

**MICHIGAN STATE
UNIVERSITY**

April 4, 2012

MEMORANDUM

To: Trustee Finance Committee
From: Lou Anna K. Simon, Ph.D.
Subject: Energy Transition Plan

RECOMMENDATION

Whereas, Michigan State University's energy infrastructure plays a crucial role in supporting its core mission; and

Whereas, the campus energy system must be carefully managed within the resources available to the University to meet the core mission of the University; and

Whereas, the University has a Campus Master Plan that guides the physical development of the University; and

Whereas, it may take more advanced technology than is currently available to address some of the challenges that must be met to supply the University's future energy needs; and

Whereas, using the University campus as a living learning laboratory for teaching and research is an important part of the academic environment for faculty, staff and students; and

Whereas, the University is a demonstration project and model for addressing issues of energy security and sustainability, including the goal of moving aggressively to replace fossil fuels, as the University confronts the problems faced by universities and communities around the world; and

Whereas, it will be valuable to have a master plan which accounts for reliability, cost, health, environmental impact and plant capacity factors to guide the development of the University's energy system and to set forth a vision for meeting the University's energy needs over the next 20 years.



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Now, therefore,

Be it resolved that the Trustee Finance Committee recommends adoption of the attached Energy Transition Plan (Plan), including the overall goal of moving toward 100% renewable energy and the greenhouse gas reduction and campus renewable energy targets for achieving that goal; and

Be it further resolved that the Trustee Finance Committee recommends that, since the Energy Transition Plan serves a purpose similar to that of the Campus Master Plan, the Vice President for Finance and Operations (“VPFO”) shall provide a progress report and Energy Transition Plan update to the campus and Board of Trustees every five years, as the VPFO does for the Campus Master Plan.

BACKGROUND

As the University looks toward its future, it faces significant challenges to reliably meet a growing demand for power while simultaneously reducing the negative impacts of power generation on the campus and the surrounding community.

MSU has been preparing a long-term energy plan for several years. The University has implemented countless energy conservation measures that have reduced demand and consumption, while promoting behavior change through regular education and messaging. It was also important to have in place the proper data and metrics in order to measure and manage the changes brought about by reduction efforts. Much of this work has been completed and we now have a better understanding of the energy data and information on both the supply and demand sides. However, there is still much to be done.

For more than a year, a group of 24 faculty, staff, students, and community members, representing diverse viewpoints and areas of expertise, worked to formulate the Energy Transition Plan and establish goals for addressing the University’s power needs while also reducing the negative environmental impacts of generating steam and electricity. This group of MSU faculty, staff and students should be commended for their work on this critical project.

The Plan was assembled using data and research from MSU faculty, staff, and students, as well as the consultation of industry experts. It recognizes the interactive and closely linked variables that impact the complexity of power generation and use – reliability, cost, health, environmental impact, and capacity of the power infrastructure.

The Plan proposes goals with a set of strategies along three dimensions: the physical environment, energy research, and educational leadership. The use of goals, rather than prescriptive strategies, provides the flexibility MSU will need

to manage its energy future. While the goals will be challenging to reach, given the constraints imposed by the plan's variables, we believe they can be achieved by implementing existing technologies.

The Energy Transition Plan is one of several planning tools, including the Campus Master Plan and the Just In Time Maintenance Plan, that provide a blueprint and metrics for managing the University's built environment. Each provides a substantive role for Board review and approval. Like the Campus Master Plan, the Energy Transition Plan will be reviewed every five years and subject to Board review and approval. Interim updates will be provided to the Board on an annual basis. Through this process the plan becomes a living document and allows for adjustments over time as new technologies and advancements become available and viable.

Approval of the Energy Transition Plan will put in place a framework for guiding future energy decisions for Michigan State University.

cc: Trustee Policy Committee, F. Poston, J. Battle, L. Boomer, B. Ellerhorst, R. Flinn, K. Lindahl, B. Latta, Energy Transition Steering Committee

MICHIGAN STATE
UNIVERSITY

April 4, 2012

TO: President Lou Anna K. Simon

FROM: Vice President Fred L. Poston 

SUBJECT: Energy Transition Plan

Recently, you asked for my response to a variety of issues that have been mentioned over the last few months regarding the Energy Transition Plan. I have taken this opportunity to address the issues that you mentioned in our conversation as well as those raised by others.

