Ferris State University
Energy Conservation Task Force Report
November 30, 2009

As one consideration in the FSU strategic planning process, a task force was convened by Jerry Scoby VP-Admin/Finance at the direction of President Eisler to "identify practical ways the University can reduce its consumption of natural gas, electricity, water and solid waste" [Charge]. This Energy Conservation Task Force (ECTF) has met six times during the summer and presents the following as its final report and recommendations.

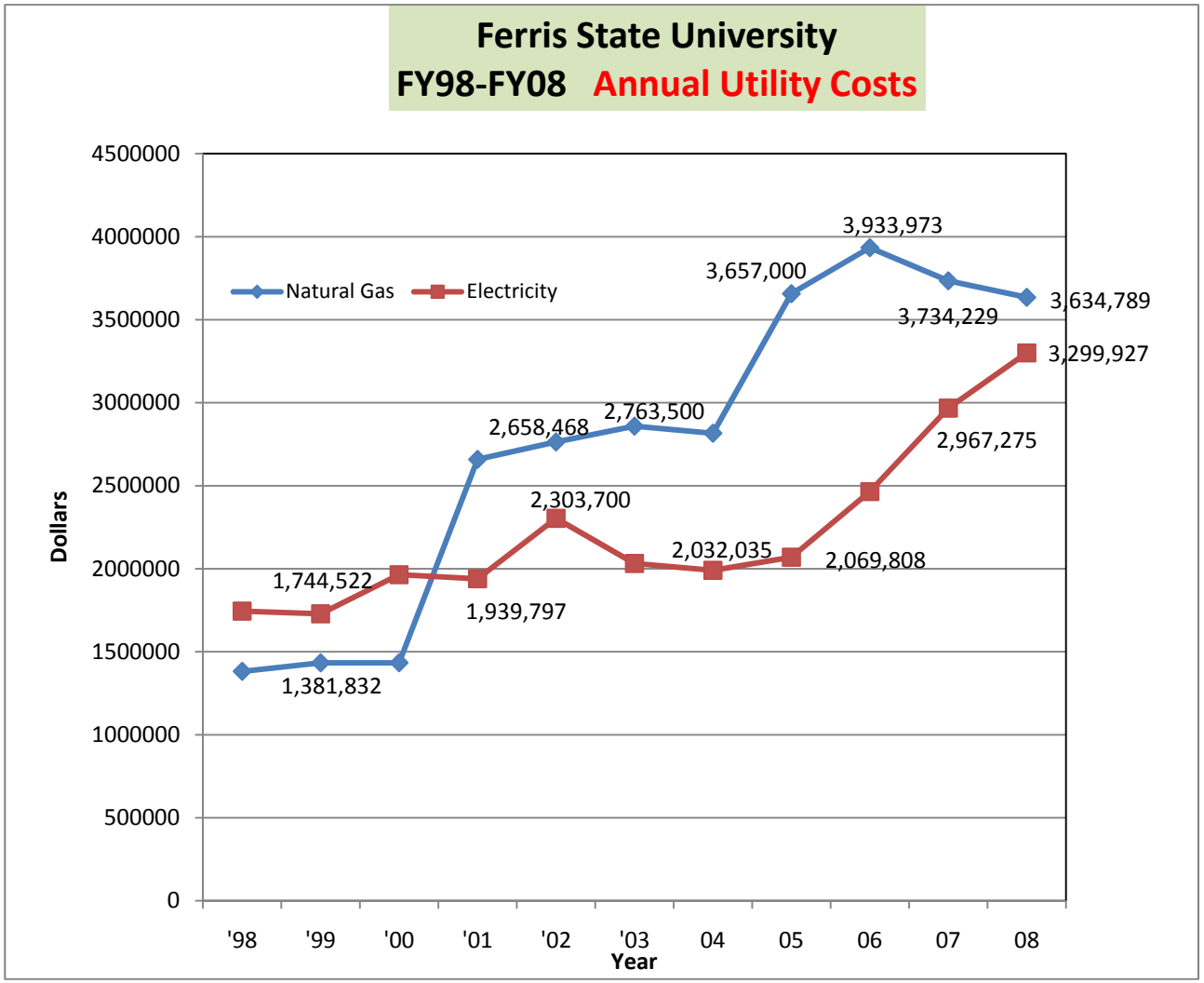
Fourteen staff and faculty were designated from across campus including physical plant, dining services, student services, faculty, academic affairs, arts and sciences, advancement, finance and Kendall College of Art & Design. The following lists the FSU Energy Conservation Task Force Members:

Jerry Scoby, VP Admin/Finance and Chair	Tom Oldfield, Engineering Technology
Charlie Carpenter, Physical plant	John Pasquantonio, Physical plant
Diane Dustin, KCAD	Gary Rasmussen, UA & M
Don Flickinger, Academic Affairs	Mark Schuelke, Rankin Center
Linda Golden, Financial servces	Jon Shaffer, Residence Life
Mark Hill, Faculty	Dan Sovinski, Physical plant
Julie Modene, Dining services	Christi Swank, Arts & Sciences

As charged, the group was asked to consider "both issues of behavior and systems. In the context of systems, the Task Force is asked to focus on projects that are no cost, low cost, or ones with a payback period of up to four years. Items identified should include a description, location, an estimated cost to implement, estimated savings, and the payback period." A recognized shortcoming of the Task Force membership is that it did not include students. Additionally, because the timing of the Task Force work was over the summer, the faculty representatives were not able to be actively involved with the group.

The first meetings focused on introductions and areas of interest and expertise provided by the Task Force members. Meeting schedules and topics were discussed and sessions typically ended with spirited and enthusiastic brainstorming on issues. At the close of each meeting, Task Force members left with specific assignments for the next meeting and an enduring sense of the importance of these discussions.

