

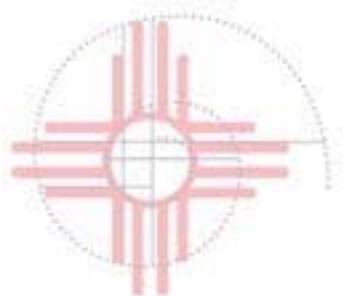
Supercomputing, Science, and Technology in New Mexico

Thomas Bowles

Science Advisor to Governor Richardson

*Information Technology and
Telecommunications Oversight Committee*

9/19/08



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New Mexico Science and Technology Plan

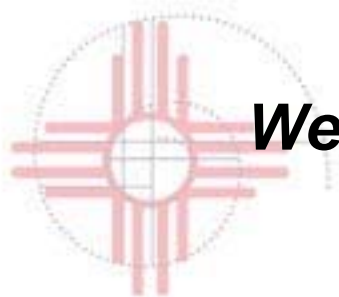
Goal: Significantly increase number of high-paying jobs for New Mexicans across the entire State

- *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



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***We can create more and better jobs -
The State needs to provide the support to translate
Federal R&D into the commercial sector***

Technology Basis for Growth

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.



Supercomputing underpins progress in all of five areas

New Mexico Computing Applications Center

Tom Bowles
Science Advisor

Lorie Liebrock
Interim Education Dir

Lenny Martinez
Interim Business Adv

Stephan Helgesen
Client Services Director

Edmundo Gonzales
Operations Director

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



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July 2008

Primary Directions

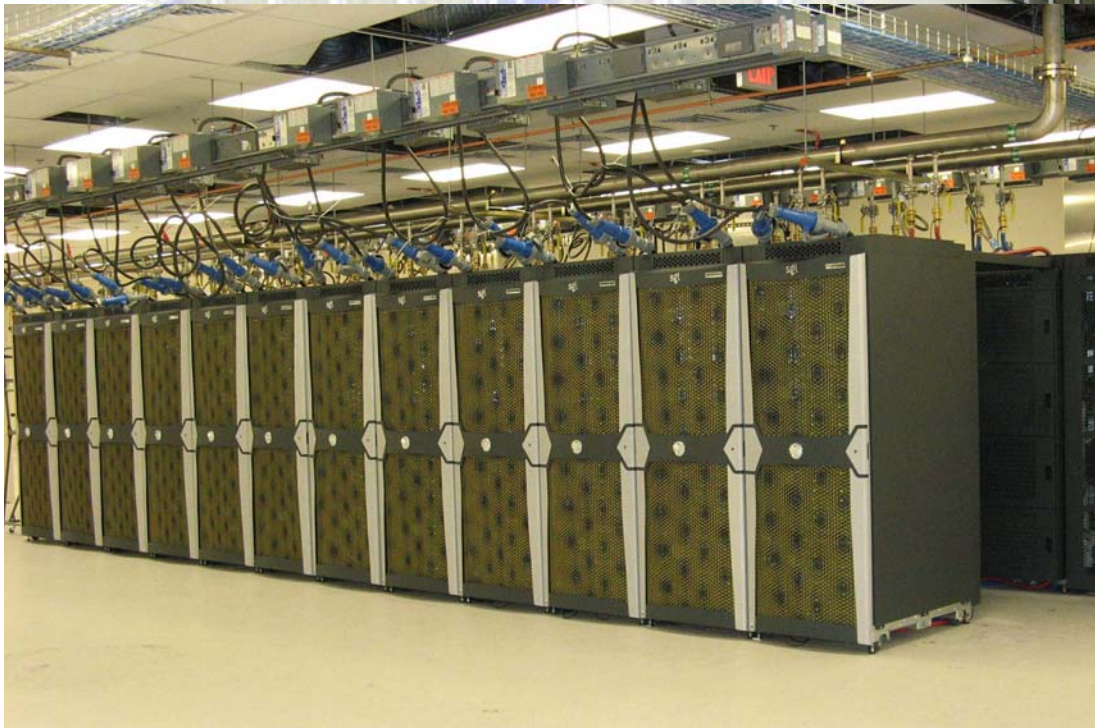
- Technology-based economic development and support
 - *Provide R&D support needed for NM businesses to grow*
 - *Attract large clean and green companies to NM*
- Education and workforce development
 - *K-20 - support STEM education*
 - *Support professional development for teachers*
 - *Keep our kids in New Mexico*
- Assistance to NM communities in solving problems
 - *Health, water, environment, clean energy, traffic, ...*
 - *Telehealth, museums, libraries, emergency response, ...*

Major draw is scientific talent at our national labs & universities

It's about our people, not the computer.

