

MINUTES OF THE MEETING
OF THE
MICHIGAN STATE UNIVERSITY
BOARD OF TRUSTEES

January 25, 2013

President Simon called the meeting of the Board of Trustees to order at 9:35 a.m. in the Board Room.

Trustees present: Brian Breslin, Dianne Byrum, Joel Ferguson, Mitch Lyons, Brian Mosallam, Faylene Owen, George Perles, and Diann Woodard (via telephone).

University officers present: President Simon, Acting Provost Youatt, Vice President and Secretary Beekman, Vice President and General Counsel Noto, Vice Presidents Burnham, Flinn, Gore, Groves, Haas, Hsu and Swain, Acting Vice President Maybank, and Senior Advisor and Director Granberry Russell. Faculty liaisons present: William Anderson and John Powell. Student liaisons present: Stefan Fletcher, Kelcey Gapske, and Evan Martinak.

All actions taken were by unanimous vote of the Trustees present, unless otherwise noted.

1. On a motion by Trustee Owen, supported by Trustee Ferguson, the **BOARD VOTED to approve** the agenda.
2. On a motion by Trustee Owen, supported by Trustee Ferguson, the **BOARD VOTED to approve** the minutes of the Board meeting of December 14, 2012.
3. President's Report

President Simon provided the following report to the Board.

A. MSU's German Program Awarded Highest Distinction

MSU's German Program has been designated as a "German Center of Excellence" by the American Association of Teachers of German (AATG) for 2013. The program is one of only two recipients of this high distinction and is uniquely situated to provide a humanist dimension for international and global studies.

B. 2012 Fulbright Top Producing Institution

MSU was named one of this year's Fulbright Program "top producers." Top producing institutions in all Carnegie Classifications were highlighted in the October 28th online edition of *The Chronicle of Higher Education*. MSU continues to promote the Fulbright Program's goals of fostering leadership and increasing mutual understanding between the people of the United States and the people of other countries.

C. MSU College of Law to Help Small Michigan Businesses with Intellectual Property Questions

The MSU College of Law, through the coordination of the I6 Green Proof of Concept Center, is leading the initiative to help West Michigan and mid-Michigan entrepreneurs and small businesses with their intellectual property questions. The new program, called the Intellectual Property Start-Up Project, will offer assistance with patents, copyrights, and trade secrets.

D. MSU Biofuels Expert in Top 100

MSU AgBioResearch scientist Bruce Dale was recently ranked 22nd and was the top-ranked academic on BioFuels Digest's 2012-13 list of the Top 100 People in Bioenergy. The list was determined by votes from readers of the magazine and the magazine's editorial board. This marks the third year Dale, a professor in the Department of Chemical Engineering and Materials Science, has received recognition in this top 100 list.

E. MLK Celebration

MSU's 2013 celebration of Martin Luther King Jr.'s legacy was well attended by students and community members. Events included a student leadership conference and community dinner.

F. MSU Students Awarded for Creative, Inclusive Thinking

Eight MSU students have been recognized for sharing the inclusive, out-of-the-box thinking of Martin Luther King, Jr. The award highlights the ways in which MSU students use their critical and creative skills to understand and re-envision the world. All prize winners will be honored at the University's Excellence in Diversity Awards Program on February 15.

G. MSU Students at Auto Show

A team of MSU students roared into the North American International Auto Show, exhibiting three innovative race cars they designed and built. It will be the sixth year in a row the MSU Formula Racing Team will be displaying its work, alongside five other Formula SAE teams from other universities.

H. MSUFCU Donation for Jazz Studies Program

Thanks to a \$1 million gift from the MSU Federal Credit Union, MSU's College of Music will launch a new jazz studies artist-in-residence program. It is the largest-ever investment in the College's curriculum.

I. Spartans Will. 360

For decades, MSU researchers have been crossing disciplines, cultures, and continents to advance the common good in uncommon ways. Now, MSU will take Spartans, friends, and colleagues on an adventure—around the world and on the scene—to see first-hand the indispensable work of MSU scientists, scholars, and students.

On January 7, the SPARTANS WILL. 360 site launched, allowing audiences to follow the members of the SPARTANS WILL. 360 crew as they began traversing four continents to visit more than 10 sites from East Lansing to East Africa. They will stop in fields, hospitals, and universities, in locations from rural villages to populous cities, all places—where MSU faculty, staff, and students are working with individuals, fellow universities, corporations, communities, and countries to enhance the quality of life, create opportunity, and solve some of the toughest problems of our time.

The 360 crew will capture the story of MSU's activity and impact in each location through video, photos, and blogs and will share this material via social media, email, and the SPARTANS WILL. 360 site.

4. There was no public participation on issues germane to the agenda.

5. Personnel Actions

Acting Provost Youatt presented the following personnel actions:

Lucas, Russell, AY—Associate Professor, Department of Linguistics and Germanic, Slavic, Asian, and African Languages, \$80,000, with Tenure, effective January 1, 2013.

Ross, Arun A., AY—Associate Professor, Department of Computer Science and Engineering, \$137,000, with Tenure, effective January 1, 2013.

Trustee Owen **moved to approve** the recommendations, with support from Trustee Byrum.

THE BOARD VOTED to approve the recommendations.

President Simon presented the following personnel action:

Dantonio, Mark J., AN—Head Coach—Football, Intercollegiate Athletics, Subject to Contract, effective January 15, 2017 to January 14, 2018.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Mosallam.

THE BOARD VOTED to approve the recommendation.

6. Gifts, Grants, and Contracts

Vice President Hsu presented the Gifts, Grants, and Contracts Report for the period of November 28, 2012 through January 8, 2013. The report is a compilation of 300 Gifts, Grants, and Contracts plus 73 Consignment/Non-Cash Gifts, with a total value of \$65,562,517.

Trustee Ferguson **moved to approve** the report, supported by Trustee Byrum.

THE BOARD VOTED to approve the Gifts, Grants, and Contracts Report.

Vice President Hsu introduced Dr. Wolfgang Bauer, Chairperson of the Department of Physics and Astronomy. Dr. Bauer made a presentation to the Board on energy. (Appendix A)

7. Finance Committee

Trustee Owen presented the Trustee Finance Committee Report and recommendations.

A. Revised Investment Policy

It was recommended that the Board of Trustees authorize the Finance Committee, the Investment Advisory Subcommittee, and the University Administration, when recommending an investment manager for appointment by the Board, to provide in the recommendation for the use of a legal entity formed with the MSU Foundation that functions as a vehicle for joint investments by the University and the MSU Foundation when committing funds to that manager.

It was also recommended that the Board amend its Investment Policy as set forth in the materials attached to the resolution. (Appendix B)

Trustee Owen **moved to approve** the recommendations, with support from Trustee Breslin.

THE BOARD VOTED to approve the recommendation.

B. Bond Authorization

It was recommended that the Board of Trustees authorize the issuance of up to \$220 million in series 2013 long-term debt and adopt the resolution attached as Appendix C in its entirety.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Ferguson.

THE BOARD VOTED to approve the recommendation.

C. New Investment Manager—Pacific Investment Management Company LLC

It was recommended that the Board of Trustees select Pacific Investment Management Company LLC as an investment manager.

Trustee Breslin **moved to approve** the recommendation, with support from Trustee Byrum.

THE BOARD VOTED to approve the recommendation.

D. Long-Term Lease

It was recommended that the Board of Trustees approve entering into a lease for approximately 40,000 square feet of finished office and teaching space in Flint, Michigan with an entity to be formed by

the Uptown Reinvestment Corporation for an initial term of 20 years and upon such other terms and conditions as may be acceptable to the Vice President for Strategic Infrastructure Planning and Facilities.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Ferguson.

THE BOARD VOTED to approve the recommendation.

E. Authorization to Plan—Akers Hall Dining and Life Safety Renovation

It was recommended that the Board of Trustees authorize the Administration to plan for the project entitled Akers Hall Dining and Life Safety Renovation.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Ferguson.

THE BOARD VOTED to approve the recommendation.

F. Authorization to Plan—Munn Ice Arena—HVAC Upgrades and Ice Making System Replacement

It was recommended that the Board of Trustees authorize the Administration to plan for the project entitled Munn Ice Arena—HVAC Upgrades and Ice Making System Replacement.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Lyons.

THE BOARD VOTED to approve the recommendation.

G. Authorization to Plan—North Campus Infrastructure Improvements

It was recommended that the Board of Trustees authorize the Administration to plan for the project entitled North Campus Infrastructure Improvements—West Circle Drive –2014 and the project entitled North Campus Infrastructure Improvements—West Circle Drive—2015.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Breslin.

THE BOARD VOTED to approve the recommendation.

H. Authorization to Proceed—Parking—Lot 67 (Jenison)--
Reconstruction

It was recommended that the Board of Trustees authorize the Administration to proceed with the project entitled Parking—Lot 67 (Jenison)—Reconstruction, and that it approve a budget of \$1,900,000.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Byrum.

THE BOARD VOTED to approve the recommendation.

I. Project Approval—Authorization to Proceed—Transportation
Services—New Fuel Station

It was recommended that the Board of Trustees authorize the Administration to proceed with the project entitled Transportation Services—New Fuel Station, and that it approve a budget of \$4,800,000.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Breslin.

THE BOARD VOTED to approve the recommendation.

J. Bid and Contract Award (budget reduction)—Reconstruct Bogue
Street and Shaw Lane Intersection (including partial closure of
Bogue Street) and Steam Distribution—Replace Steam Lines to
Owen Graduate Hall

It was recommended that the Board of Trustees authorize the Administration to award a contract in the amount to \$3,359,000 to Triangle Associates, Inc., and that the budget be reduced from \$6,800,000 to \$5,200,000 for the project entitled Reconstruct Bogue Street and Shaw Lane Intersection (including partial closure of Bogue Street) and Steam Distribution—Replace Steam Lines to Owen Graduate Hall.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Lyons.

THE BOARD VOTED to approve the recommendation.

K. Bid and Contract Award—Butterfield Hall—Renovation

It was recommended that the Board of Trustees authorize the Administration to award a contract in the amount of \$11,944,000 to DeMaria Construction Company for the project entitled Butterfield Hall—Renovation.

Trustee Owen **moved to approve** the recommendation, with support from Trustee Ferguson.

THE BOARD VOTED to approve the recommendation.

8. Policy Committee

Trustee Byrum presented the Trustee Policy Committee Report and recommendations.

A. Policy Revisions Consistent with Recent Organizational Changes

It was recommended that the Board of Trustees approve the Board Policy revisions, described in Appendix D, consistent with recent organizational changes.

Trustee Byrum **moved to approve** the recommendation, with support from Trustee Owen.

THE BOARD VOTED to approve the recommendation.

B. Approval of Contract Terms: *Ubiquitous Energy, Inc.*

It was recommended that the Board of Trustees approve the execution of a research contract with *Ubiquitous Energy, Inc.*, consistent with earlier public notice and with the “Research Contract Term Sheet” presented to the Board. (Appendix E)

Trustee Byrum **moved to approve** the recommendation, with support from Trustee Ferguson.

THE BOARD VOTED to approve the recommendation.

C. Notice of Intent to Negotiate a Contract with *Salgomed, Inc.*

Pursuant to State Law, the Chair of the Policy Committee gave public notice of the University’s intent to negotiate contracts with *Salgomed, Inc.*, a company based in California.

Dr. Carlo Piermarocchi, a Professor in the Department of Physics and Astronomy, and his family own or have options to buy an ownership interest of more than one percent of the company. Dr. Piermarocchi is also a partner in *Salgomed, Inc.*

9. Audit Committee

Trustee Breslin presented the Trustee Audit Committee Report.

The public accounting firm of Plante & Moran PLLC has served as the University's external auditor since January 2006. In February 2010, the Board re-appointed Plante & Moran as the University's external auditor for fiscal year 2010-11 and extended the appointment through fiscal year 2012-13 to allow continuity through the EBS implementation process. The next formal request for auditor bids will occur in Fall 2013 for the 2013-14 fiscal year. Thus, no further Board action is required at this time.

Vice President for Legal Affairs and General Counsel, Bob Noto and several of his colleagues reported on litigation involving the University.

David Gift, Chief Information Officer, and Jim Dunlap, Chief of Police, provided an overview of cyber security measures on campus to protect individual and University confidential information and computer systems.