Dan Sovinski presented a graphic overview of the University's ten year energy use and cost trends for natural gas and electricity, plotted against enrollment, campus area, and total costs. Overall, while natural gas usage has remained relatively stable showing little usage rise in the past ten years in spite of the increase in student enrollment, growth in campus building area and cooler winters. Electricity usage, however, has increased dramatically due in part to additions in air conditioned space square footage, additional lighting and plug load increases. [Figure 1]



Annual Usage: Natural Gas

+1.6%

FY98 → 415 MMBTU

FY08 → 422MMBTU

Annual Usage: Electricity

+63%

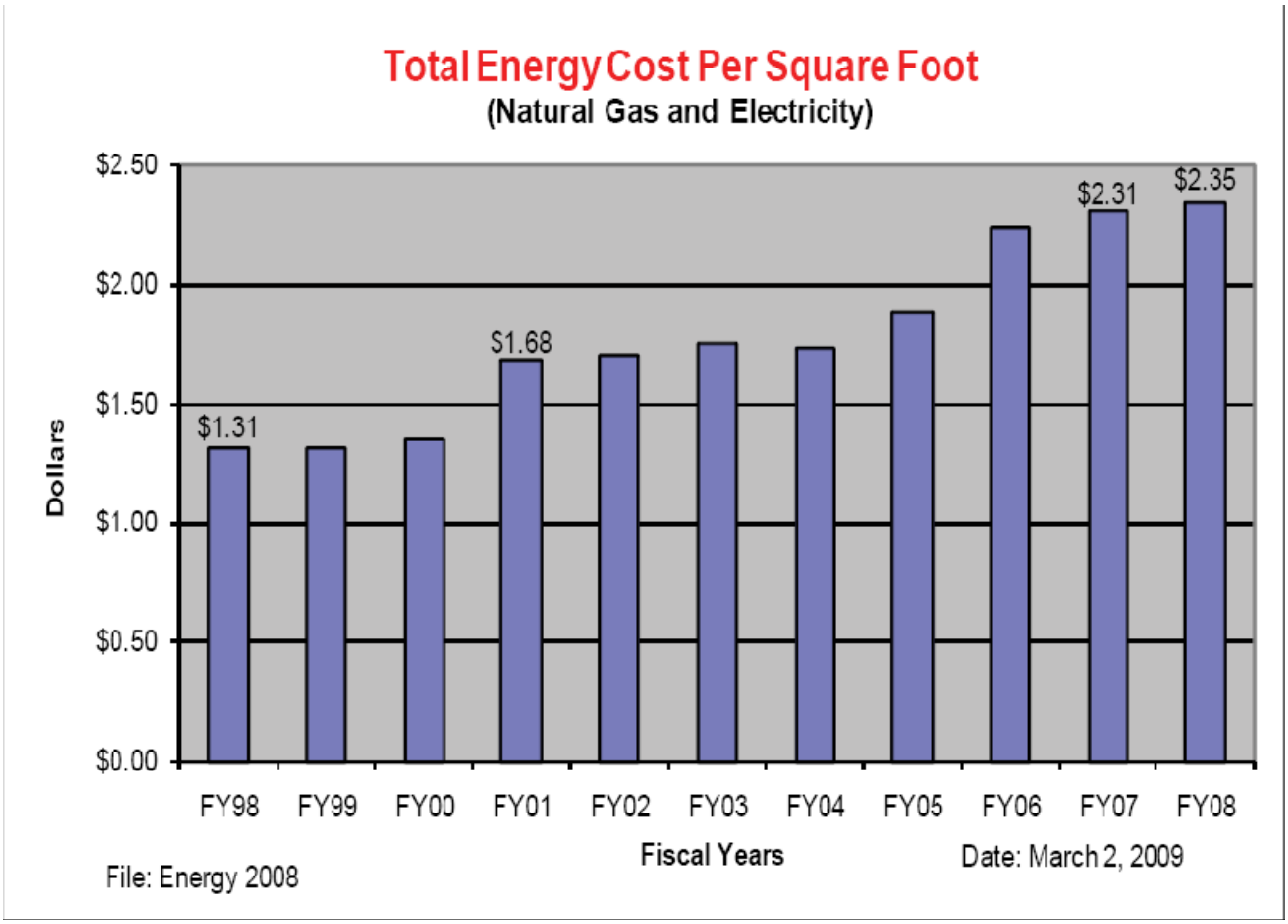
FY98 → 92 MMBTU

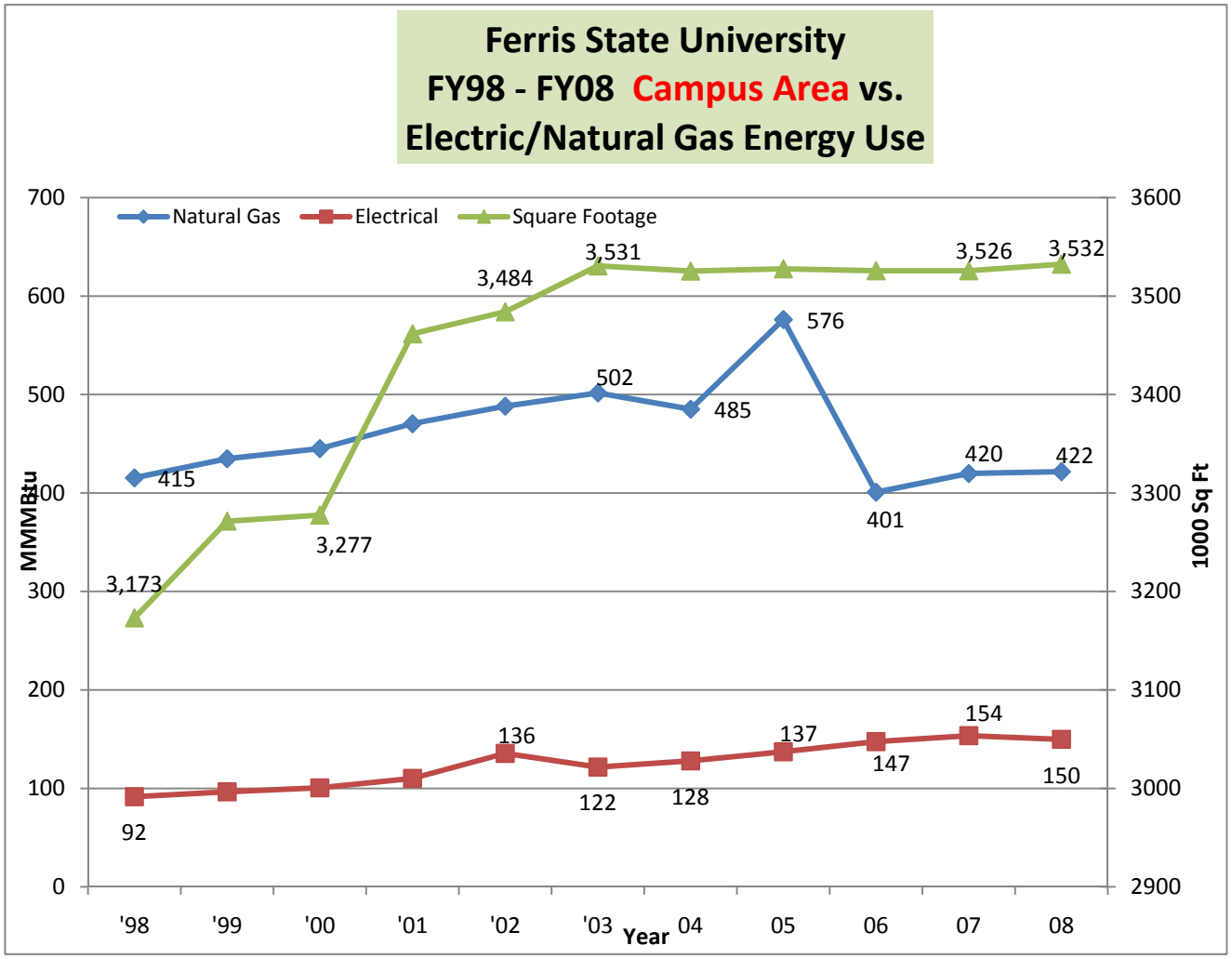
FY08 → 150 MMBTU

Figure 1

Total Costs for Electricity and Natural Gas

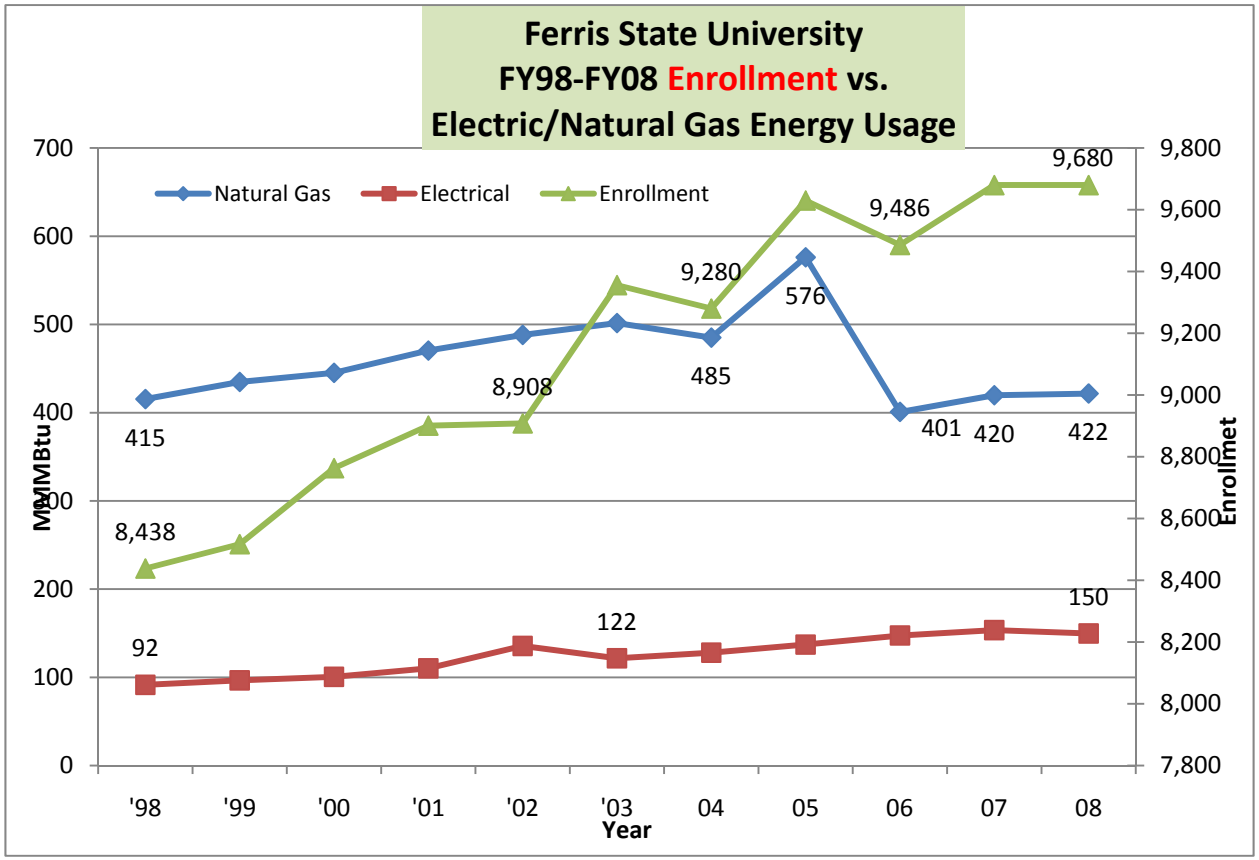
FY98 : $ 3.1 million → FY08 : $ 7.0 million → + 125%


Total Energy Cost Per Square Foot
(Natural Gas and Electricity)
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
Dollars
$1.31
$1.68
$2.31
$2.35
FY98
FY99
FY00
FY01
FY02
FY03
FY04
FY05
FY06
FY07
FY08
Fiscal Years
File: Energy 2008
Date: March 2, 2009



