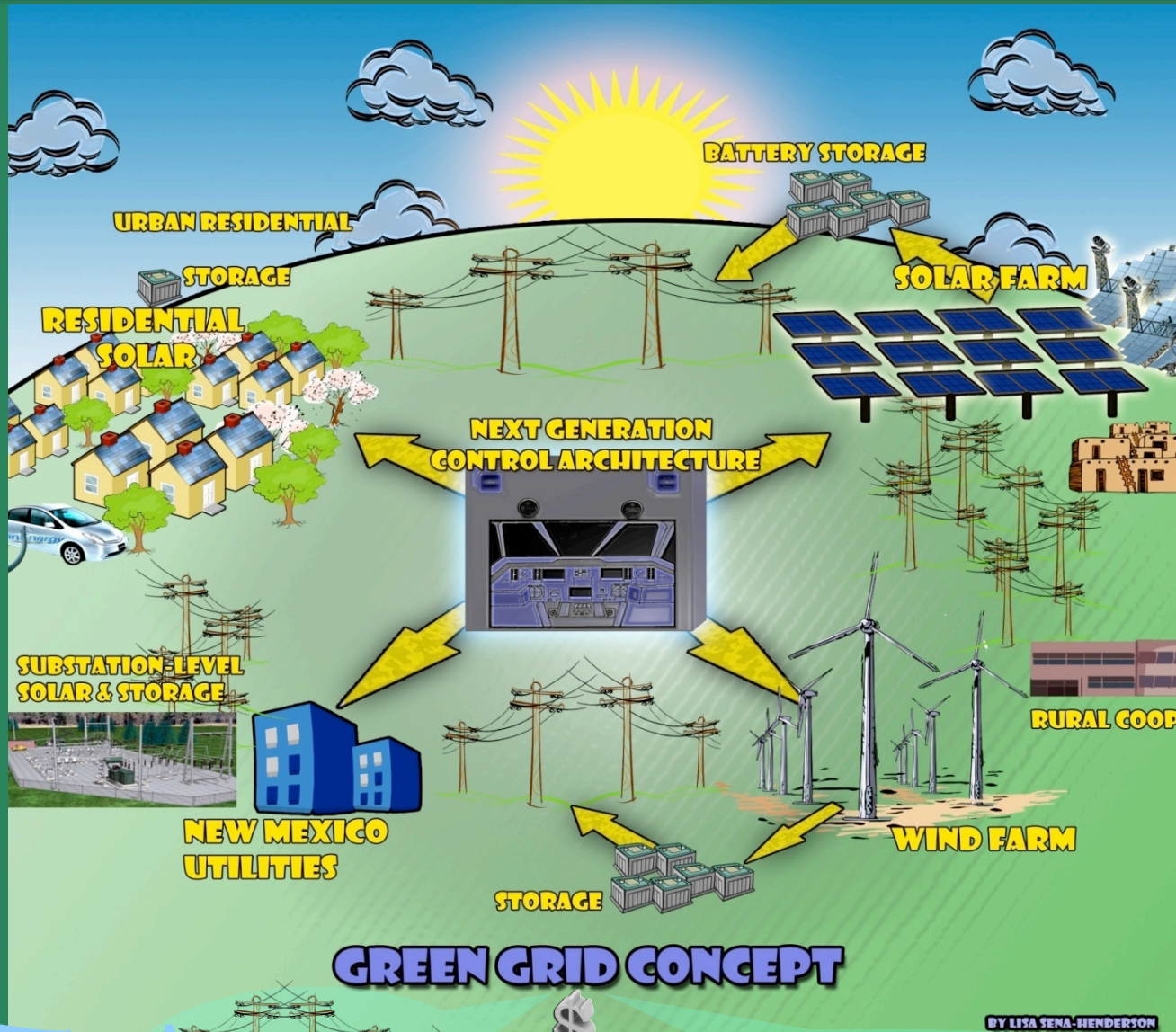
Green Grid Components

- Technology Development
  - Improved solar PV, energy storage, energy management and communication systems, smart inverters, modeling and simulation

- Two Demonstration Projects
  - Rural microgrid demonstration
  - Urban microgrid demonstration
    - *includes policy and incentives development*

- Clean Manufacturing
  - Solar thermal & PV, wind turbines, geothermal, biomass systems, control,cyber, and communications systems, smart inverters

- Clean energy export
  - Drive new energy economy in NM thru clean energy export to markets in CA, AZ, NV, …

Green Grid Participants

Formed seven working groups

Renewable Production

Modeling and Simulation

Data Collection/Analysis

Energy Storage

Transmission

Business/ Regulatory

Control Systems

Partnering Organizations *(over 50 participants at present)*:
Sandia, LANL, UNM, NMT, NMSU, SFCC, PNM, Kit Carson, El Paso Electric, Springer Elec., Xcel, Gov Ofc, EDD, EMNRD, RETA, PRC, CCAE, Arch Venture, Emcore, Energy Control, Intel, Mesa del Sol, Schott

Conclusions

New Mexico has all the necessary characteristics to develop and implement the next-generation Green Grid:

- Ability to develop the required new technologies
- An alliance of all the relevant organizations
- Small enough population to make state-wide implementation practical
- Strong leadership in the State
- Good connections nationally

Modest state investment over several years would attract a multi-hundred $M Federal investment

This initiative can lead to VC and business investment to:

- Build out the first Green Grid system in the U.S. in New Mexico
- Manufacture the components and systems needed for a national Green Grid system in New Mexico
- Transition New Mexico into the new energy economy by exporting clean energy to markets in CA, AZ, NV, …