Tom Luccock, Director of Internal Audit, reported on the external peer review of MSU's internal audit function. His peers from other universities participated in this review.

10. Facilities and Infrastructure Report

Assistant Vice President Bill Latta presented the Facilities and Infrastructure report.

The Facilities and Infrastructure report is prepared annually. The report is designed to inform the Trustees of the state of the campus infrastructure and buildings and of changes in construction projects. It includes the annual property report.

The full report can be viewed at:

<http://pp.msu.edu/physplantdiv/assets/File/FacilitiesandInfrastructureReport2013WEB.pdf>

11. Trustees Comments

Trustee Ferguson wished Trustee Woodard a speedy recovery and thanked her for participating by telephone.

Trustee Lyons welcomed Trustee Mosallam to the Board and said that he looked forward to working with him.

Trustee Owen asked Dr. John Powell, Faculty Liaison, to provide an overview of the discussion that occurred at the faculty liaison breakfast meeting.

Dr. Powell said that the liaison group discussed faculty engagement, governance, environmental concerns, and promoting MSU throughout the community.

Trustee Woodard thanked everyone for their concern and said she looks forward to returning to campus soon.

Trustee Byrum welcomed Trustee Mosallam.

Trustee Mosallam thanked everyone for their warm welcomes. He said that he looked forward to serving MSU.

Trustee Perles welcomed Trustee Mosallam to the Board.

Trustee Breslin welcomed Trustee Mosallam and gave his best wishes to Trustee Woodard.

12. Request to Adjourn

On a motion by Trustee Owen, supported by Trustee Ferguson, **THE BOARD VOTED to adjourn** at 10:50 a.m.

Respectfully submitted,



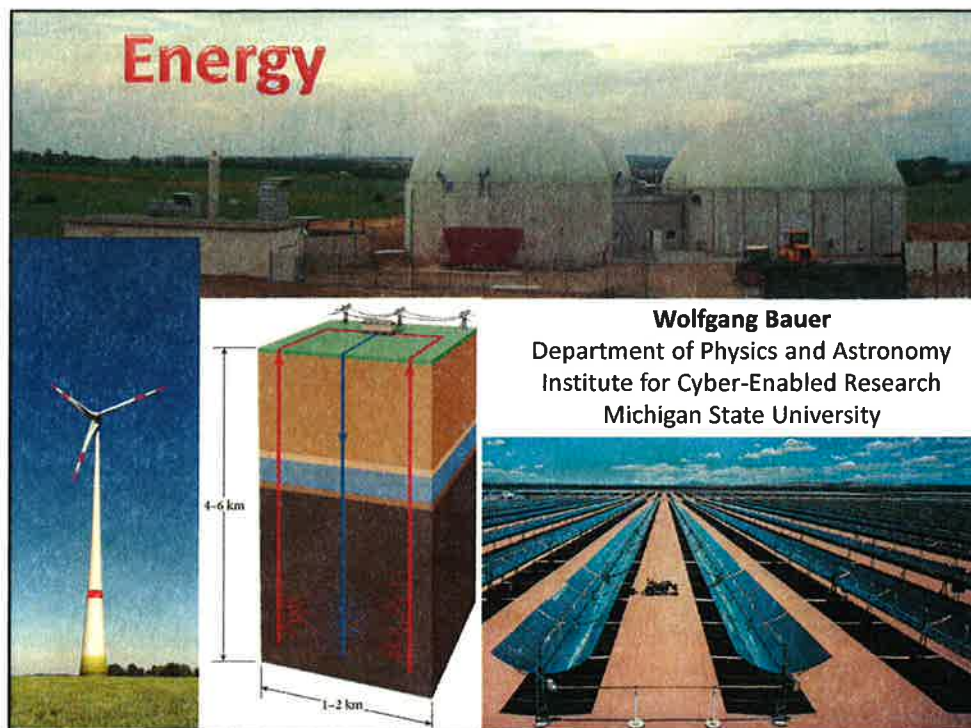
William R. Beekman
Vice President and Secretary of the Board of Trustees

**RESEARCH
PRESENTATION
TO THE MSU BOARD OF TRUSTEES**

JANUARY 25, 2013

**WOLFGANG BAUER
COLLEGE OF NATURAL SCIENCE**

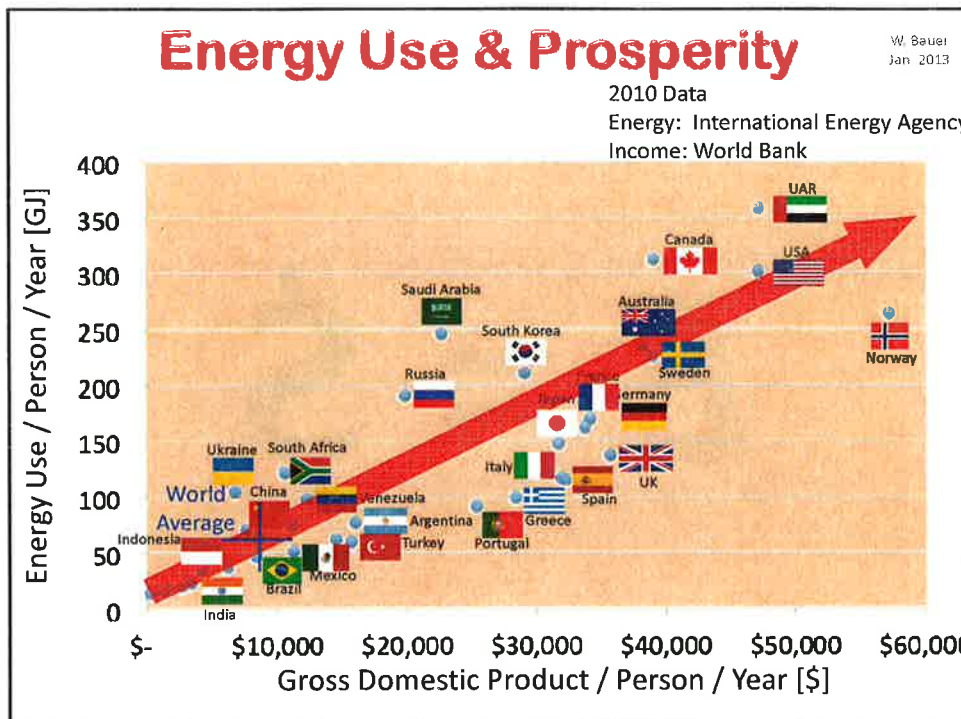
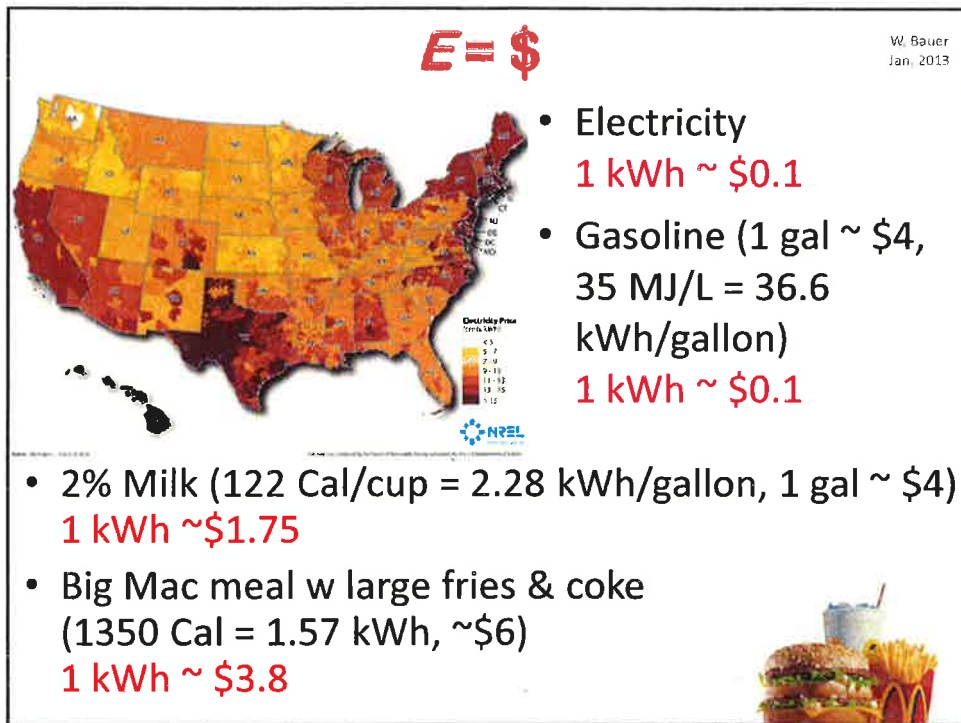
Facilitated by the Office of the Vice President for
Research and Graduate Studies



W. Bauer
Jan. 2013

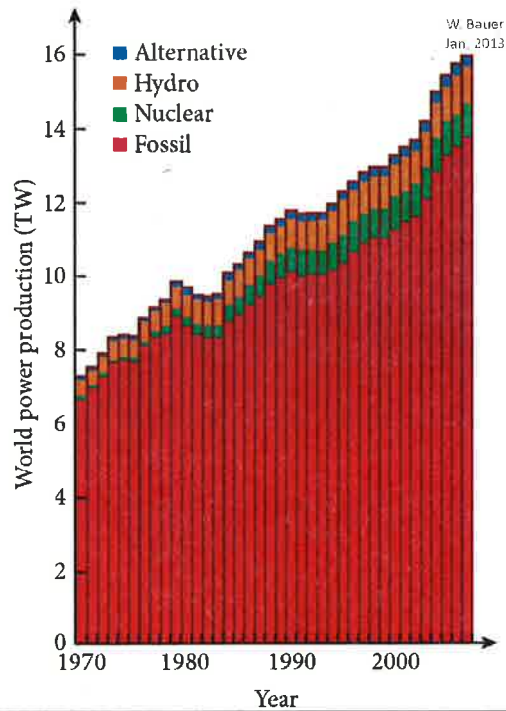
$$E = \$$$

International versions: $E = \text{€}$, $E = \text{¥}$, $E = \text{£}$, ...



World Power Consumption

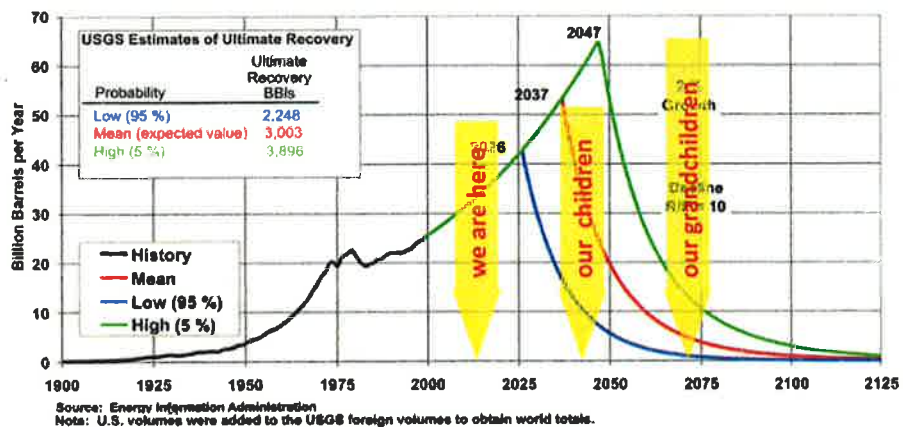
- Increasing strongly with time
- Overwhelmingly satisfied with fossil fuels
- ~~Biggest Problem facing the World~~
- **Biggest Opportunity of our lifetime**



We are running out of oil!