Campus Area

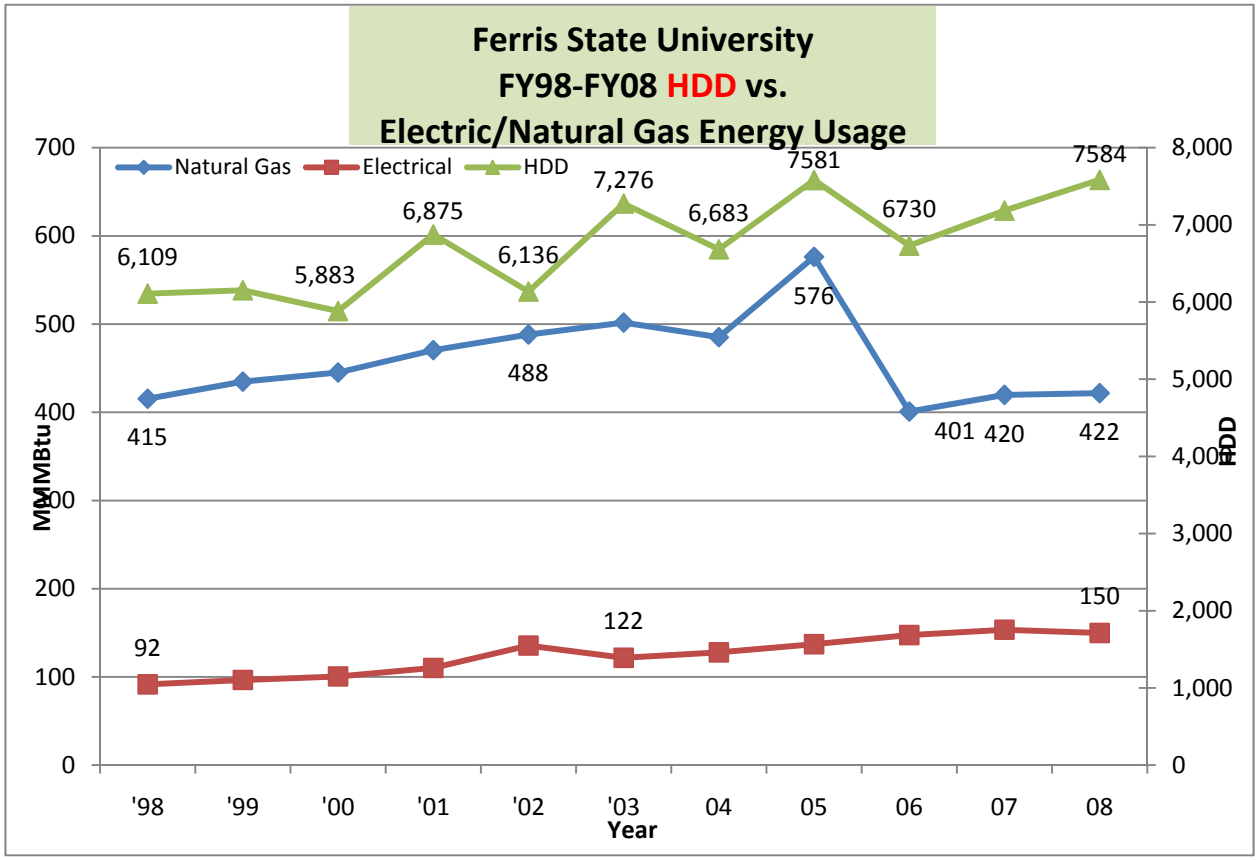
FY98 : (3.17 MMsqft) Base → FY08 : (3.53 MMsqft) → +11.7%



Enrollment **(on Campus)**

FY98 : (8438 students) Base → FY08 : (9680 students) → +14.7%

HDD (Heating Degree Days an indicator of heating demand)
FY98 : (6109 HDD) Base →
FY08 : (7584 HDD) → **+24.1%**



Natural Gas

FY98 : (415 MMMBTU) Base → FY08 : (422 MMMBTU) → +1.6%

(note: Annual energy unit : MMMBTU is 1000 million BTUs)

Dan, a P.E. and Certified Energy Manager (CEM), also provided the Task Force with technical information concerning the trends and on campus facilities which established a foundation on which to base discussions and perspectives. Charlie Carpenter and John Pasquantonio also supplied valuable information and data concerning recycling, transportation and facilities use patterns as well as providing a good deal of the "institutional memory", along with Tom Oldfield, Christi Swank and Don Flickinger. Such memories are critical to the success of fundamental change processes. The Task Force members from dining services, residence life, advancement and Kendall also provided valuable insight and perspective.

Christi Swank graciously volunteered to keep meeting minutes and those excellent and timely notes are gratefully acknowledged in the writing of this final report which was prepared by Diane Dustin and Dan Sovinski.

While doing background reading on the subjects at hand to ground the Task Force in the current state and trends in energy conservation and sustainability, doing research to establish campus baselines and investigating current energy use trends and specifics was deemed valuable by the Task Force, it was acknowledged that the short timeline of the current charge would not allow for such undertakings. Therefore, the Task Force has relied on its best instincts and informed estimates for making its recommendations.

The list of cost cutting suggestions generated across campus from the budget discussions during March and April were examined closely by the Task Force and formed the basis of a ranked list composed of no cost/low cost suggestions, items deemed likely to fall within the four year payback period, and items which were deemed to be outside the scope of the charge for the Task Force. From this list, Diane Dustin created a classified list of initiatives loosely organized by type (e.g. behaviors, policies and procedures, central controls etc.) Task Force members then ranked these suggestions on a three-point scale and the results were discussed at the July 16, 2009 [Appendix A]. In July, Jerry Scoby used the campus-wide notices to request additional input on cost saving measures for conservation and received three replies. These were discussed as well at the July 16 meeting but most were found to be outside the scope of the current work.

<u>Themes which emerged from the Task Force include</u>:

- There is a desire across campus for significant, sustained, systemic and institutional action on these issues, including several projects initiated by students and student groups.

- The Task Force believes there is much room for improvement in the area of personal responsibility for conservation of energy and reduction of resource use. The challenge will be to mount a comprehensive, consistent and engaging campaign for change which will significantly affect the behavior of individuals and groups.