Computing System

SGI Altix ICE 8200 Cluster
14,336 3 GHz Cores
28 TB Local Memory
172 TB File Storage
*(7th fastest computer
in the world)*



Installed
and Running at
Intel Fab 7 Plant
in Rio Rancho, NM

Gateways for New Mexico

Gateways at all public colleges across New Mexico (44 sites)

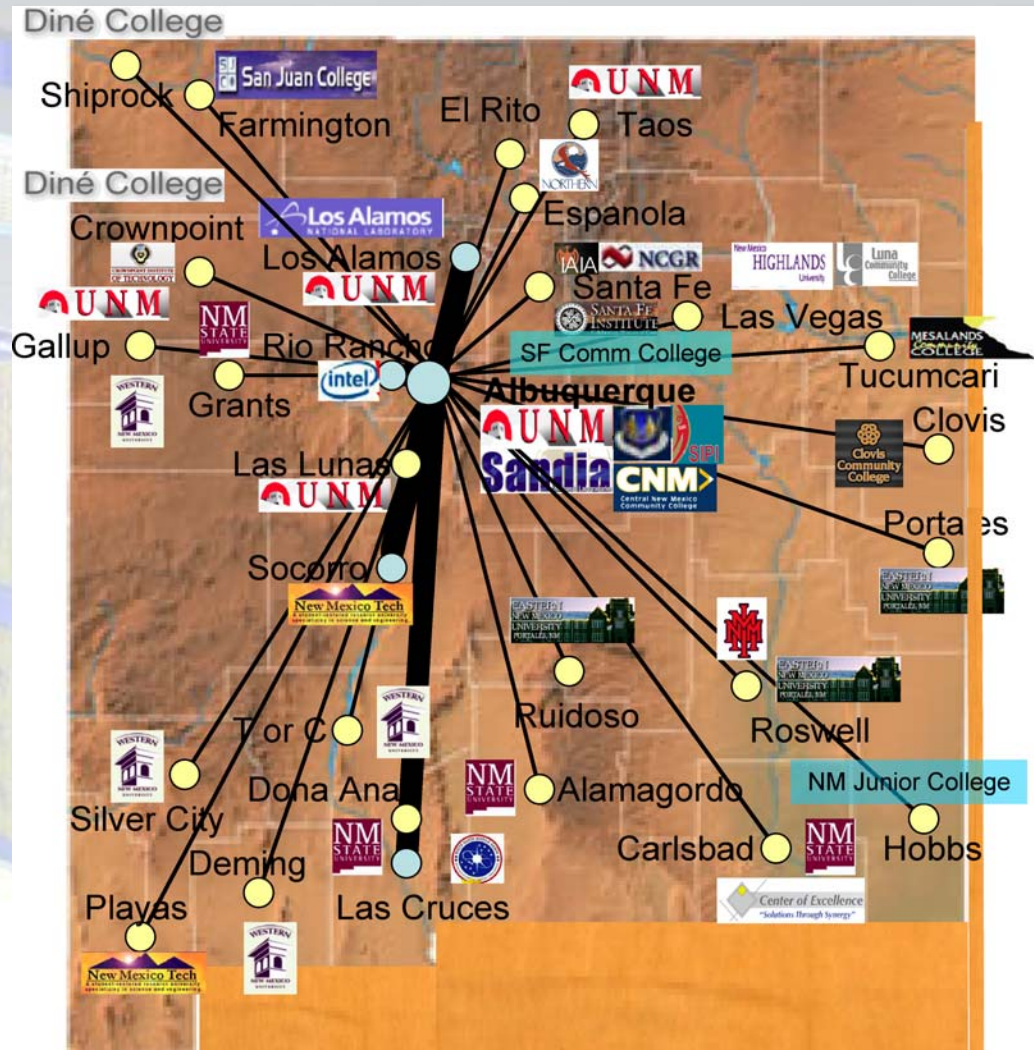
Bring small R&D businesses onto campus

Support education across NM

Support municipalities in NM

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

This is a new paradigm for people working together in New Mexico

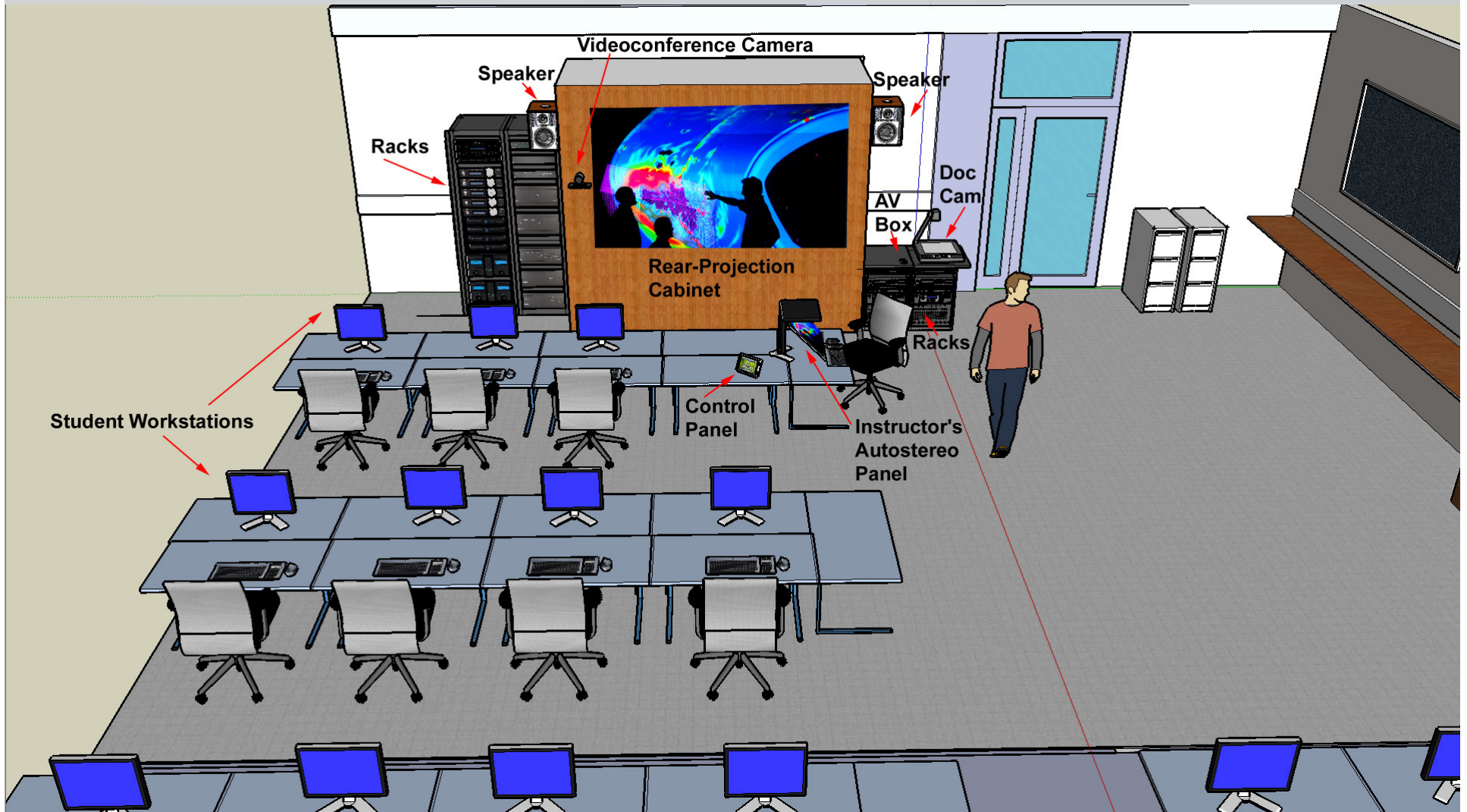


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Gateways

- All colleges and universities (and branches) will have:
 - *High-definition videoconferencing and 3-D stereo visualization*
 - *Microcluster and desktop computers networked to system*
 - *Connectivity to NMCAC center in Albuquerque and other gateways*
(NMCAC working with Design Nine to explore basis for a possible statewide public-private broadband initiative)
- Each campus serves both as a gateway to the Center and as a portal to the public, local K-12 schools, local businesses, and communities
- Major gateways will be connected to Lambda Rail
 - *Other campuses connected thru Wire NM / CHECsNet to NLR*
 - *Provides new capabilities for national/international collaborations*

Gateway Layout



Business Development

- Developed business plan and market analysis
 - *Only computing center targeting Tech-Based Economic Development*
- Gateways will be connected to LambdaRail
 - *New capabilities for national / international collaborations*
- *Businesses can join the center in a variety of relationships*
 - *Full members, limited scope and duration, ...*
- *Criteria for membership:*
 - *Mutual benefit to both partners*
 - *R&D is in an area of importance to New Mexico*
 - *Good prospect for return on investment*
 - *Personnel from partnering organization must spend some time in New Mexico to build personal relationships*
 - *Effort does not compete with private businesses in New Mexico*