W Bauer Jan. 2013

Figure 2. Annual Production Scenarios with 2 Percent Growth Rates and Different Resource Levels (Decline R/P=10)



<http://www.eia.doe.gov/>
 S.E. Koonin, BP

Atmosphere

W. Bauer
Jan. 2013

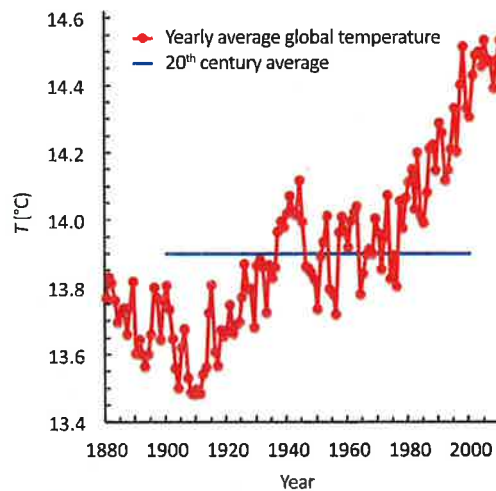
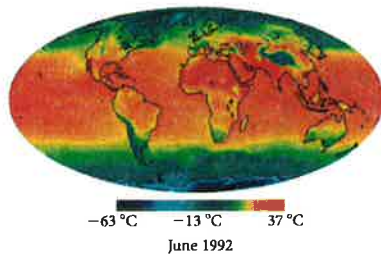
- **Composition**
78.08% nitrogen, 20.95% oxygen,
0.93% argon, 0.039% (= 390 ppm) CO₂
- Each year we add 2 ppm (= 16 billion tons = 40 times the mass of all humans) of CO₂ to the atmosphere due to the burning of fossil fuels



Global Temperature

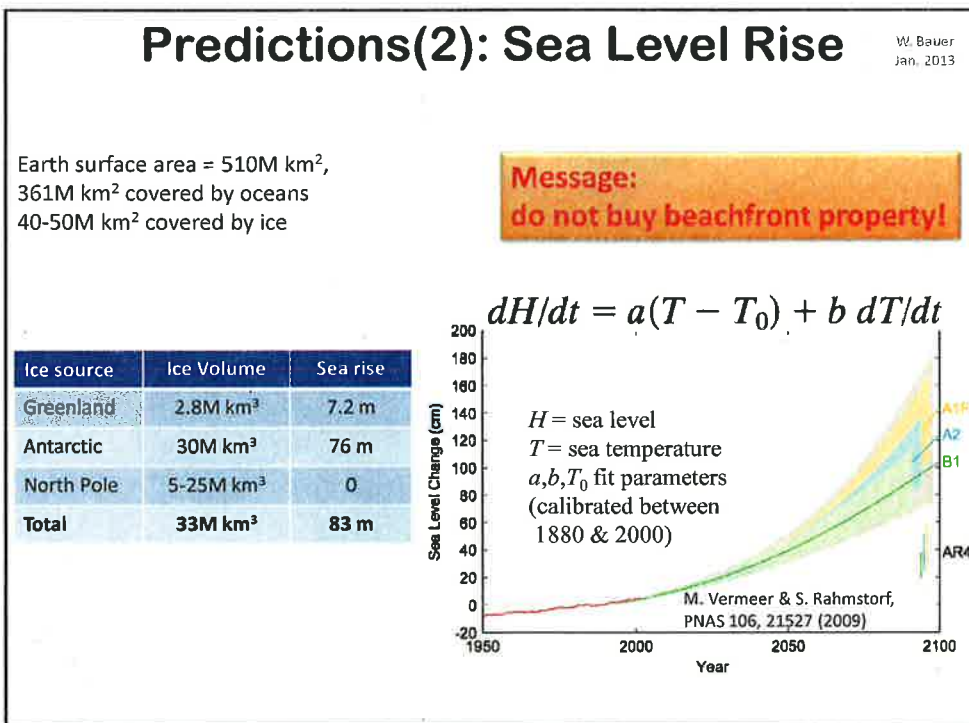
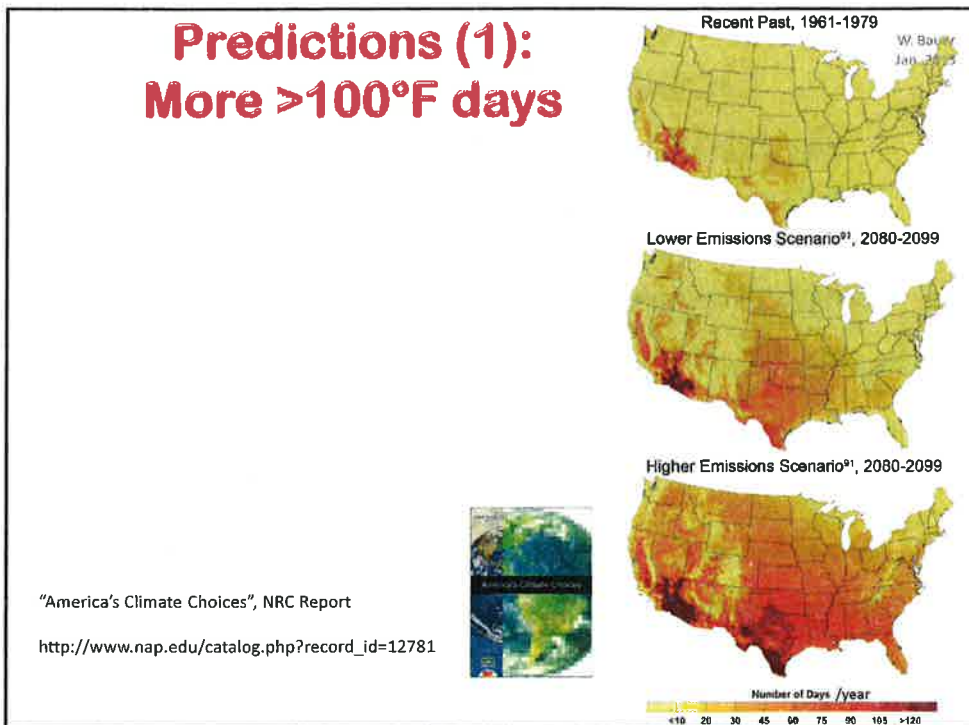
W. Bauer
Jan. 2013

- Careful averaging needed
(over *space* and *time*)



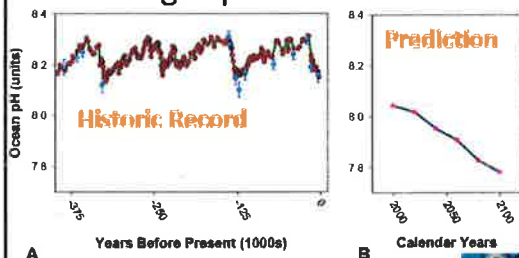
**Global Warming
of ~0.2°C/decade is happening
Is it man-made?**

Data: National Climatic
Data Center
U.S. Department of Commerce



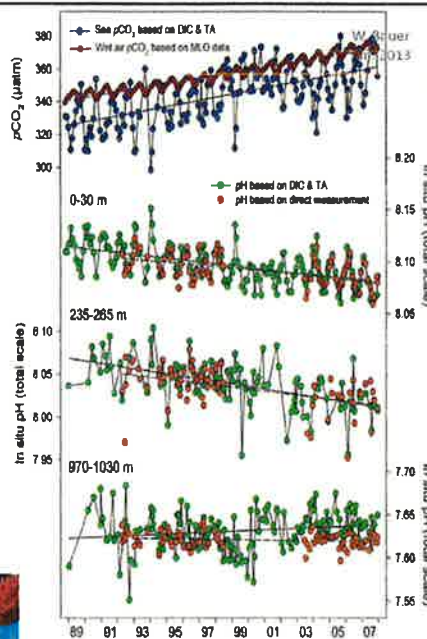
Predictions(3): Ocean Acidification

- ~10 billion tons/year of CO₂ absorbed in oceans
- Changes pH value!



"Ocean Acidification: A National Strategy to Meet the Challenges of a Changing Ocean", NRC Report

http://www.nap.edu/catalog.php?record_id=12904



Dore, J.E., et al. 2009. PNAS 106(30): 12235-12240.

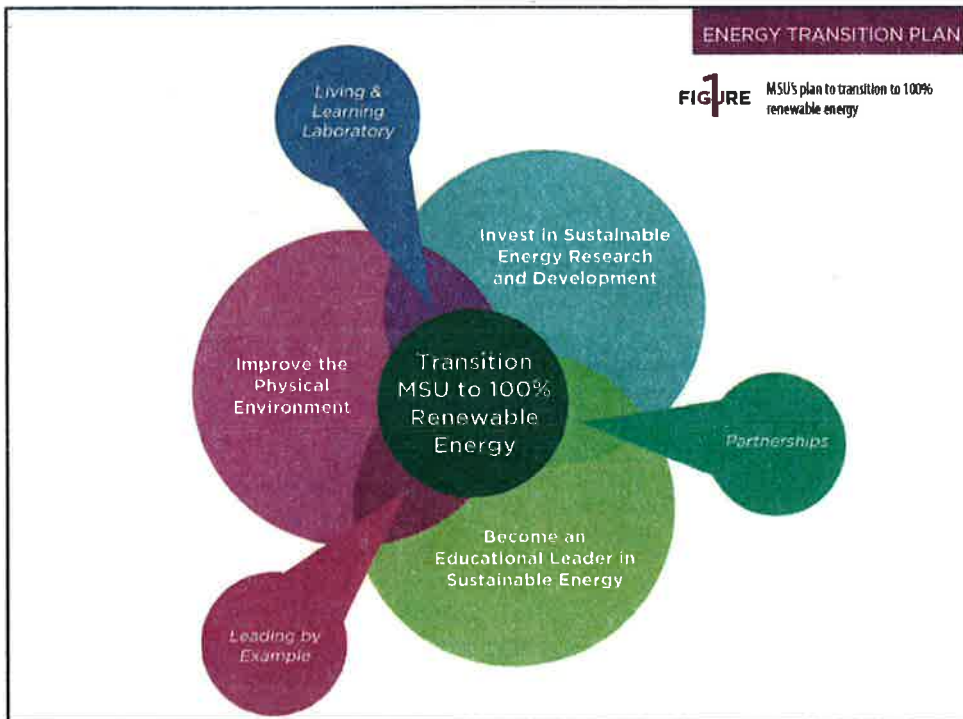
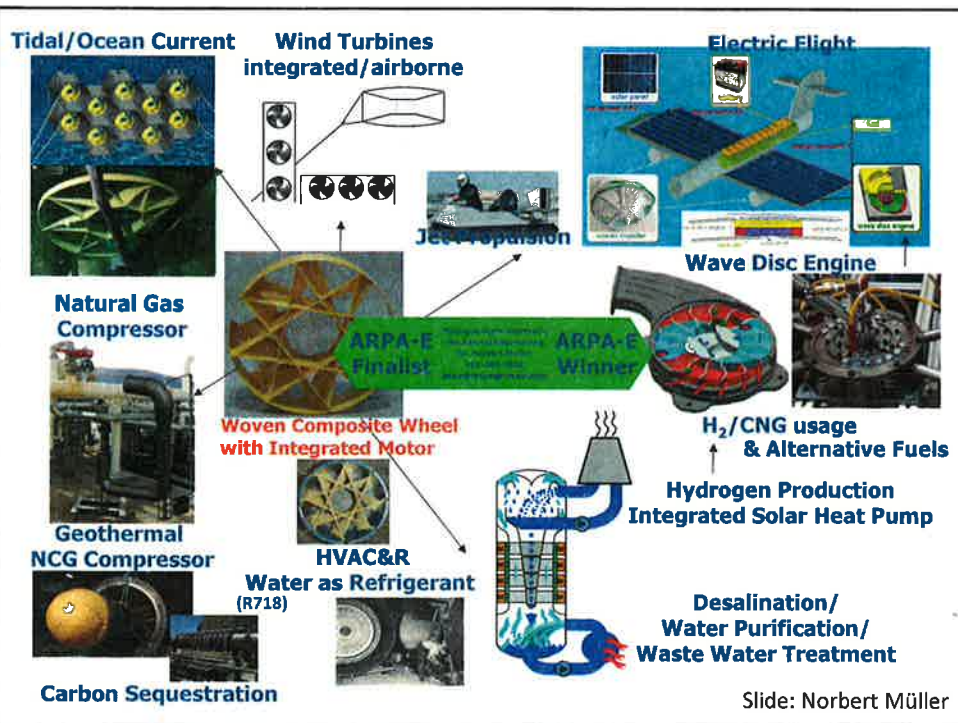


FIGURE MSU's plan to transition to 100% renewable energy

Go Green!