First, I would like to put the Energy Transition Plan into context because it differs from the plans of other universities that I have reviewed. The foundation of this plan is the assumption that someday in the future MSU will meet all of its energy needs from various forms of renewable energy. This we believe is because all other forms of energy generation have deleterious side effects. If one agrees with this assumption, the question arises, "How rapidly can MSU transition towards total reliance on renewable energy?"



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To answer this question, MSU first contracted with Black and Veatch, an accomplished engineering firm, to inventory and describe our current power system and to recommend some of the current power energy technologies applicable to our power plant. These recommendations were not intended to be an exhaustive list, but rather a place to start. Second, MSU worked with Energy Strategies, a nationally recognized firm comprised of business, economic, energy, engineering, regulatory, and modeling specialists. Energy Strategies worked with MSU to develop an integrated energy forecasting model that enables users to gain better insights into the economic, operational, and environmental tradeoffs for power generation and use at MSU. The model predicts the impact of implementing various energy strategies on five variables: cost, capacity, reliability, human health, and the environment. Equipped with the model, the remaining principal question was, "How to weight the impact of the various energy strategies on these five variables?" To address this question, we assembled a committee broadly representing the views of the MSU community. It was important to have a committee that represented faculty, staff and students. People were selected based on their willingness to speak up and strongly represent their point of view on the various issues discussed. As an

example, included on the committee were students who opposed burning coal in the power plant as well as students who were opposed to tuition increases. Individual committee member's support of the resulting plan was not sought, but rather they were asked to find, in their opinion, the best compromise plan that optimized across the five variables as a transition plan to the future. Given the strong views held by many of the committee members, I would have been surprised to receive unanimous support of the resulting compromise plan. There was, however, strong overall support to move the plan forward for approval by the President and the Board of Trustees. This is a complex issue, and the committee spent many hours processing and mastering an enormous amount of information before making informed decisions. I commend them for their work.

The committee's plan was then vetted with the MSU community through a series of communications and meetings and with a set of experts outside the MSU community. This feedback was provided back to the planning committee for further clarification and refinement. The plan delivered to you at the January Board meeting was the result of this process. I believe that the process was representative of various viewpoints on the issue. Opportunities to provide input were well communicated through all types of social and other media to the MSU community, and those interested had ample opportunity to participate in the planning effort.

Unlike the plans that I reviewed from other universities, the table of goals (outcomes) is the heart of the MSU plan. Should the Board of Trustees adopt this plan, the administration will be compelled to manage the energy generation and use of the university to attempt to comply with the goals. While the goals will be challenging to reach, given the constraints imposed by the management of the five variables, we believe they can be achieved by implementing existing technologies. The use of goals rather than prescriptive strategies provides the flexibility MSU will need to manage its energy future. It is impossible to predict with any accuracy if and when new energy technologies will be commercially viable. As new technologies become viable through time the attainment of the goals should become easier. Should events move us along this path more rapidly than we anticipate, the goals will be reviewed and adjusted at each of the plan's five-year updates. This process produces a living quality to the plan as it adjusts through time. We have used this approach successfully with the implementation of the Campus Master Plan.

Over the last few months, some have criticized the plan for inadequate reliance on energy conservation, insufficient consideration of thermal storage, poor implementation of renewable energy strategies, and over reliance on coal as compared to natural gas to generate energy. I will comment on each of these.

Conventional thermal storage was evaluated, but did not fit the MSU situation. Conventional thermal storage usually involves the use of off-peak (cheaper) electricity to pump cool water during the night into large holding tanks and then release the cool water during the warmer temperatures of the day. This is a technique applicable in situations where the user is dependent on buying off the 'grid' or from an outside utility company with a daily cost differential between peak and off-peak energy rates. MSU produces its own electricity. Electricity during the night costs the same as it does during the day. Seasonal thermal storage which consists of pumping warm or cool water into the bedrock and storing the energy for use on the surface may have some applicability. It is under study by engineers in the Physical Plant.

Perhaps a more promising source of thermal energy on the campus does not involve storage. MSU pumps large quantities of potable water from wells on the campus every day. The water is a constant 55°F and it may be possible to tap this energy source to heat or cool facilities at different times of the year. A team of engineers is currently exploring the technical, economic, and regulatory feasibility of this approach.