Business Targets

- Business model and market analysis done in collaboration with UNM Anderson School of Business Management
- Analysis yielded 3 major market areas and 6 sectors
- Market requirements:
 - Market area has need for development of new computing capabilities
 - NMCAC has the talent and resources to do the work
 - Market area has strong financial resources to invest
- Primary markets identified:
 - Digital Film and media
 - Energy\Oil-Gas\Alternative Energy, Environment, and Water
 - Health, Medical, Bio Med\Tech and Pharmaceutical
- Funding sectors identified:

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Federal
Universities & Labs

Commercial
IP

State
Foundations

Education

- Supercomputing can attract kids to Science and Technology
 - *3-D visualization is a great draw*
 - *Will coordinate with and enhance NM STEM education efforts (IDEAL, Project 2012, Innovate-Educate NM, Supercomputing Challenge, GUTS, ...)*
- Universities can connect not only to their own branches, but to every college and university in NM.
 - *Enables a new mode for distance learning and collaboration*
 - *Provides ability to tailor courses for specific workforce development*
- Teacher professional development
 - *Programs with partial salary support to teach teachers how to bring computing into the classroom*
 - *Enhances Master of Science Teaching opportunities*

Education

- Center supports R&D at universities
 - *Focus in on R&D that is of importance to New Mexico (e.g., energy, water, health, advanced materials, ...)*
 - *Provides competitive advantage in attracting top-notch professors to universities*
 - *Provides competitive advantage to obtain Federal grants (EPSCoR, National Science Foundation, Dept of Energy, ...)*
- Educating the Public
 - *Inform parents (PTA mtgs, ...) about what their children are learning and why science is important in their children's future*
 - *Programs to educate public on issues in energy, health, ... (Provide voters with info needed to make informed decisions)*



Education

- Student Internships
 - *Funded internships for high school and college students*
 - *Perform research of interest to New Mexico*
 - *Develop expertise and experience*
- 2008 Internships Funded by Intel Corp.
 - *New Mexico State University*
 - Mi Deng working with J. Cook,
 - Performance Analysis & Optimization of Space Weather Codes
 - *University of New Mexico*
 - Jeff Fenchel working with J. Galewsky
 - Understanding Extreme Rainfall
 - *New Mexico Institute of Mining and Technology*
 - Thor Johnson & Mariah Deters working with L.M. Liebrock
 - Modeling Albuquerque's Transportation System



Encanto Progress

- Received \$14M capital appropriation in FY08
- Procured Encanto at remarkable cost savings

| Vendor | Procurement Cost (\$M) | 5-yr Operating Cost (\$M) | Total(\$M) |
|------------------|------------------------|---------------------------|----------------|
| SGI/Intel | \$11.0 | \$7.5 | \$18.5 |
| Vendor 2 | \$19.7 | \$24.5 | \$44.2 |
| Vendor 3 | \$29.6 | \$15.5 | \$45.1 |
| Vendor 4 | \$51.1 | \$31.4 | \$82.5 |
| | | Total Savings | \$25.6M |

- Encanto procured, installed, and running in world-record time
 - *Funding available July 1, 2007*
 - *Contract in place November 1, 2007*
 - *System delivered Jan 10, 2008*
 - *First log-in on full system Jan 12, 2008*
 - *First scientific user Feb, 2008*
 - *Full friendly user period started May, 2008 (68 users and growing)*
 - *IV&V completed, final acceptance from SGI June 27, 2008*

Center Progress

- Formed Advisory Committee under EO 2007-034
- Requested (but did not get) legislation in 2008 regular session to provide means to stand up and fund the Center
- NMCAC formed as nonprofit by NM University Research Consortium through the Research Parks Act on 6/27/08
- Incorporation approved by PRC on 7/3/08
 - Board of Directors formed and officers elected
- MOU between DoIT, UNM, and NMCAC signed 9/19/08
 - Provides funding for NMCAC to UNM
 - Provides NMCAC with sole access to Encanto
 - UNM provides financial services
- Center budget sufficient to cover only basic operations
 - Any development activities require other funding

FY09 Center Plans

- Full operations anticipated 10/1/08
 - Transfer SGI operations contract from DoIT to NMCAC
(Encanto hardware / software support to remain in DoIT)
- Center to contract for personnel for FY09
- Center to sign MOUs with member institutions
 - Access to Encanto, member agreement, joint appointments
- Move into interim offices (provided by Mesa del Sol at no cost to NMCAC) 10/1/08
- Sign first business contract by 10/1/08
- Install and operate initial gateways January 2009
- Develop business investments
- Stand up and provide educational materials to initial gateways
- Support small business development (through SBAP)