W. Bauer
Jan 2013

- Huge array of conservation efforts (building efficiency, thermal insulation, sensors, CFL & LED lights, tray-less cafeterias, ...) since $E = \$$ => savings
- Better fuels for power plant (lower emissions)
- Incredible research opportunities all across campus



Power from the Sun

W. Bauer
Jan. 2013

- Average solar radiation hitting any point on the ground **200 W/m²**
- Total: **100,000 TW** (> 5,000x humanity's demand)

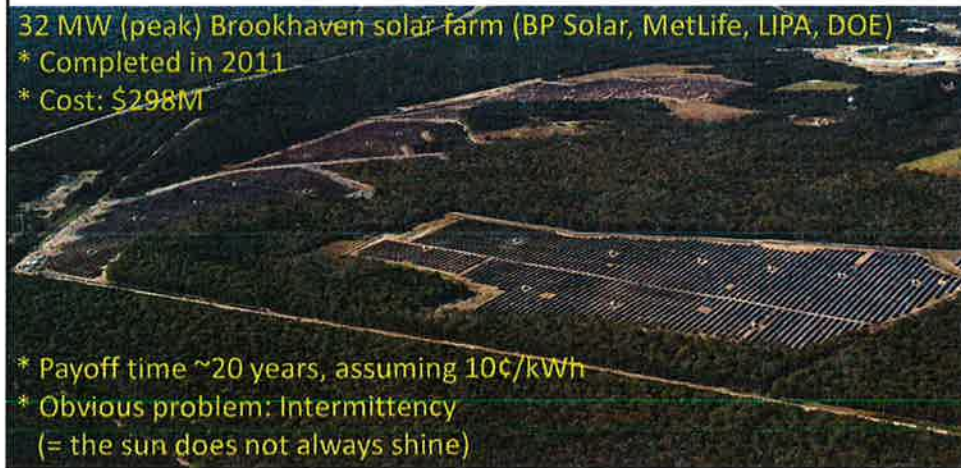
32 MW (peak) Brookhaven solar farm (BP Solar, MetLife, LIPA, DOE)

* Completed in 2011

* Cost: \$298M

* Payoff time ~20 years, assuming 10¢/kWh

* Obvious problem: Intermittency
(= the sun does not always shine)



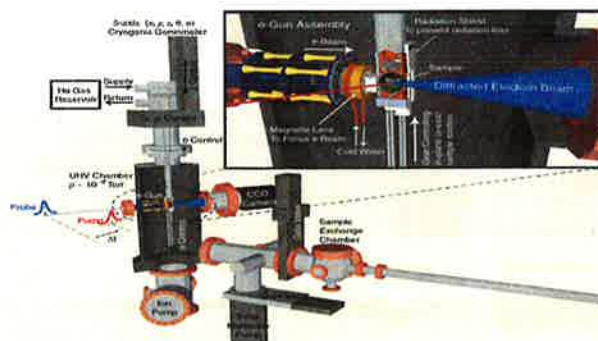
Center of Research Excellence in Complex Materials (CORE-CM)

Interdisciplinary teams to develop: Energy materials and devices; Biomaterials and devices; Forefront research equipment; Interface with FRIB/NSCL Materials Groups. Two examples:



1. Lunt: Transparent solar cells

Several other strong solar research groups at MSU: Hamann, McCusker, Zhang, Duxbury, Promislow



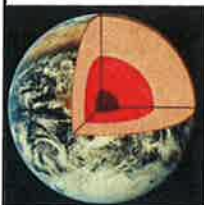
2. Ruan: Designing and building the worlds fastest camera to see molecules react and atoms hop at the femtosecond timescale and atomic lengthscales.

Other members of microscope development team: Berz, Crimp, Duxbury

Also affiliated with NSCL/FRIB materials groups

Power from the Earth

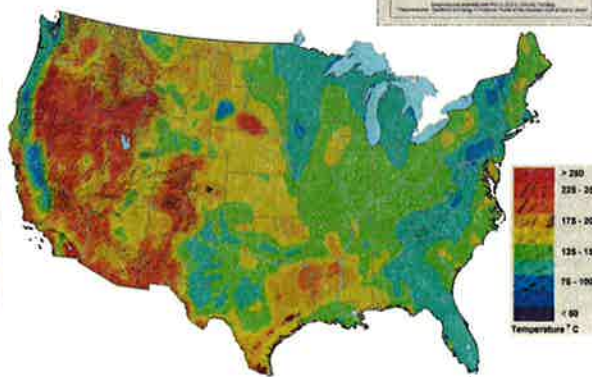
W. Bauer
Jan. 2013



Earth's thermal energy $\sim 10^{31}$ J
Heat flow density: 0.1 W/m^2
Total heat flow: 44 TW



FIGURE 18.32 Nesjavellir Geothermal Power Station in Southwest Iceland, which generates 120 MW of electrical power.



Enhanced Geothermal

W. Bauer
Jan. 2013

Enhanced Geothermal System

- 2 or more bore holes
- Hydraulic fracturing
- Cost: \sim \$20 million
- Capacity: 4 MW
- Payoff time (@10¢/kWh): 6 years
- Risks
 - Induced seismicity
 - Ground water contamination

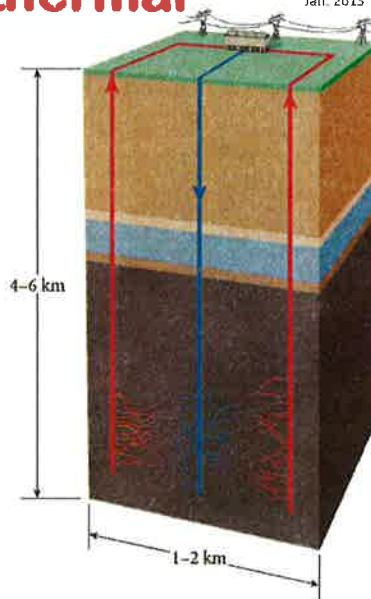


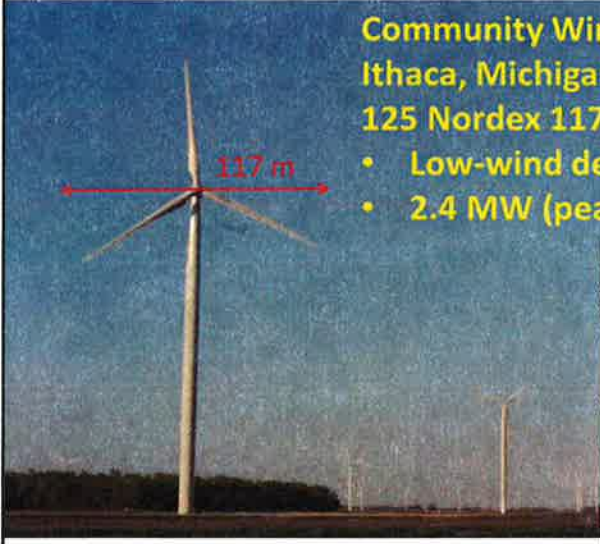
FIGURE 18.33 Diagram of an enhanced geothermal system.



GSA Topical Session, Denver 2010
Warren Wood
Wolfgang Bauer

Wind


W. Bauer
Jan. 2013

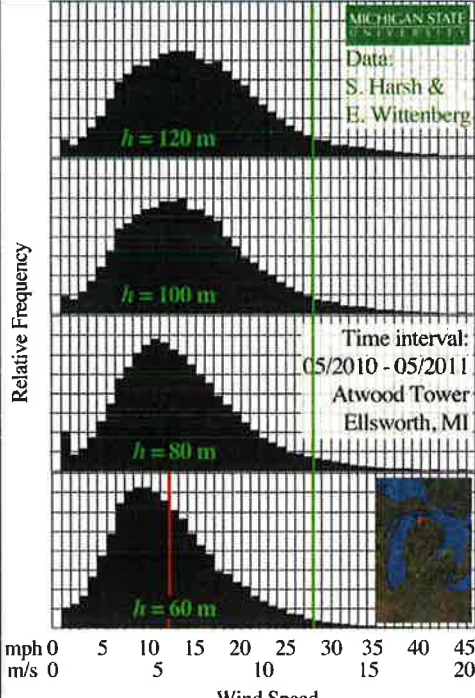


117 m

Community Wind Farm Ithaca, Michigan 125 Nordex 117 Turbines

- Low-wind design
- 2.4 MW (peak)





h = 120 m

h = 100 m

h = 80 m

h = 60 m

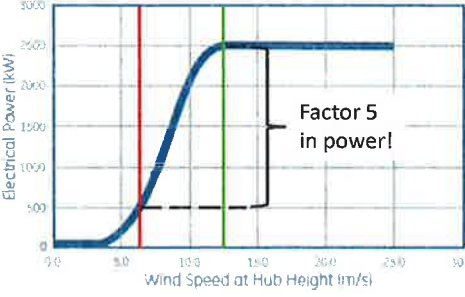
Data:
S. Harsh &
E. Wittenberg

Time interval:
05/2010 - 05/2011
Atwood Tower
Ellsworth, MI

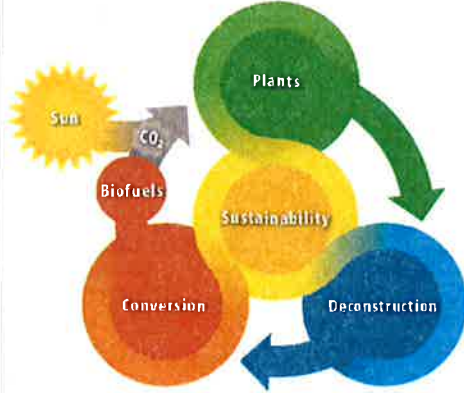
Wind Speed

W. Bauer
Jan 2013

- Wind speed increases with altitude
 - More power from taller towers
- Broad distribution
 - Intermittency



Great Lakes Bioenergy Mission

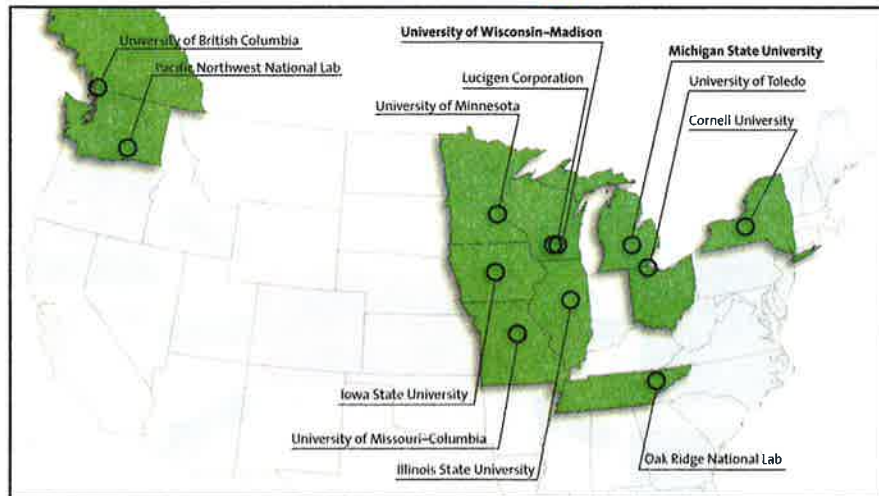


Perform the basic research that generates technology to convert cellulosic biomass to ethanol and advanced biofuels

(GLBRC Roadmap, 2008)