- There is a need for more effective building management processes campus-wide; including scheduling of classes, climate control issues and effective implementation of centrally controlled building controls (building automation systems (BAS) systems and direct digital control (DDC)) systems. There are currently four primary systems in three generations along with pneumatics. There are mixed manufacturers in single buildings and obsolete direct digital control (DDC) unsupported by the manufacturer as well.

- Additional cost/benefit analyses, payback and other financial and feasibility work will be necessary prior to implementing most of the recommendations, although the Task Force believes that a large number of the recommendations will have immediate and quantifiable effects.

- Several building and energy audits have been done in past years by students and faculty as part of classroom assignments. Action was not taken on results and so this activity languished for several years. Seven reports were located by John Pasquantonio and reviewed by Tom Oldfield. The most recent one dates from the mid- to late 1990s. Two building audits are planned however, for Fall 2009 of Granger Center and the Racquet Facility.

- Need for significant education across all campus cohorts concerning energy issues on campus, conservation measures and personal responsibility for conservation practices.

- Need to publicize and celebrate things which are currently underway and going well: recycling and campus-wide reuse of materials, student move-out "dump and run" initiatives and all energy-related cost avoidance measures currently occurring.

- Recognition of specific people making a difference to energy-related costs and empowerment of all personnel university-wide to recognize and act on energy-related issues is needed. The university-wide notices, opening screens on Banner and MyFSU and "Pat on the Back" announcements might be used for these purposes. The university home page (www.ferris.edu) was discussed as a possible place to publicize and link to energy-related activities and monitoring on campus.

There was discussion about the level of engagement which might be obtainable from certain campus cohorts and what might be done to increase the active participation of faculty, staff and students. It was determined by the group that further involvement and discussion with faculty in particular was necessary before making any specific recommendations which might involve faculty. It was agreed that this report should be submitted through appropriate faculty channels (possibly the Academic Senate Executive Committee) to elicit additional and specific items which faculty could pursue.

RECOMMENDATIONS from the Task Force and examples of possible implementation strategies:

1. **Take advantage of as many of the current and future federal, state and local incentive, rebate, grant and tax programs** as possible to fund energy and sustainability activities. Hire a consultant (consider a contract payable as a percentage of funding obtained for FSU) or otherwise assign human and budget resources to this as necessary but do it!
    a. The existing energy services contract providers might be a source for assistance.
    b. Review combined list of DTE and Consumers Energy rebates and incentives supplied to Jerry Scoby.

2. **Continue the work of the current Energy Conservation Task Force into the future and add additional representatives from faculty and student groups.**

3. **Design and implement a *coordinated* University-wide campaign for Fall, 2009**. The Task Force feels strongly that many initiatives can be put in place for the incoming class of Fall, 2009 and publicized through existing campus activities, perhaps with modules being developed which can be presented in many different venues.

    Campus Engagement Strategies

    - Make the task important and fun

- Set goals such as saving 1% on energy campus-wide for a specific time period and report the program (real-time electric metering is already currently available and could be prominently displayed on campus web pages).
- Use items FSU already has to reward constituents for embracing campaigns e.g. racquet facility membership, golf, food tickets etc.
- Initiate friendly campus-wide competitions around energy issues and recycling e.g. competition for designing a light switch sticker advocating a "Kill-A-Watt" Wednesday, a "Big Turn Off" or being "Green with envy" programs with campus-wide voting; FSU can participate in other national programs including RecycleMania , Association for the Advancement of Sustainability in Higher Education (AASHE) sponsored conferences and programs.
- FSU could also partner with the community and other groups on combined efforts (this type of outreach increases possibilities for grant opportunities).
- Incorporate conservation and sustainability education into mandatory FSUS 100 courses, residence hall orientations and other types of student activities.
- Use the annual Michigan Energy Conference posters to engage the campus community.
- Use bicycles left at the end of terms for a campus "borrow a bike" program
- Punch card system (similar to coffee bars) for people to be rewarded for specific efforts; completed cards are submitted to a larger drawing for a larger prize (consider vendor donations)
- Document savings and publicize!
- Inclusion of students on building and construction, operations and facilities committees†[1]
- Implementation of student life educational initiatives such as: peer-to-peer outreach and education efforts like "Eco-Rep" programs, sustainability pledge programs e.g. "Graduation Pledge" †[2]

4. **Implement comprehensive energy conservation policies University-wide** to optimize efforts, especially as they pertain to HVAC and fan operating schedules, computer operations (personal and organizational), seasonal heating and cooling, fleet vehicles, equipment purchasing standards (new and replacement), and on-campus resident practices.

5. **Implement comprehensive design, construction and capital acquisition policies and procedures** which promote/require life cycle analysis as part of the cost/benefit analysis and make sure they are followed. A commitment has been made to achieving LEED Silver ratings for new construction on campus [President Eisler enumerated specific sustainability principles in the 2009 update to the Facilities Master Plan – Big Rapids Campus] page 3. In addition, there are other green rating systems e.g. LEED for Existing Buildings / O&M, which could provide a framework for monitoring and achieving energy use and conservation university-wide.

6. **Implement as many of the Energy Conservation Initiatives as is possible**. There are many Initiatives identified in Appendix B. These represent the ones that survived the tests of a four year or shorter payback period, and so doing these initiatives will result in a return of the investment over a relatively short period of time. Some of these initiatives require a behavior change on the part of us as employees and as such it is recognized some of these may be difficult to implement.

[1] † ACUPCC Implementation Guide, 2007

[2] † ACUPCC Implementation Guide, 2007

The following tables provide summary data for projected energy conservation measures. Detailed data projections correlated with the ranked items follows in Appendix B.