Institutional and Business Investments

- Have received or have commitments for significant support from NMCAC member institutions and businesses:

| Source of Support * | Thru 9/30/08 (\$K) | Committed for rest of FY09 (\$K) | Probable FY09 (\$K) | Total (thru FY09) (\$K) |
|--------------------------|--------------------|----------------------------------|---------------------|-------------------------|
| Members - Salary Support | \$1,326.4 | \$352.3 | | \$1,678.8 |
| Student Support | \$45.0 | | \$45.0 | \$90.0 |
| Other Support | \$315.7 | \$1,314.8 | \$1,195.0 | \$2,858.5 |
| Total Non-State | \$1,687.1 | \$1,700.1 | \$1,240.0 | \$4,627.2 |

**Total non-state operating investment committed through FY09:
\$3.387M**

NMCAC is also partner on a number of proposals to Fed Gov agencies



** Does not include staff support from DoIT and EDD*

Elements of success

Principles

- Stability and sustainability
- Flexibility
- Alignment of state, business, labs, universities
- Market driven
- Return on investment

Resources Required

- Workforce
- Intellectual / natural
- Critical mass
- State and Federal investment
- VC / business investment

Operational

- Leadership
- Integration and coordination
- Priority setting



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NMCAC Budget

Goal is to become self-sustaining in 5 years

| Operating Funds (\$K) | FY08 | FY09 | FY10 | FY11 | FY12 | FY13 | Total |
|------------------------------------|-------------------|------------------|------------------|-------------------|-------------------|-------------------|-------------------|
| Staff & Operating Costs | \$0.0 | \$968.4 | \$5,924.1 | \$8,649.0 | \$10,857.2 | \$12,447.2 | \$38,845.9 |
| Computer Operations Cost | \$0.0 | \$1,886.6 | \$1,790.8 | \$1,833.4 | \$1,692.0 | \$1,724.2 | \$8,927.1 |
| Office Lease Cost | \$0.0 | \$0.0 | \$226.8 | \$445.5 | \$700.0 | \$700.0 | \$2,072.3 |
| Total Operating Cost | \$0.0 | \$2,855.0 | \$7,941.7 | \$10,928.0 | \$13,249.2 | \$14,871.5 | \$49,845.3 |
| Paid from non-state funds | \$0 | \$0 | \$1,580 | \$4,760 | \$11,785 | \$14,871 | \$32,996 |
| Total State Operating Funds | \$0 | \$2,855 | \$6,362 | \$6,168 | \$1,464 | \$0 | \$16,849 |
| Capital Funds (\$K) | | | | | | | |
| Computer procurement | \$11,000.0 | \$0.0 | \$0.0 | \$0.0 | \$0.0 | \$0.0 | \$11,000.0 |
| Gateway equipment | \$3,000.0 | \$1,800.0 | \$2,600.0 | \$1,000.0 | \$0.0 | \$0.0 | \$8,400.0 |
| Total State Capital Funds | \$14,000.0 | \$1,800.0 | \$2,600.0 | \$1,000.0 | \$0.0 | \$0.0 | \$19,400.0 |
| Total State Request | \$14,000.0 | \$4,655.0 | \$8,961.7 | \$7,168.0 | \$1,464.2 | \$0.0 | \$36,248.9 |

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FY10 Operating Request: \$6.362M
FY10 Capital Request: \$2.6M

Benefits to the State

- Remote videoconferencing at sites all around NM
 - Accessible to legislators, businesses, community groups
- Traffic modeling
 - Can reduce time spent at traffic lights and on the road
- Green Grid / RETA / Clean Energy
 - Optimize layout of new transmission lines, smart grid, wind turbines
- Agriculture
 - Develop genomic markers / therapeutics for chile wilt
- Water modeling
 - Effect on surface water of drawing on deep aquifers
- Assist in emergency response
 - Modeling spread of avian flu outbreak and response needs
- Environmental permitting
 - Reduce cost and time for granting air quality and water permits
- Museums and libraries
 - Can scan and show works of art in 3D high-def across NM

Framing the Discussion

- Communication

- *We want to have an ongoing dialog with the ITTOC and other groups to maximize benefits from NMCAC*

- Building Confidence

- *We appreciate your input to assure us (and you) that we are on the right track to success*

- Getting Your Support

- *We need your support for technology development that will improve the lives of New Mexicans across NM*