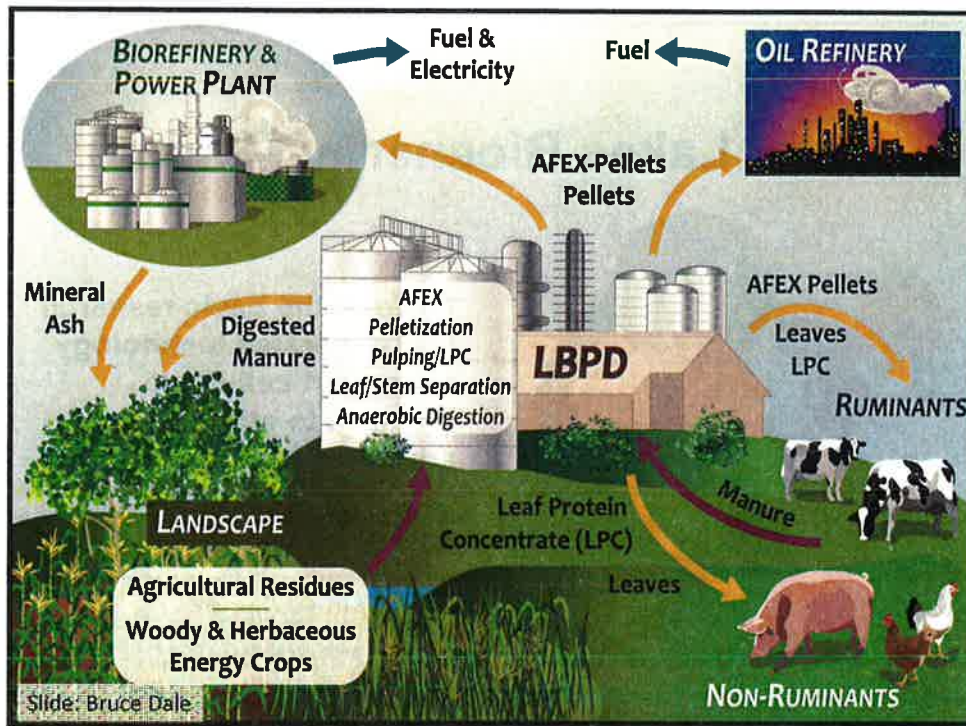
Slide: Ken Keegstra

Great Lakes Bioenergy Partners



✦ International team from Universities, National Labs & Private Sector

Slide: Ken Keegstra

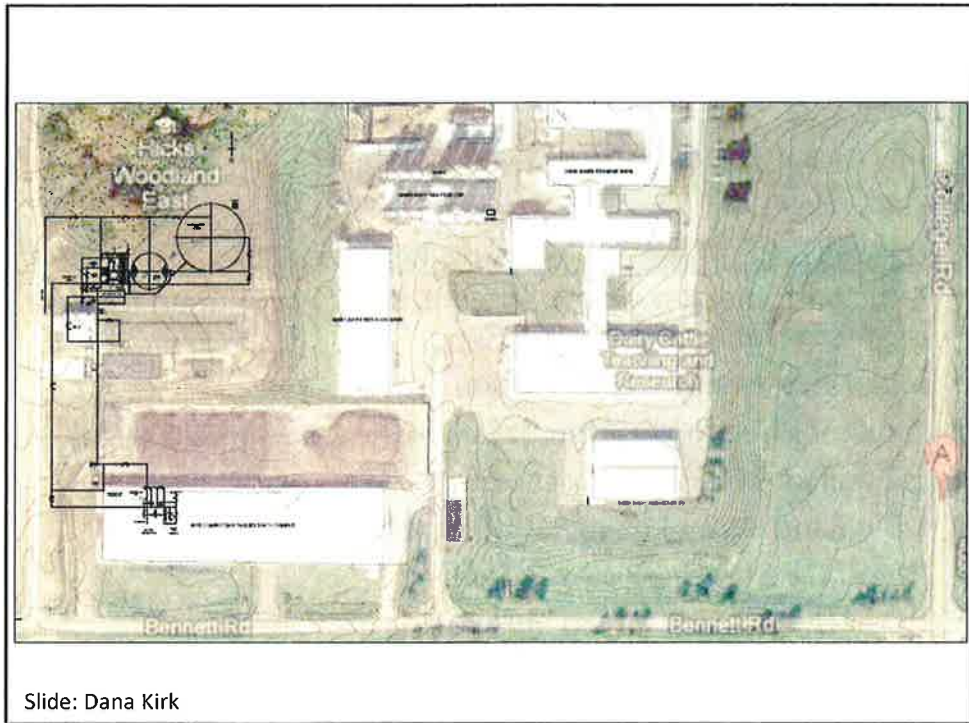


MSU Anaerobic Digester

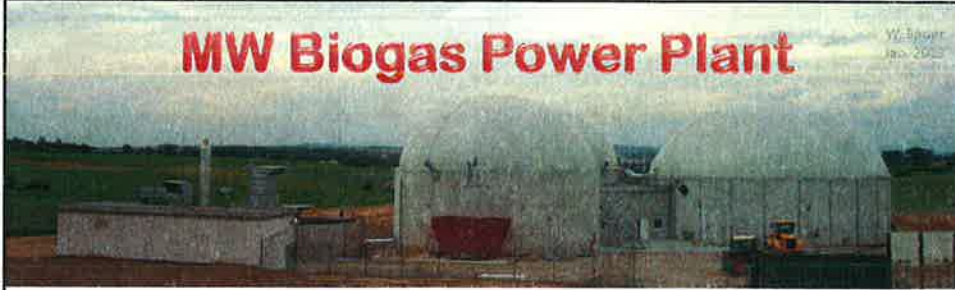
W. Bauer
Jan. 2013

- Approved by MSU Board of Trustees, Jan. 2012
- Research on better bacteria, plants, & processes

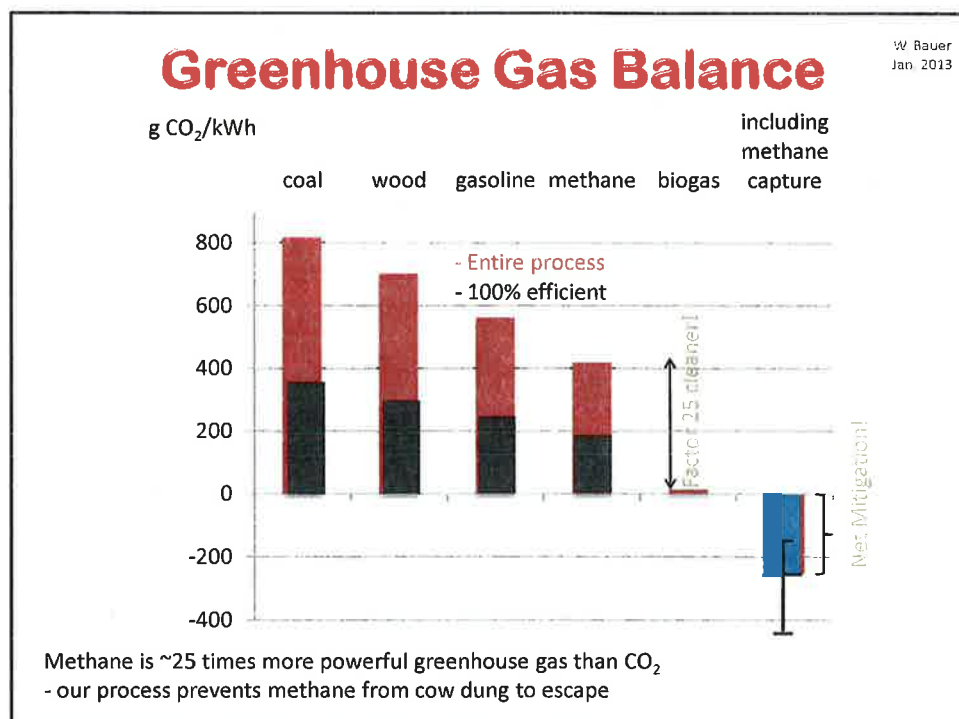
Anaerobic Digester



MW Biogas Power Plant



- Basic principle: grow corn, shred it, store in silo, then ferment in an anaerobic digester
- Initial investment: ~ \$3-5 million
- Land required to grow biomass: 150 hectares (= 370 acres)
- 6.2 million kWh of electrical energy/year
- 6.5 million kWh of co-generated thermal energy
- Payoff time (@10¢/kWh): 3-5 years
- **NO INTERMITTENCY** (can buffer wind/sun energy production with leverage factor 3-10)



The Future

W. Bauer
Jan. 2013

- Research (ANR, CNS, ENG, KBS) on better biogas power plant
 - Evolving microbes
 - Improving energy crops
 - Engineering processes
 - Smoothing wind intermittency
- **Ultimate Goal:** MSU provides turnkey solution for a ~500 acre farm in Michigan to become a biogas power plant
 - 1,000 farms ~ \$5 billion economy impact for Michigan

Summary

W. Bauer
Jan. 2013

Biggest Opportunity of our Time:

- Replace ~ 14 TW of fossil fuel-based power
- Installation cost ~ \$5/W
- ~\$70 trillion economic growth opportunity!

... and it helps the planet!

The collage contains several key elements:

- Top Left:** A photograph of a volcanic eruption with a large plume of smoke.
- Middle Left:** A line graph titled 'Energy Production and Consumption' showing trends from 1980 to 2000. The y-axis is in '1000 TeraWatt Hours'.
- Bottom Left:** A line graph titled 'Yearly average global temperature' showing a steady increase from 1880 to 2000. The y-axis ranges from 13.4 to 14.6. A horizontal line represents the '20th century average'.
- Bottom Left (Map):** A map of the United States with various locations marked, titled 'Costs for you'.
- Center:** A small image of the Earth from space.
- Right Side:** A vertical stack of four images: a power plant with smokestacks, a landscape with wind turbines, a close-up of a turbine, and another view of a power plant.

INVESTMENT POLICY

Policy Number: 01-07-01

Updated⁽¹⁾: (1/26/79; 4/15/83; 6/8/84; 2/6/87; 10/14/88; 12/6/91; 9/22/00; 6/5/03; 5/7/04; 11/12/04, 5/15/07, 12/5/08, 4/24/09, 4/16/10, 9/17/10, 12/10/10, 10/21/11, ~~12/14/12~~, 1/25/13)

I. General Statement

As stated in the Constitution of the State of Michigan and in the Bylaws of the Board of Trustees of Michigan State University (Board), the Board is responsible for the “control and direction of all expenditures from the institution’s funds.” In carrying out this responsibility with respect to the University’s investments, the Board has established a framework for active, professional investment management. This policy states the responsibilities of the parties involved in carrying out the investment program.

The Board will establish an investment program for the investment of University funds for maximum return with an acceptable degree of risk. Within the context of its fiduciary responsibilities, the Board will exhibit social conscience in the administration of the University’s investment portfolio.

All institutional funds available for long-term investment (generally at least five years), with the exception of funds restricted by law or by special donor limitations, will be consolidated into the Board’s Common Investment Fund (CIF). (See Exhibit A for the CIF Statement of Investment Objectives.) All institutional cash, with the exception of cash restricted by external agreements or by special donor limitations, will be consolidated into the Board’s Pooled Cash Fund for investment purposes. The Pooled Cash Fund shall consist of i) the Liquidity Pool (short and intermediate-term commercially available funds) and ii) the Liquidity Reserve Pool. (See Exhibit B for the Pooled Cash Fund Statement of Investment Objectives.)

II. Nature of Assets

Three distinct types of assets are covered by this policy:

1. Institutional Funds - Assets owned and held for long-term investment by the University, such as employee retirement funds and endowment funds, which include endowment trusts and funds functioning as endowments.
2. Annuity and Life Income Funds - Assets held for permanent investment by the University as trustee for the benefit of named beneficiaries, to revert to the University upon the demise of the last beneficiary or after a specified period of time, which should be invested to produce annual returns at least equal to contractually required payments to beneficiaries.
3. Institutional Cash – Cash being pooled and invested pending its intended use.

⁽¹⁾Revision dates for exhibits are shown on the exhibits.

III. Role of Board of Trustees

The Board:

1. Shall exercise its investment responsibilities through its Finance Committee;
2. Shall, upon the recommendation of the Finance Committee, establish investment policies relating to the administration of its investment portfolio;
3. Shall, upon the recommendation of the Finance Committee, establish investment objectives;
4. Shall, upon the recommendation of the Finance Committee, appoint an investment consultant, investment managers and investment custodians for the Institutional Funds; and
5. Shall receive periodic reports on investment results through the Finance Committee.

IV. Role of Finance Committee

The Finance Committee:

1. Shall, in consultation with the Investment Advisory Subcommittee, make recommendations about policies relating to the administration of the University's investment portfolio to the Board;
2. Shall, in consultation with the Investment Advisory Subcommittee, recommend to the Board an investment consultant, investment managers and investment custodians for the Institutional Funds;
3. Shall receive periodic reports on the investment status of the portfolios and shall transmit relevant information from such reports to the Board; and
4. Shall consider other investment-related matters.