Executive Summary of Ferris State University Energy Costs
(prepared and submitted by Dan Sovinski)

Utility Resources	**Annual Cost FY2008**	**Estimated Annual Savings (Cost Avoidance) per Utility**	**Reduction per Utility (%)**
Electricity	$3,299,927	$716,449	**21.7%**
Natural Gas	$3,634,789	$231,204	**6.4%**
Water and Sanitary	$1,354,333	$73,500	**5.4%**
Total:	***$8,289,049***	**$1,021,153**	Est. **12.3%** annual savings overall on utility costs

Executive Summary of Proposed Savings with Energy Conservation Measures

System Summary	***Estimated Implementation Cost***	***Annual Savings (Cost Avoidance) by System***	**Est. Return on Investment (ROI in months)**	**Reduction per Utility (%)**
Implementation of lighting efficiency program. (Electricity)	$400,000	$453,875	10.6	13.7%
Implementation of air conditioning efficiency program. (Electricity) (50%electrical/50% NG)	$150,000	$231,204	7.8	7.0%
Implementation of heating efficiency program. (Natural Gas) (50%electrical/50% NG)	$150,000	$231,204	7.8	6.4%
Implementation of miscellaneous systems. (Electricity)	$89,775	$31,370	30.8	1.0%
Implementation of water conservation. (Water and Sanitary)	$110,000	$73,500	18.0	5.4%
Total:	***$899,775***	***$1,021,153***	***10.6***	

RESOURCES FOR FURTHER WORK

Association for the Advancement of Sustainability in Higher Education [FSU is a current member which allows access to "members only" documents] www.aashe.org
Resource center: http://www.aashe.org/resources/resource_center.php
Climate Action wiki: http://www.aashe.org/wiki/climate-planning-guide
Implementing low cost or no cost operational energy savings (specific implementation strategies for physical plant)-Walter Simpson at AASHE
Energy pigs-what are they? What to do about them? (implementation and technical descriptions for physical plant) -Walter Simpson at AASHE

APPA: Association of Higher Education Facilities Officers www.appa.org
Michigan chapter [FSU is a member] www.pp.wmich.edu/miappa/members.html

Architecture2030 www.architecture2030.org

Clean Air Cool Planet www.cleanair-coolplanet.org
Campus carbon footprint and greenhouse gas calculator (compliant with ACUPCC requirements)
http://www.cleanair-coolplanet.org/toolkit/inv-calculator.php

Energy Star programs and information www.epa.gov/energystar
Higher education www.energystar.gov/index.cfm?c=higher_ed.bus_highereducation

Labs21 (voluntary partnership program dedicated to improving the environmental performance of US laboratories) www.labs21century.gov

National Wildlife Federation campus ecology publications www.nwf.org
Guide to Climate Action Planning: pathways to a low carbon campus
Higher Education in a warming world: the business case for climate leadership on campus (minor registration required, but free)

National Association of College and University Business Officers www.nacubo.org

RecycleMania: RecycleMania is a friendly competition and benchmarking tool for college and university recycling programs to promote waste reduction activities to their campus communities.
www.recyclemania.org

Society for College and University Planning www.scup.org

University at Buffalo-SUNY UB Green Climate Action Report, 2007

Whole Building Design Guide (resource for technical information on sustainability and related issues, especially as related to federal requirements) www.wbdg.org/design/sustainable.php#mjr

Books

Building Commissioning Handbook, 2d ed. APPA, 2004.

Business case for renewable energy: a guide for colleges and universities by Michael Philips and Andrea Putman, jointly published by APPA, NACUBO and Society for College and University Planning, 2006.

Degrees that matter: climate change and the university by Ann Rappaport and Sarah Hammond Creighton, MIT Press, 2007.

Education Facilities Professionals Practical Guide to Reducing the Campus Carbon Footprint, ed. Walter Simpson

Green Campus: meeting the challenge of environmental sustainability, by Walter Simpson, APPA, 2008.

Transportation and sustainable campus communities: issues, examples, solutions by Will Toor and Spenser Havlick, Island Press, 2004. (bicycle program and public transportation subsidies)

APPENDIX A: FSU Energy Conservation Task Force
RANKED List of Energy Conservation Suggestions
August, 2009

Idea	Rank	Questions / Comments	DTE and/or Consumers Energy Incentives?
1. Turn off lights, printers, computers, monitors at end of day	11		Yes; sensors and intelligent power strips
2. Develop and implement campaign for energy education to decrease waste across campus (e.g. cell phone chargers, lights, computers, monitors, phones, any other plug loads etc.)	10		
3. Consolidate summer teaching/offerings in one building	9	At least to fewer buildings if not one	
4. Power off all types of equipment when not in use (e.g. projectors etc.)	9		Yes; sensors and intelligent power strips
5. Change power settings on computers for energy savings	8		
6. Close buildings during university breaks	8		
7. Offer weekend classes all at one site (e.g. IRC)	8	At least to fewer buildings if not one	
8. Specify Energy Star equipment in all planning and procurement documents	8	What are the up-front and ongoing cost implications of this choice?	Yes
9. Be sure expensive lighting is turned off as much as possible	8		Yes
10. Purchase Energy Star equipment for housing	8	What are the up-front and ongoing cost implications of this choice?; what would this entail	Yes!
11. Implement policy to purchase only Energy Star appliances, equipment and computer equipment	8	What are the up-front and ongoing cost implications of this choice?	
12. Develop and implement policies to support energy conservation in all aspects of campus life	7		
13. Replace water fixtures when necessary with only low flow/water saving types	7		
14. Specify only low flow fixtures in new construction			
15. Adjust HVAC set points and central control settings to moderate temperatures (e.g. 68F winter and 78F summer)	7		Yes
16. Install / replace lighting fixtures and lamps with more energy efficient models	6		Yes!
17. Encourage students, faculty, staff to dress appropriately	6		
18. Reduce number of personal appliances in offices (e.g. refrigerators, clock-radios, coffeepots, microwaves, space heaters, fans etc.)	6	On voluntary basis	Yes; replace w/ Energy Star
19. Consider LED lighting for some applications	6	Don't know enough about pros / cons of LED	Yes
20. Don't use power-assisted doors or elevators if you don't need them!	6		
21. Encourage alternative transportation possibilities; don't drive-walk	6	In many cases this would cost us money;	