Energy conservation is at the core of the recommended plan. We must rely heavily on the energy saved by implementing rigorous conservation programs to generate the savings that are needed for capital investment to meet the outcomes of the plan through time. MSU has insufficient capacity to raise tuition to meet the academic needs of the university and invest heavily in new energy technology. At present, we are implementing a building retro-commissioning program which has saved an average of about 25% on the energy use in each building. If this relationship holds true for the other buildings across the campus, we will have a good start on meeting our transition goals.

The perception that MSU is reticent to implement renewable energy sources is incorrect. We are testing our first large geothermal field located near the new Bott Nursing Building, which is under construction. It is believed that additional opportunities for the use of this technology on campus will arise, but its implementation consumes a large amount of buildable land space. Once installed in the ground we cannot build on top of it.

Wind and solar technologies hold some promise for MSU. A number of years ago, we conducted an assessment of available wind energy on the campus. We found insufficient wind energy to economically drive the commercial wind turbines of the time. New advances in wind technology may hold promise. We are currently assessing the available wind energy at a greater height. Given the new improvements in technology, we may find that we have sufficient energy to economically drive a turbine. Unfortunately, the wind does not blow all of the time. Consequently, we would have to invest in back-up capacity to cover wind

energy's contribution to our electrical supply when the wind does not blow. In addition, this technology does not generate heat, which is required to generate steam. We use steam to heat and cool the campus.

Solar energy has the same steam constraint as wind energy. It does not generate heat which is used to create steam. Likewise, solar energy is still significantly more expensive than conventional energy sources. The technology continues to evolve, however, and solar panel efficiency has improved significantly over the past decade. Given the current efficiency of solar panels, MSU could only generate about 13% of its energy needs if every roof was covered with solar panels.

As stated in the Energy Transition Plan, MSU uses both coal and natural gas to insure energy reliability for the campus. The power plant can switch fuels on most of the boilers depending on which fuel source is the least cost. This helps to protect the annual budget from an unexpected increase in fuel costs from spikes in the market price of either fuel. During 2009 for example, natural gas prices were \$4-5 per million BTU's more than coal. Had we been dependent solely on natural gas, our energy costs would have jumped \$24-30 million.

Historically, the cost of gas has, with a few exceptions, significantly exceeded the cost of coal. We are currently in one of these historical exceptions. We are burning large amounts of natural gas at present because the price of natural gas is very low. Whether this will continue very far into the future is debatable. Some argue that the price of gas will remain low because of new supplies discovered in the United States. Others argue that the current price of gas does not adequately cover the variable costs of the drillers, and that drilling companies will be slow to bring new gas wells online until prices increase. Time will tell. Should the price of gas remain low, we will be able to reach the goals stated in the plan much more rapidly. Under these circumstances, MSU would likely advance our goals in the next five year review. If gas prices return to more traditional levels, our goals should be on target and attainable. In either case, we will have a reliable source of electricity and steam and not be held hostage to the market prices for either fuel.

The implementation of this plan will require significantly greater attention to management detail than at present. Consequently, I anticipate the formation of an energy operations committee to implement and report on our annual progress toward meeting the goals dictated by the plan. I also anticipate the reformation of the environmental stewardship systems team, to evaluate all of our environmental stewardship needs, set priorities, and recommend changes to practices and policies which impact our environmental footprint. While the reorganization of the environmental committee structure into the Office of Campus Sustainability eliminated some redundancies, we lost ground on specific

recommendations for improvement. As before, the environmental stewardship systems team will be comprised of faculty, staff, and students. We will continue to fund select research projects which advance the operational needs of the University. In addition to these projects, we intend to set aside funds for worthy student research and demonstration projects. These funds will be administered by the Office of Campus Sustainability in conjunction with the Neighborhood programs. Students or student groups may also present ideas directly to the Systems Team for possible integration into the environmental strategies for the campus. Students, faculty, and staff will have multiple opportunities to participate at various levels. The goal is to provide a rich opportunity for engagement of faculty, staff, and students around the identification and the implementation of changes to improve the environmental footprint of the campus. We believe that access to these committees, programs, and funds will promote these interactions.

I hope that I have addressed the issues raised over the last few months regarding the Energy Transition Plan. I strongly recommend your consideration of the Plan and hope that you will recommend the Plan to the Trustees.