V. Role of the Chairperson of the Finance Committee

1. The Chairperson of the Finance Committee is authorized to appoint ~~certain~~ investment managers when recommended by the Vice President for Finance ~~and Operations and~~ Treasurer (VPFT~~0~~), in consultation with the investment consultant, when Board action on such new manager appointments at a regularly scheduled Board meeting is not feasible due to the timing of the investment opportunity; *provided that* (a~~1~~) the ~~VPF0~~VPFT shall notify the Board and members of the Investment Advisory Subcommittee of each proposed new manager appointment by fax or email at least one week prior to action on the proposed appointment by the Chairperson of the Finance Committee; (b~~2~~) the Chairperson of the Finance Committee shall not act on the proposed new manager appointment if within forty-eight hours of the notification, at least three Trustees request a special Board meeting on the proposed appointment; (c~~3~~) the Chairperson of the Finance Committee shall consult with available members of the

Investment Advisory Subcommittee prior to making any new manager appointment pursuant to this Section V; and (d4) amounts committed in connection with new manager appointments by the Chairperson of the Finance Committee (a) shall be within the targeted asset allocation range specified in the CIF Statement of Investment Objectives, and (b) shall not exceed (i) \$15 million per new investment manager and (ii) a total of \$100 million per calendar year; and (5) the VPFOVPFT shall document compliance with each of the conditions of this Section V before implementing the appointment. Any new investment manager appointments by the Chairperson of the Finance Committee pursuant to this Section V shall be reported to the Board and members of the Investment Advisory Subcommittee.

2. In connection with the appointment of an investment manager under this Section V, the Chairperson of the Finance Committee is authorized to approve University administration implementing the appointment through the formation of an entity that will function as an investment vehicle through which University funds may be committed to the newly appointed investment manager; provided that (a) the proposed investment vehicle entity and proposed equity holders of such entity are included in the notice provided under subsection 1 of this Section V, (b) the Chairperson of the Finance Committee shall not authorize the proposed investment vehicle entity if within forty-eight hours of the notification, at least three Trustees request a special Board meeting on the proposed entity; and (c) the Chairperson of the Finance Committee shall consult with available members of the Investment Advisory Subcommittee prior to authorizing any new investment vehicle entity pursuant to this Section V.
3. The amount of University funds committed under this Section V in connection with new manager appointments by the Chairperson of the Finance Committee shall not exceed:
 - a. \$15 million per new investment manager, or
 - b. an aggregate amount of \$100 million per calendar year.
4. The VPFT shall document compliance with each of the conditions of this Section V before implementing the appointment of a new investment manager or the creation of an investment vehicle entity.
- 4.5. Any new investment manager appointment by the Chairperson of the Finance Committee and any new joint investment vehicle created in connection with such appointment pursuant to this Section V shall be reported to the Board and members of the Investment Advisory Subcommittee.

VI. Role of the Investment Advisory Subcommittee

The Investment Advisory Subcommittee:

1. Shall advise the Finance Committee in the review and evaluation of investment opportunities and strategies;
2. Shall provide knowledgeable, objective and independent advice to the members of the Finance Committee and University administration on strategic investment

planning and policy, investment opportunities, and such other matters as shall be determined by the Board;

3. Shall review policies relating to the administration of the University's investment portfolio and, when appropriate, shall advise the Finance Committee about such policies;
4. Shall, in consultation with the investment consultant, the investment managers and the University administration, annually review the performance and investment objectives of the portfolio of Institutional Funds investments;
5. Shall, in consultation with the University administration, semiannually review the performance and investment objectives of the Pooled Cash Fund;
6. Shall, in consultation with the University administration, advise the Finance Committee concerning the investment consultant, investment managers and investment custodians for the Institutional Funds; and
7. Shall usually meet with the investment consultant quarterly, but in no case less frequently than three times a year, and shall periodically evaluate the performance of the investment managers, in consultation with the University administration and the investment consultant.

VII. Role of the Investment Consultant

The investment consultant:

1. Shall annually develop and communicate to the Finance Committee, through its meetings with the Investment Advisory Subcommittee, an appropriate strategy to meet the Board's long-term investment objectives for the Institutional Funds;
2. Shall usually meet with the Investment Advisory Subcommittee quarterly, but in no case less frequently than three times a year, and with the Finance Committee as needed;
3. Shall advise the Finance Committee, through its meetings with the Investment Advisory Subcommittee, regarding searches for investment managers and investment custodians;
4. Shall provide a monitoring and measurement program that will permit evaluation of the performance of the CIF portfolio, asset classes within the portfolio and investment managers in comparison with applicable investment market benchmarks and with other managers;
5. Shall provide a monitoring and measurement program that will permit evaluation of the performance of the Liquidity Reserve Pool and investment managers in comparison with applicable investment market benchmarks and with other managers;
6. Shall provide a monitoring and measurement program that will permit evaluation of the performance of the Liquidity Pool and investment managers in comparison with applicable investment market benchmarks and with other managers; and

7. Shall provide such other information pertaining to the Board's investment program as may reasonably be required and shall report immediately to the Board any major change in its confidence regarding the securities markets.

VIII. Role of the Investment Managers

Each investment manager:

1. Shall report at least quarterly to the University administration on performance and other appropriate matters;
2. Is authorized to execute investment transactions within its established guidelines, subject to any restrictions established by the Board;
3. Shall provide other necessary information for the development of interim reports and shall meet, as necessary, with the Finance Committee, the Investment Advisory Subcommittee and the ~~VPPF~~VPFT; and
4. Shall vote all proxies in a manner most likely to preserve or enhance the value of the underlying investments and normally to support management on routine matters.

IX. Role of the Investment Custodians

Each investment custodian:

1. Shall hold all securities in an agreed-upon nominee name and form;
2. Shall execute all transactions as directed by the relevant investment manager;
3. Shall collect all income pertaining to the securities held, and shall temporarily invest such income in cash equivalents;
4. Shall periodically remit accumulated income to the University, for credit to the appropriate funds or trusts, pursuant to instructions received from the University administration;
5. Shall provide the University with a full monthly accounting of all transactions, together with a listing of all holdings at cost and market; and
6. Shall provide such other information as may reasonably be required.

X. Role of the University Administration

The University administration through the ~~VPPF~~VPFT:

1. Shall continuously monitor and review the investment consultant's reports, the actions of the investment managers and the status of the University's investment portfolios;

2. Shall serve as a liaison for communication among the Board, the Finance Committee, the Investment Advisory Subcommittee, the investment consultant and the investment managers;
3. Shall maintain communications, as appropriate, among the Board, the Finance Committee, the Investment Advisory Subcommittee, the investment consultant and the investment managers;
4. Shall make recommendations to the Finance Committee, in consultation with the Investment Advisory Subcommittee, concerning investment policies, structure, objectives and selection of investment managers;
5. Shall rebalance the portfolio, generally on a quarterly basis, in order to stay within the asset allocation parameters established by the Board and to maintain proper diversification among individual investment managers, (a) by reallocating funds among accounts or investment vehicles managed by investment managers already approved by the Board or by the Chairperson of the Finance Committee pursuant to Section V of this policy, or (b) by managing net cash flows into and out of the CIF by adding to underweight positions or withdrawing from overweight positions;
6. Shall report all rebalancing transactions and all new financial commitments to private investments completed during the quarter to the Finance Committee and Investment Advisory Subcommittee, and shall provide quarterly reports to the Finance Committee and Investment Advisory Subcommittee showing potential rebalancing transactions that are likely to occur over the ensuing quarter;
7. Shall have the authority to allocate funds to investment managers already approved by the Board or by the Chairperson of the Finance Committee through use of a joint investment vehicle entity, such as a limited liability company, and shall have the authority to take all actions and execute all documents in connection with the formation, management, operation and dissolution of any such joint investment vehicle entity.
- 7.8. Shall report monthly to the Board and the Investment Advisory Subcommittee any market value decline in excess of both 10 percent and \$500,000 in the value of the CIF, of the Liquidity Reserve Pool, of the Liquidity Pool or of Institutional Funds that are separately invested due to donor limitations;
- 8.9. Shall report quarterly to the Board and the Investment Advisory Subcommittee any market value decline in excess of both 10 percent and \$500,000 in the value of the University's investment with an investment manager; and
- 9.10. Shall have the authority to appoint, or may act in the role of, the investment managers and investment custodians for the Pooled Cash Fund and shall report any such appointments to the Finance Committee, the Investment Advisory Subcommittee and the Board.

XI. Endowment Spending

1. In fulfillment of its fiduciary duties as trustee of the University's endowment and other Institutional Funds, the Board causes those Funds to be invested to generate amounts that may be expended for the purposes for which those Funds were established ("programmatic spending") and amounts that may be accumulated for reinvestment to preserve the value of those Funds, and their purchasing power, against inflation. These are the priorities for the use of the University's endowment and other Institutional Funds. The Board may also permit reasonable and appropriate costs to be charged to the endowment and other Institutional Funds. These charges may include reasonable and appropriate costs of administering and managing the Institutional Funds, such as reasonable and appropriate internal and external investment costs and, for certain Institutional Funds, fund-raising costs. Additional returns, if any, generated by the investment of the Institutional Funds may be used to add real principal growth to such Funds, to better preserve their long-term value, to improve and further diversify the investment options for such Funds, and, thus, to enhance opportunities to stabilize and increase annual expenditure rates for such Funds.
2. In accordance with these precepts:
 - (a)(i) The University will make available for programmatic spending 5.0 percent of the average market value of the CIF as calculated for the 20 quarters of the five calendar years prior to the beginning of the fiscal year in which the spending is expected to occur, expressed as a dollar per unit annual distribution amount based on the number of units in the CIF at the time of the calculation. Programmatic spending distributions will be made to CIF unit holders on a periodic basis during the fiscal year based on the number of units in the CIF held when each periodic programmatic spending distribution is made.¹ The ~~VPF~~VPFT will determine when the periodic programmatic spending distributions will occur.
 - (ii) This programmatic spending rate shall be reviewed annually by the Finance Committee, in consultation with the Investment Advisory Subcommittee. In connection with each of these reviews, the University's investment staff shall present an analysis of the projected impact of inflation on the University's endowment and other Institutional Funds, including how inflation is expected to affect their purchasing power (i.e., the expenditures of amounts for the purposes for which those funds were established).
- b. Reasonable and appropriate internal and external investment costs for the CIF, including the costs of the investment consultant, the investment managers and the investment custodians and the University's own investment management costs (staff and support), shall be deducted in determining the average market value of the CIF available for programmatic spending pursuant to Section XI (2)(a)(i) of this policy.

¹ The per unit annual distribution amount will be allocated evenly over the periodic programmatic spending distributions during the fiscal year. The amount of the periodic programmatic spending distributions will not be reduced if the number of units in the CIF increases between when the per unit annual distribution amount is calculated and when the periodic programmatic spending distributions occur.

c. The President and the ~~VPFT~~~~VPFO~~ are authorized to ~~establish~~~~make~~ annual assessments for endowment stewardship, including fund raising, against those of the University's endowment and other Institutional Funds established entirely or primarily with private donations. The amount of the assessments must be reasonable and appropriate, particularly when considered in the context of the University's priorities for the use of its endowment and other Institutional Funds. In any event, the amount assessed may not, without further Board action, exceed 1 percent of the average market value of the CIF units held by such Funds. The calculation of the amount assessed and its allocation to the Funds subject to assessment shall be conceptually consistent with the methodology by which programmatic spending distributions are calculated and allocated under Section XI (2)(a)(i) of this policy. Assessments will be made periodically during the fiscal year, as determined by the ~~VPFO~~~~VPFT~~. Not less than 30 days prior to the annual review of the programmatic spending rate pursuant to Section (2)(a)(ii) of this policy, the President and the ~~VPFO~~~~VPFT~~ shall provide a written report to the Finance Committee and other members of the Board stating the amount, if any, of the assessment for the following fiscal year and how it was determined.

3. If the University has accepted a gift to an endowment fund documented by a gift instrument in which the donor gives legally binding instructions for the investment of, or expenditures from, that fund which are inconsistent with the foregoing, the University will comply with those special instructions. The ~~VPFO~~~~VPFT~~ shall calculate the annual programmatic spending distribution and assessment for each endowment fund which is not invested in the CIF in accordance with applicable law and report the programmatic spending rate and assessment amount for each such fund to the Finance Committee. Insofar as possible, given each such fund's investments and the instructions of its donor, the priorities for the use of such funds should be the same as those for endowment funds invested in the CIF.