22. Install low flow fixtures on faucets	5		
23. Install motion sensors for some building areas	5		Yes
24. Consider changes in cleaning and custodial behavior in buildings (e.g. team cleaning)	5	Already occurring in housing	
25. Make residence halls more energy efficient	4	Don't know what this means; Hard to rate in about 1 million sq. ft. of living space; what does this mean?	Yes
26. Become aware of energy savings in personal environment and take action to save energy daily	4		
27. Eliminate CRT monitors across campus and replace with LCD or better	3	Wouldn't do all today but would make higher on the replacement cycle list	
28. Conduct energy audits of all buildings (utilize any existing studies as applicable)	3		
29. Install low flow showerheads in housing	3	Efficient; but very poor amenity for students	
30. Submeters for all buildings as necessary or possible	3	Would have made this "1" if within 4 yr payback; Why do this?	Yes
31. Turn off motors on all campus vehicles while idling and/or unoccupied	3		
32. Any personal/department appliances have to be Energy Star and "passed" by ??	3		Yes
33. Close buildings between semesters	2	Selectively where it makes sense	

APPENDIX B: Energy conservation initiatives with calculations (September 15, 2009)

Systems and Behavior Summary

Recommendation Item	Systems		Behavior	
	One-time Implementation Cost	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**
Behavior Modification Efforts Ranks 1,2,3,4,6,7,9,15,17,18,20, 24, 33	**$300,000**	To be determined (TBD)	Implementation Cost Element: Behavior Modification & Requires Human Resources enforcement.	**$747,283**
System Modification Efforts Ranks 5, 11,13,14,16,19, 22, 23, 27, 29	**$599,775**	**$273,870**	Not Applicable (NA)	Not Applicable (NA)
Energy Awareness Efforts Ranks 8,10, 12, 21, 25, 26, 28, 30, 31,32	To be determined (TBD)	To be determined (TBD)	To be determined (TBD)	To be determined (TBD)
Summary	**$899,775**	**$273,870**	**$0**	**$747,283**

Recommendation Item	Systems		Behavior		
Ranks 1,2,4,18	**One-time Implementation Cost**	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**	**DTE or Consumers Energy incentive?**
1.Turn off lights, printers, computers, monitors at end of day and when not in use. 2. Develop and implement campaign for energy education to decrease waste across campus (e.g. cell phone chargers, lights, computers, monitors, phones, any other plug loads etc.) 4. Power off all types of equipment when not in use (e.g. projectors etc.) 18. Reduce number of personal appliances in offices (e.g. refrigerators, clock-radios, coffeepots, microwaves, space heaters, fans etc.)	**NA**	**NA**	Implementation Cost Element: Behavior Modification & Requires Human Resources enforcement, see below comments.	**$108,450**	YES, plug load sensors, occupancy sensors and intelligent power strips
			1. Cost Avoidance based on turning off one hour per work day of **lighting, printers, and flat panel monitor** use at current electrical rates ($0.075/kWh).		
			2. Cost Avoidance based on reducing one **Coffee Pot** per 20 Employees, (2000 employees) to 50% operations in time or units.		
			3. Cost Avoidance based on reducing one **Charger** per Student and Employee,(11500 students and employees) to 50% operations in time or units.		
			4. Reduce **space heaters** by ensuring that end users have adequate apparel. Savings based on removal of 1 heater for 30 Gen. Fund Buildings.		
			5. Reduce **refrigerators.** Savings based on removal of 1 Refrigerator for 30 Gen. Fund Buildings.		
			6. Reduce **projectors.** Savings based on removal of 1 projector for 30 Gen. Fund Buildings.		

Recommendation Item	Systems		Behavior		
Ranks 3,6,7,9,33	**One-time Implementation Cost**	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**	**DTE or Consumers Energy incentive?**
3.Consolidate summer teaching/offerings in one building 6. Close buildings during university breaks 7. Offer weekend classes all at one site (e.g. IRC) 9. Be sure expensive lighting is turned off as much as possible (e.g. FLITE) 33. Close buildings between semesters	**NA**	**NA**	Implementation Cost Element: Behavior Modification & Requires Human Resources enforcement, see below comments.	**$114,235**	YES, plug load sensors, occupancy sensors and intelligent power strips
			1. Cost Avoidance based on **shutting off all lighting** for a minimum of 100,000 sq ft of building space.		YES, replacement of lamps, ballasts, entire fixtures, controls
			2. Cost Avoidance based on **shutting off *all* lighting** for a minimum of week, no building services.		
			3. Cost Avoidance based on **shutting off all lighting** for a minimum of 100,000 sq ft of building space during weekends		
			4. Cost Avoidance based on **increasing set point** by 5 deg f per 100,000 sq ft of building space. During cooling season from April to October		
			5. Cost Avoidance based on **decreasing set point** by 5 deg f per 100,000 sq ft of building space. During heating season from October to April.		
			6. Cost Avoidance based on **shutting down all buildings for one week.** During *cooling* season from April to October		
			*7. Cost Avoidance based on **shutting down all buildings for one week**. During heating* season from October to April.		

Recommendation Item	Systems		Behavior		
Ranks 5,11,27	**One-time Implementation Cost**	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**	**DTE or Consumers Energy incentive?**
5. Change power settings on computers for energy savings 11. Implement policy to purchase only *EnergyStar®* appliances, equipment and computer equipment 27. Eliminate CRT monitors across campus and replace with LCD 19" flat panel or better	**$89,775**	**$11,370**	Implementation Cost Element: Behavior Modification & Requires Human Resources enforcement, see comments below.	**$20,000**	YES, utility may pay for removal of low efficiency models; rebates and incentives on purchase of new EnergyStar® equipment and appliances; especially food service
	1. Total replacement CRT screens with flat screen operating 5,000. Number of CRTs campus-wide not including everything in GR or satellite offices: 525 (est. 15% of 3500)		1. Estimated cost avoidance contributed to energy saving mode for computer systems and EnergyStar® appliance purchasing policy.		

Recommendation Item	Systems		Behavior		
Ranks 13,14,22,29	**One-time Implementation Cost**	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**	
13. Replace water fixtures when necessary with only low flow/water saving types 14. Specify only low flow fixtures in new construction [1.1 gpf] 22. Install low flow fixtures on faucets 29. Install low flow showerheads in housing [1.8 gpm]	**$110,000**	**$73,500**	NA	NA	Not for water
	1. Change to low flow devices.				