Appendix C

RESOLUTION OF THE BOARD OF TRUSTEES
OF MICHIGAN STATE UNIVERSITY
AUTHORIZING THE ISSUANCE AND DELIVERY OF
GENERAL REVENUE BONDS
AND PROVIDING FOR OTHER MATTERS RELATING THERETO

WHEREAS, the Board of Trustees of Michigan State University (the “Board”) is a body corporate created by and existing under the Constitution of the State of Michigan with full constitutional authority over and general supervision of Michigan State University (the “University”) and control and direction of all expenditures from the University’s funds; and

WHEREAS, the Board has previously issued in several outstanding series its General Revenue Bonds (the “Prior Bonds”), its Commercial Paper Notes, Series B (Taxable) and Series D (Tax-Exempt) (the “Notes”), and certain other obligations, in each case payable from and secured by a lien on General Revenues (hereinafter defined) (collectively, the “Outstanding Obligations”); and

WHEREAS, the Board has previously entered into certain interest rate swap agreements related to the debt service on certain of the Outstanding Obligations, payable from and secured by a lien on General Revenues (collectively, the “Existing Swap Agreements”); and

WHEREAS, the Board has determined it may be appropriate and in the best interests of the University to refund all or a portion of the Prior Bonds and all or a portion of the Notes as shall be determined by the Authorized Officers (hereinafter defined) (the portion of the Prior Bonds to be refunded being herein called the “Bonds to be Refunded,” and the portion of the Notes to be refunded being herein called the “Notes to be Refunded”); and

WHEREAS, the Board has determined that financing capital projects of the University with the proceeds of tax-exempt or taxable debt, or both, will enhance the flexibility of the University with respect to its budget and financial resources, and will permit the allocation of the costs of the capital projects to the periods of the useful lives of the projects being acquired; and

WHEREAS, the University’s current high credit ratings not only reflect the financial strength of the University and its ability to repay its debt obligations, but will also permit the University to access the public debt markets in the most efficient and economic manner; and

WHEREAS, the Board has therefore determined it is appropriate and in the best interests of the University to finance all or a portion of certain capital expenditures of or for the benefit of the University, as described on Exhibit A attached hereto (collectively, the “Projects”), with the proceeds of the General Revenue debt authorized hereby; and

WHEREAS, in the exercise of its constitutional duties, and in order prudently to control and direct expenditures from the University’s funds, the Board has determined it is necessary and desirable to authorize the issuance and delivery of additional General Revenue Bonds (the “Bonds”) payable from and secured by a pledge of General Revenues in order to provide funds which, together with other available funds of the University, will be used to fund all or part of the costs of the Projects, to pay all or part of the costs of refunding the Bonds to be Refunded and

the Notes to be Refunded, if any, and to pay costs related to the issuance of the Bonds and the refunding; and

WHEREAS, one or more trust agreements (collectively, the "Trust Agreement") or loan agreements (collectively, the "Loan Agreement") must be entered into by and between the Board and a trustee (the "Trustee") or a direct placement lender, in either case to be designated by an Authorized Officer, pursuant to which the Bonds will be issued and secured; and

WHEREAS, it is necessary to authorize the Authorized Officers to negotiate the sale of the Bonds with an underwriter or group of underwriters selected by an Authorized Officer (collectively, the "Underwriter") or with a direct placement lender to be selected by an Authorized Officer (the "Purchaser"), and to enter into one or more bond purchase agreements with the Underwriter or Purchaser (collectively, the "Bond Purchase Agreement") setting forth the terms and conditions upon which the Underwriter or Purchaser will agree to purchase the Bonds and the interest rates thereof and the purchase price therefor, or, in the alternative, to select the Underwriter for all or any portion of any series of the Bonds and to establish the terms for such Bonds through a competitive sale or bidding process pursuant to a Notice of Sale; and

WHEREAS, in order to be able to market the Bonds at the most opportune time, and in accordance with the Board's Capital Projects Debt Policy, it is appropriate for the Board to ratify and confirm its authorization of the President, Vice President for Finance and Treasurer and the Director of Investments and Financial Management (each an "Authorized Officer") or any of them individually, to negotiate, execute and deliver on behalf of the Board, the Trust Agreement or Loan Agreement, the Bond Purchase Agreement, one or more remarketing agreements with the Underwriter or other parties (collectively, the "Remarketing Agreement"), and other related documents, to publish any Notice of Sale required for the sale of any portion of the Bonds, to establish the specific terms of the Bonds and to accept the offer of the Underwriter or Purchaser to purchase the Bonds, all within the limitations set forth herein; and

WHEREAS, the indentures and other documents authorizing the Outstanding Obligations create certain conditions for the issuance obligations payable from and secured by a pledge of General Revenues on a parity basis with the Outstanding Obligations; and

WHEREAS, the Vice President for Finance and Treasurer shall, on or prior to the delivery of the Bonds, certify that the conditions for issuing the Bonds, secured on a parity basis by General Revenues with the Outstanding Obligations, have been met; and

WHEREAS, the acquisition, equipping and construction of the Projects, the refunding of the Bonds to be Refunded and the Notes to be Refunded, and the funding of all or a part of the costs thereof with the proceeds of the Bonds, will serve proper and appropriate public purposes; and

WHEREAS, the Board has full power under its constitutional authority and supervision of the University, and control and direction of expenditures from the University's funds, to acquire, equip and construct the Projects, to refund the Bonds to be Refunded and the Notes to be Refunded and to pay all or a part of the costs of the Projects and the costs of the refunding by issuance of the Bonds, and to support payment of the Bonds by a pledge of General Revenues.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF TRUSTEES OF MICHIGAN STATE UNIVERSITY, AS FOLLOWS:

1. The Board hereby approves the definition of the term "Projects" as set forth on Exhibit A attached hereto, and, subject to final approval of the Board in the case of any of the Projects listed in Category I-B or Category II on Exhibit A, for which final approval has not yet been received, authorizes the Authorized Officers, or any of them, to select the portion of the Projects to be financed, in whole or in part, from the proceeds of the Bonds, and to fund, as appropriate, the remaining portion of the costs of the Projects from available funds of the University, consistent with the Board's resolutions authorizing construction of the Projects. The Board further approves the refunding of the Bonds to be Refunded and the Notes to be Refunded and authorizes the Authorized Officers, or any of them, to select the portion, if any, of the Prior Bonds to constitute the Bonds to be Refunded and the portion, if any, of the Notes to constitute the Notes to be Refunded, in order to produce interest or other cost savings or a more favorable debt service structure, to reduce or eliminate risks associated with variable rate bonds and related interest rate swaps, to provide for more favorable terms or covenants, or to provide for permanent financing of projects previously financed from short-term debt, and to fund, if deemed appropriate, a portion of the costs of the refunding from available funds of the University and the balance of such costs from the proceeds of the Bonds, and to proceed with the refunding.

In connection with the refunding of all or any portions of any Outstanding Obligations, an Authorized Officer may, in the name and on behalf of the Board, and as its corporate act and deed, modify any Existing Swap Agreements, in whole or in part, and relate any of such Existing Swap Agreements to any portion of the debt service on the Bonds or any Outstanding Obligations, or terminate any Existing Swap Agreements, in whole or in part, and any fees or termination payments required in connection with any such modifications or terminations may be paid from the proceeds of the Bonds, or from available funds of the University.

2. The Board hereby authorizes the issuance, execution and delivery of the Bonds in one or more series to be designated GENERAL REVENUE BONDS, with appropriate series designations, in the aggregate original principal amount established by an Authorized Officer, but not to exceed the principal amount necessary to produce proceeds of One Hundred Thirteen Million Dollars (\$113,000,000), plus the amount necessary to accomplish the refunding of the Bonds to be Refunded and the Notes to be Refunded and to pay costs related thereto. The Bonds shall be dated as of the date or dates established by an Authorized Officer, and shall be issued for the purpose of providing funds which, together with other available funds, will be used to pay all or a portion of the costs of the Projects, including, if determined to be appropriate by an Authorized Officer, capitalized interest related to all or a portion of the Projects for a period specified by an Authorized Officer, to pay all or a portion of the costs of refunding the Bonds to be Refunded, if any, and the Notes to be Refunded, if any, to pay the costs of modifying or terminating any Existing Swap Agreements, if deemed appropriate by an Authorized Officer, and to pay costs related to the issuance of the Bonds and the refunding, including the costs of bond insurance premiums, if any Authorized Officer determines such insurance to be appropriate. The Bonds shall be serial bonds or term bonds which may be subject to redemption requirements, or both, as shall be established by an Authorized Officer, but the first maturity shall be no earlier than July 1, 2013 and the last maturity shall be no later than December 31, 2053. The Bonds may bear interest at stated fixed rates for the respective maturities thereof as shall be established

by an Authorized Officer, but the weighted average yield of the Bonds (computed using the stated coupon and the stated original offering price) shall not exceed 5.5% per annum for tax-exempt bonds and 8.0% per annum for taxable bonds. Alternatively, all or part of the Bonds may bear interest at a variable rate of interest, determined on the basis of an index or through market procedures, or both, for all or a portion of their term, and the variable rate of interest shall not exceed the lesser of 25% per annum, the maximum rate permitted by law or the maximum rate, if any, specified in the Trust Agreement or Loan Agreement. The Bonds may be subject to redemption or call for purchase prior to maturity at the times and prices and in the manner as shall be established by an Authorized Officer, but no redemption premium shall exceed 3% of the principal amount being redeemed, unless the redemption price is based on a "make whole" formula, in which case no redemption premium shall exceed 40% of the principal amount being redeemed. Interest on the Bonds shall be payable at such times as shall be specified by an Authorized Officer. The Bonds shall be issued in fully registered form in denominations, shall be payable as to principal and interest in the manner, shall be subject to transfer and exchange, and shall be executed and authenticated, all as shall be provided in the Trust Agreement or Loan Agreement. The Bonds shall be sold to the Underwriter or Purchaser for a price to be established by an Authorized Officer (but the Underwriter's or Purchaser's discount, exclusive of original issue discount, shall not exceed 2.00% of the principal amount thereof) plus accrued interest, if any, from the dated date of the Bonds to the date of delivery thereof.

In relation to the debt service on all or any portion of the Bonds, or in relation to the debt service on all or any portion of the Outstanding Obligations, an Authorized Officer may, at any time, on behalf of and as the act of the Board, enter into or modify an interest rate swap, cap, forward starting swap, option, swaption, rate lock or similar agreement or agreements (collectively, the "Swap Agreement") with a counterparty or counterparties to be selected by the Authorized Officer. Such Swap Agreement shall provide for payments between the Board and the counterparty related to interest on all or a portion of the Bonds or any series of Outstanding Obligations, at indexed or market established rates. If the Swap Agreement is entered into at approximately the same time as the issuance of the Bonds and is related to the Bonds, the expected effective interest rates on the Bonds to which the Swap Agreement relates, taking into account the effect of the Swap Agreement, shall be within the limitations set forth herein. Any Swap Agreement may, if determined necessary or appropriate by an Authorized Officer, be subsequently terminated, in whole or in part, which may result in termination payments due by the Board. Any such required payments and other costs of termination may be funded from available funds of the University or the proceeds of the Bonds or other indebtedness of the Board.

Any or all of the Bonds may be made subject to tender for purchase at the option of the holder thereof or to mandatory tender for purchase. The obligation of the Board to purchase any Bonds subject to tender for purchase may be limited to the remarketing proceeds of such Bonds, or may be made payable from General Revenues, from available cash reserves of the University, subject to such limitations as may be specified in the Trust Agreement or Loan Agreement, or from a letter of credit, line of credit, standby bond purchase agreement or other liquidity device (the "Liquidity Device"), or any combination thereof, all as shall be determined by an Authorized Officer and provided for in the Trust Agreement or Loan Agreement. Any reimbursement obligation for draws under the Liquidity Device shall be a limited and not a general obligation of the Board, payable from, and may be secured by a pledge of, General Revenues. Each Authorized Officer is authorized to execute and deliver at any time, for and on

behalf of the Board, any amendments to the Trust Agreement or Loan Agreement and any agreements or instruments with a party or parties selected by an Authorized Officer necessary to obtain, maintain, renew or replace, and provide for repayments under, any Liquidity Device deemed by such officer to be required for the purposes of this Resolution.

Any Bonds authorized and issued hereunder may, at any time upon direction of an Authorized Officer, be subsequently converted to another mode or structure authorized hereby, either through procedures established in the Trust Agreement or Loan Agreement pertaining thereto, or through the issuance hereunder of refunding Bonds to refund and replace the outstanding Bonds to be converted. Any such refunding Bonds issued hereunder shall be subject to the terms, conditions and limitations contained in this Resolution. Each Authorized Officer is authorized to execute and deliver, for and on behalf of the Board, any documents or instruments, including but not limited to, any amendments to the Trust Agreement or Loan Agreement, necessary or convenient for the purpose of accomplishing the conversion as described in this paragraph.

3. The Bonds, and the obligations of the Board under the Swap Agreement and the Liquidity Device, if any, shall be limited and not general obligations of the Board payable from and, except as provided below in this Section 3, secured by a lien, on the General Revenues (as shall be defined in the Trust Agreement or Loan Agreement in a manner generally consistent with the definition thereof contained in the trust agreements pursuant to which the Prior Bonds were issued). The lien on General Revenues securing the Bonds, the Swap Agreement and the Liquidity Device, if any, shall be on a parity basis with the liens on General Revenues securing the Outstanding Obligations. The Bonds, and the obligations of the Board under the Swap Agreement and the Liquidity Device, if any, may also be payable from and secured by a lien on moneys, securities or other investments from time to time on deposit in certain funds created pursuant to the Trust Agreement or Loan Agreement or the Swap Agreement or Liquidity Device.

No recourse shall be had for the payment of the principal amount of or interest or premium on the Bonds, the Swap Agreement or the Liquidity Device, or any claim based thereon, against the State of Michigan, or any member or agent of the Board (including, without limitation, any officer or employee of the University), as individuals, either directly or indirectly, or, except as specifically provided in the Trust Agreement or Loan Agreement or the instruments entered into in connection with the Swap Agreement or the Liquidity Device, if any, against the Board, nor shall the Bonds and interest with respect thereto, or any obligations of the Board in connection with the Swap Agreement or Liquidity Device, if any, become a lien on or be secured by any property, real, personal or mixed, of the State of Michigan or the Board, other than General Revenues and the moneys, securities or other investments from time to time on deposit in certain funds established as pledged pursuant to the Trust Agreement or Loan Agreement or the Swap Agreement or Liquidity Device, if any.

Any pledge of General Revenues, and funds specified in the Trust Agreement or Loan Agreement, the Swap Agreement or the Liquidity Device, if any, shall be valid and binding from the date of the issuance and delivery of the Bonds or such agreements, and all moneys or properties subject thereto which are thereafter received shall immediately be subject to the lien of the pledge without physical delivery or further act. The lien of said pledge shall be valid and binding against all parties (other than the holders of any other bonds, notes or other obligations

secured by a parity first lien on General Revenues) having a claim in tort, contract or otherwise against the Board, irrespective of whether such parties have notice of the lien.

Notwithstanding anything herein to the contrary, any obligations of the Board under the Swap Agreement or the Liquidity Device may, if determined appropriate by an Authorized Officer, be payable and secured on a subordinated basis to the Bonds and other General Revenue obligations of the Board, or may be payable from General Revenues but be unsecured.

4. The right is reserved to issue additional bonds, notes or other obligations payable from General Revenues and secured on a parity or subordinated basis with the Bonds and the Outstanding Obligations by a lien on General Revenues, upon compliance with terms and conditions therefor as shall be set forth in the Trust Agreement or Loan Agreement.

5. Each Authorized Officer is hereby authorized and directed, in the name and on behalf of the Board, and as its corporate act and deed, to select the Trustee, if any, and to negotiate the terms of and execute and deliver the Trust Agreement or Loan Agreement. The Trust Agreement or Loan Agreement may contain such covenants on behalf of the Board and terms as such officers deem appropriate and as shall be approved by the Office of the General Counsel, including, but not limited to, covenants with respect to the establishment of General Revenues at levels expressed as a percentage of debt service on the Bonds or all General Revenue obligations of the Board, and with respect to the issuance of additional bonds, notes or other obligations payable from and secured by General Revenues. In addition, each Authorized Officer is hereby authorized, empowered and directed to negotiate, if deemed appropriate by an Authorized Officer in connection with the issuance of the Bonds, for the acquisition of bond insurance and to execute and deliver an insurance commitment or other documents or instruments required in connection with such insurance.

6. Each Authorized Officer is hereby authorized and directed, in the name and on behalf of the Board and as its corporate act and deed, to select the Underwriter or Purchaser and to negotiate, execute and deliver the Bond Purchase Agreement with the Underwriter or Purchaser setting forth the terms of the Bonds and the sale thereof, in the forms as an Authorized Officer may approve upon recommendation of the Office of the General Counsel, all within the limitations set forth herein. In the alternative, if determined appropriate by an Authorized Officer, selection of the Underwriter and setting of the terms for all or any portion of any series of the Bonds may be made through a competitive sale or other bidding process, and each of the Authorized Officers is authorized to accept the winning bid or offer of the Underwriter for the purchase of the Bonds. Each Authorized Officer is hereby further authorized and directed, in the name and on behalf of the Board and as its corporate act and deed, to negotiate, execute and deliver the Remarketing Agreement with the Underwriter or other party selected by the Authorized Officer.

7. Either the President or Vice President for Finance and Treasurer is authorized, empowered and directed, in the name and on behalf of the Board, and as its corporate act and deed, to execute the Bonds by manual or facsimile signature and, if deemed appropriate, to impress or imprint the University seal thereon, and each of the Authorized Officers is authorized to deliver the Bonds to the Underwriter or Purchaser in exchange for the purchase price therefor.

8. Each Authorized Officer is hereby authorized to solicit ratings on the Bonds from any national rating services that the Authorized Officer deems appropriate and, if necessary, to

cause the preparation of a Preliminary Official Statement and an Official Statement with respect to each series of the Bonds, to deem such official statements "final" in accordance with applicable law, and to execute and deliver the Official Statement. In the event that all or a portion of any series of the Bonds is to be sold by means of a competitive sale or bidding process, as provided in this Resolution, each Authorized Officer is authorized to prepare and publish or cause to be published, or otherwise distribute, in such manner as an Authorized Officer shall determine, a Notice of Sale for such Bonds. Each Authorized Officer, the Underwriter or the University's financial advisor, as appropriate, is authorized to circulate and use, in accordance with applicable law, the Notice of Sale, the Preliminary Official Statement and the Official Statement in connection with the offering, marketing and sale of the Bonds.

9. The President, the Vice President for Finance and Treasurer, the Director of Investments and Financial Management, the Secretary of the Board, the Vice President for Legal Affairs and General Counsel and any Associate or Assistant General Counsel, and all other appropriate officers or representatives of the Board or the University and each one of them, are authorized to perform all acts and deeds and to execute and deliver for and on behalf of the Board all instruments and documents required by this resolution, the Trust Agreement or Loan Agreement, the Swap Agreement, the Liquidity Device or the Bond Purchase Agreement, or necessary, expedient and proper in connection with the issuance, sale and delivery of the Bonds, as contemplated hereby, including, if deemed appropriate, an escrow deposit agreement with an escrow agent to be selected by an Authorized Officer. Each Authorized Officer is hereby authorized to designate and empower the escrow agent to subscribe for United States Treasury Obligations, State and Local Government Series, on behalf of the Board, as may be necessary in connection with any refunding authorized hereby. Any reference to an officer of the Board or the University herein shall include any interim or acting officer appointed by the Board.

Any action required under the Trust Agreement or Loan Agreement, Bond Purchase Agreement, Remarketing Agreement, Swap Agreement or Liquidity Device or any other instrument related to the Bonds, and any action necessary or appropriate in connection with the on-going administration of the financing program authorized hereby, may be taken by and on behalf of the Board by an Authorized Officer.

10. In accordance with the requirements of Rule 15c2-12 of the United States Securities and Exchange Commission, the Board may be required in connection with the issuance of the Bonds to enter into a Disclosure Undertaking for the benefit of the holders and beneficial owners of the Bonds. Each Authorized Officer is authorized to cause to be prepared and to execute and deliver, on behalf of the Board, a Disclosure Undertaking.

11. If deemed necessary by the University's bond counsel, each of the Authorized Officers is authorized to arrange for the publication of a notice of and to conduct a public hearing with respect to the issuance of the Bonds, all in accordance with requirements of Section 147(f) of the Internal Revenue Code of 1986, as amended.

12. Any resolutions or parts of resolutions or other proceedings of the Board in conflict herewith are hereby repealed insofar as such conflict exists.

EXHIBIT A

PROJECTS

The Projects, as that term is used in the Resolution to which this Exhibit A is attached, are defined as follows:

Category I

<u>Project Description</u>	Currently Estimated Approximate Cost To be Funded From Bond Proceeds (exclusive of bond issuance expense) <u>(millions)</u>
A. (Board approved project construction/renovation)	
Armstrong and Bryan Halls renovations, remodeling, furnishing and equipping as part of Brody Complex Master Plan	\$15.7
Facility for Rare Isotope Beams - New High Bay	13.5
Facility for Rare Isotope Beams - Phase I - Site Preparation and Excavation and Building Structure	13.4
Steam Distribution - Replace Steam Tunnel from Library to IM Circle	12.9
Auditorium alterations to Fairchild Theatre	11.8
Landon Hall – Dining Renovation, Building Safety, and Accessibility	5.8
B. (Board approved project planning and design)	
Facility for Rare Isotope Beams - 25 Mega Watt Electrical Duct Bank	14.6

Category II

All projects heretofore or hereafter approved by the Board with an identified total or partial funding source as the proceeds of bonds or other debt obligations issued by the Board.

Category III

Miscellaneous building, renovation, remodeling, site improvement, equipment, utility, information system and similar capital projects of the University, each with an estimated cost of \$5,000,000 or less, including but not limited to, roof repairs and replacements; electrical, mechanical, chiller, refrigeration and steam system renovations, repairs, replacements and improvements; heating, cooling and air conditioning system renovations, repairs, replacements and improvements; structural repairs and improvements; utility distribution repairs and improvements; road and sidewalk repairs and improvements; building and building addition construction, renovation, furnishing and equipping; information and computing system acquisitions and improvements (including wiring and cabling); elevator repairs and improvements; miscellaneous landscaping and site work; and miscellaneous equipment acquisitions.

I hereby certify that the attached is a true and complete copy of a resolution adopted by the Board of Trustees of Michigan State University on January 25, 2013, in accordance with applicable law, and that the minutes of the meeting at which the resolution was adopted were kept and will be or have been made available at the Office of the Vice President and Secretary of the Board of Trustees of Michigan State University.

I further certify as follows:

1. Present at the meeting were the following Board members:

Absent from the meeting were the following Board members:

2. The following members of the Board voted for the adoption of the Resolution:

The following members of the Board voted against adoption of the Resolution:

RESOLUTION DECLARED ADOPTED.

Vice President and Secretary, Board of Trustees of
Michigan State University

Exhibit A

Policy 01.07.03 – Capital Projects Debt

Replace Vice President for Finance and Operations and Treasurer with Vice President for Finance and Treasurer

Policy 02.06.01 – Construction Project Planning and Approval

Replace Vice President for Finance and Operations and Treasurer with Vice President for Strategic Infrastructure Planning and Facilities

Policy 02.06.05 – Real Estate

Replace Vice President for Finance and Operations and Treasurer with Vice President for Strategic Infrastructure Planning and Facilities

Policy 05.07.02 – Expenditure Policy

Replace Vice President for Finance and Operations and Treasurer with Vice President for Finance and Treasurer

Policy 06.18.01 – Student-Athlete Conduct Policy

Delete the references to the Vice President for Finance and Operations and Treasurer

RESEARCH CONTRACT TERM SHEET

Party: Ubiquitous Energy, Inc.

Contracts: Sponsored Research Agreement
"Transparent Molecular Photovoltaic Devices"

Term: January 25, 2013 to June 30, 2013

Payment Terms: \$23,659

Services Provided: By MSU to Ubiquitous: Investigate influence of device area on performance of single-junction transparent PV devices

By Ubiquitous to MSU: none

Use of University Facilities/Personnel:
Use of MSU facilities/personnel by Ubiquitous Energy, Inc. provided at prevailing rates for industrial research

Organization Type: Delaware corporation based in Boston, Massachusetts

Personnel Interest: Dr. Richard Lunt, an Assistant Professor in the Department of Chemical Engineering and Materials Science, and his family own or have options to buy an ownership interest of more than 1% of the company