Recommendation Item	Systems		Behavior		
Ranks 16,19,23	**One-time Implementation Cost**	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**	**DTE or Consumers Energy incentive?**
16. Install/ replace lighting fixtures and lamps with more energy efficient models 19. Consider LED lighting for some applications 23. Install motion sensors for some building areas	**$400,000**	**$189,000**	NA	NA	YES, replacement of lamps, ballasts, entire fixtures, controls
	1. According to a previous performance energy study, approximately 800,000 sq. ft. have older lighting systems that could be updated. 2. Based on improving lighting usage efficiency by installation of occupancy sensors in 1,000,000 sq ft classrooms.				

Recommendation Item	Systems		Behavior		
Ranks 15,17	**One-time Implementation Cost**	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**	**DTE or Consumers Energy incentive?**
15. Adjust HVAC set points and central control settings to moderate temperatures (e.g. 68F winter and 78F summer), rather than 72 deg year-round. 17. Encourage students, faculty, and staff to dress appropriately.	**$300,000**	**NA**	**Implementation Cost Element: Behavior Modification & Requires Human Resources enforcement, see below comments.**	**$414,358**	YES, some control systems are eligible through the custom program
	1. Investment in building automation control systems that adjust temperatures automatically.		1. Cost Avoidance based on increasing set point by 4 deg f for building space. During cooling season from April to October 2, Cost Avoidance based on decreasing set point by 4 deg f for building space. During heating season from October to April.		

Recommendation Item	Systems		Behavior		
Rank 20	**One-time Implementation Cost**	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**	**DTE or Consumers Energy incentive?**
20.Don't use power-assisted doors or elevators if you don't need them! (Power doors stay open longer allowing conditioned air to escape).	**NA**	**NA**	Implementation Cost Element: Behavior Modification & Requires Human Resources enforcement, see below comments.	**$48,050**	YES, motors, HVAC incentives, sensors and controls
			1. Typical motor size for an elevator is 25 hp, by reducing the operations for 100 elevators by an estimate 10% each week.		
			2. Cost Avoidance based on **decrease of heated air** building space. During cooling season from April to October		
			3. Cost Avoidance based on **decrease of cold air** for building space. During heating season from October to April.		

Recommendation Item	Systems		Behavior		
Rank 24	**One-time Implementation Cost**	**Annual Savings (Cost avoidance)**	**One-time Implementation Cost**	**Annual Savings (Cost Avoidance)**	**DTE or Consumers Energy incentive?**
24. Consider changes in cleaning and custodial behavior in buildings (e.g. "team cleaning" which is already occurring in housing)	**NA**	**NA**	Implementation Cost Element: Behavior Modification & Requires Human Resources enforcement, see below comments.	**$42,190**	YES, occupancy sensors
			1. Based on improving lighting usage efficiency by 10% for academic areas.		
			2. Cost Avoidance based on **decrease of heated air** building space. During cooling season from April to October		
			3. Cost Avoidance based on **decrease of cold air** for building space. During heating season from October to April.		

Behavior Modification or other infrastructure ideas from Appendix A not easily quantifiable (but there may be rebates or incentives available to assist in implementation)

12. Develop and implement policies to support energy conservation in all aspects of campus life

21. Encourage alternative transportation possibilities; don't drive-walk!

25. Make residence halls more energy efficient **REBATE or INCENTIVES? Yes, window film and insulation, controls, sensors**

26. Become aware of energy savings in personal environment and take action to save energy daily

28. Conduct energy audits of all buildings (utilize any existing studies as applicable). Means and methods planning required for identifying buildings and energy conservation efforts for measurement verification **REBATE or INCENTIVES? Yes, money available for service contracts?**

30. Submeters for all buildings as necessary or possible. Similar to conducting energy audits, **submeters** are necessary for efficiency improvement verification. To ensure that cost avoidance is captured, monitoring and creating demand-side controls are required. Means and methods planning required for verifying energy conservation efforts. **REBATE or INCENTIVES? Yes, money available for meters and installation**

31. Turn off motors on all campus vehicles while idling and/or unoccupied. Means or Method for managing non-utility system [e.g. gasoline usage]

Appendix C: ENERGY STAR in Higher Education – Good for Your Budget and the Environment

The table below presents a **typical basket of college or university** ENERGY STAR qualified products (these calculations are ***not*** based on FSU-specific information) – computers, vending machines, mini-fridges, and compact fluorescent lamps – typically found at Higher Education facilities.

Colleges and universities may obtain significant reductions in energy bills by changing purchasing policies to specify ENERGY STAR qualified products. **Action**	**Annual Energy & Maintenance Savings**	**Net Life-Cycle Savings** (based on an electricity rate of $0.103/kWh) (1)	**Annual Savings CO2 (Tons)**	**Life-Cycle Savings CO2 (Tons)** compared to conventional products.
Use ENERGY STAR power management to enable low-power sleep settings network wide on 2,000 computers (2)	$94,200	$258,000	701	2,808
Replace 50 conventional vending machines with ENERGY STAR versions	$9,000	$95,300	67	941
Use 300 ENERGY STAR qualified compact refrigerators in dormitories	$2,700	$15,600	20	199
Replace 200 incandescent lamps with ENERGY STAR qualified CFLs	$4,800	$14,600	20	69
Totals	$110,700	$383,500	808	4,017

(1) Figures obtained from calculators on the Purchasing & Procurement Web page; savings have been rounded to the nearest hundred for simplicity. Calculators may be downloaded (right-click) or used from the Web (left-click). Net life-cycle savings includes energy and maintenance savings and the purchase price of ENERGY STAR qualified products and conventional ones.

(2) Savings figures assume non-ENERGY STAR qualified systems do not have low-power mode enabled.

To Learn More

The Purchasing and Procurement Web site (www.energystar.gov/purchasing) helps you locate ENERGY STAR products by brand and model number, understand the differences between ENERGY STAR and non-ENERGY STAR products, and determine savings with ENERGY STAR. **Additional savings would result from enabling ENERGY STAR features on copiers and other office products, using Monitor Power Management, and using ENERGY STAR commercial clothes washers, refrigerators, freezers, and food service equipment**.

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