



ENERGY STAR

# Managing Energy Across Multiple Sites

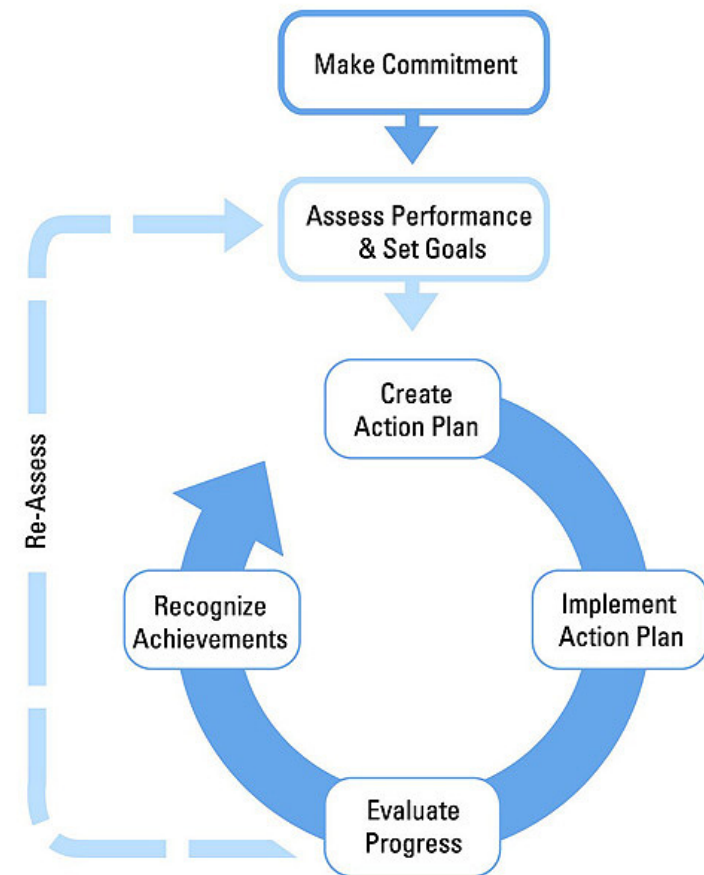
**May 19, 2004**



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# About The Web Conferences

- **Monthly**
- **Topics are structured on a strategic approach to energy management**
- **Help you continually improve energy performance**
- **Opportunity to share ideas with others**
- **Slides are a starting point for discussion**
- **Open & Interactive**





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# Web Conference Tips

- Mute phone when listening!  
Improves sound quality for everyone.
- If slides are not advancing, hit refresh or close presentation window and press the re-launch button again.



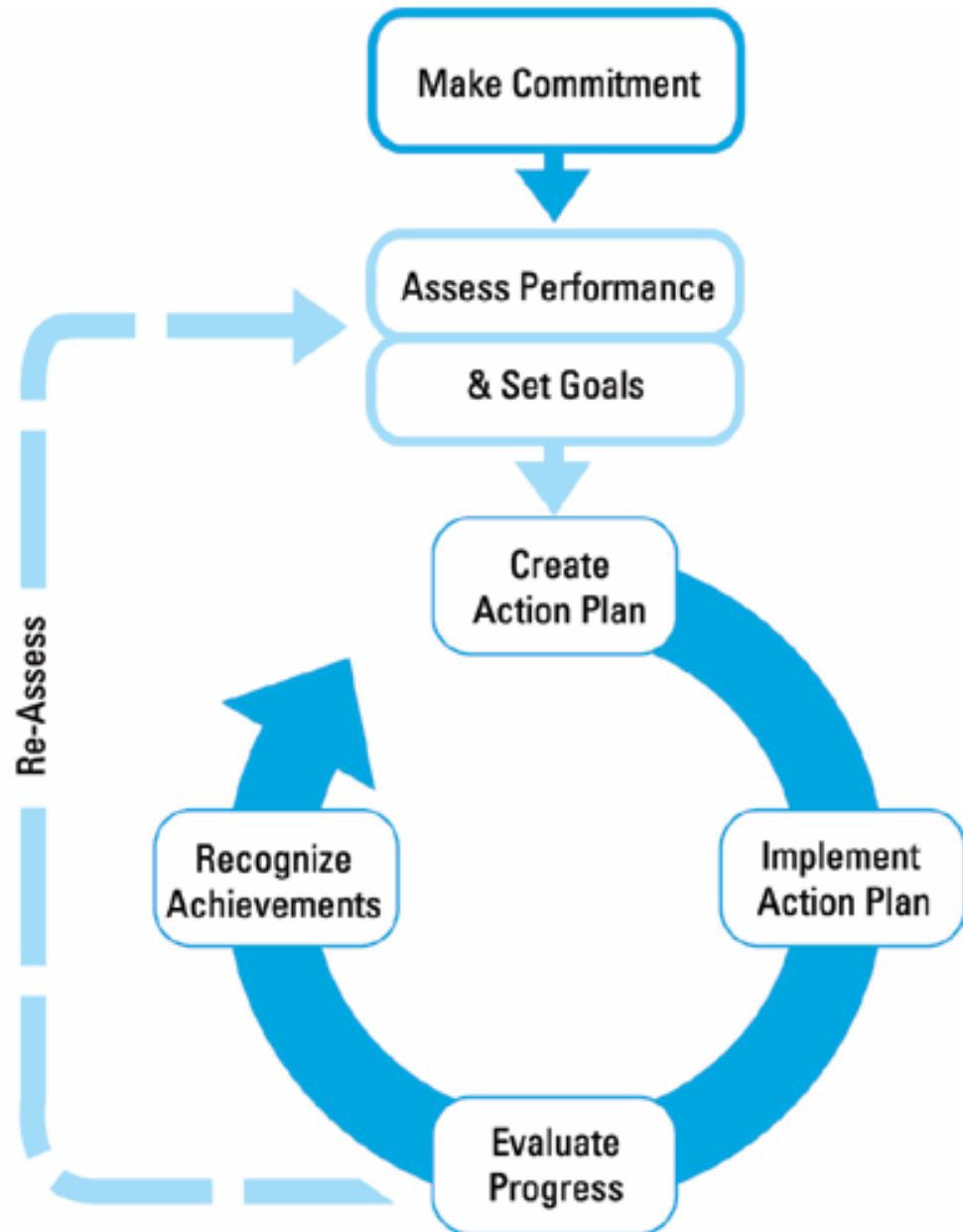
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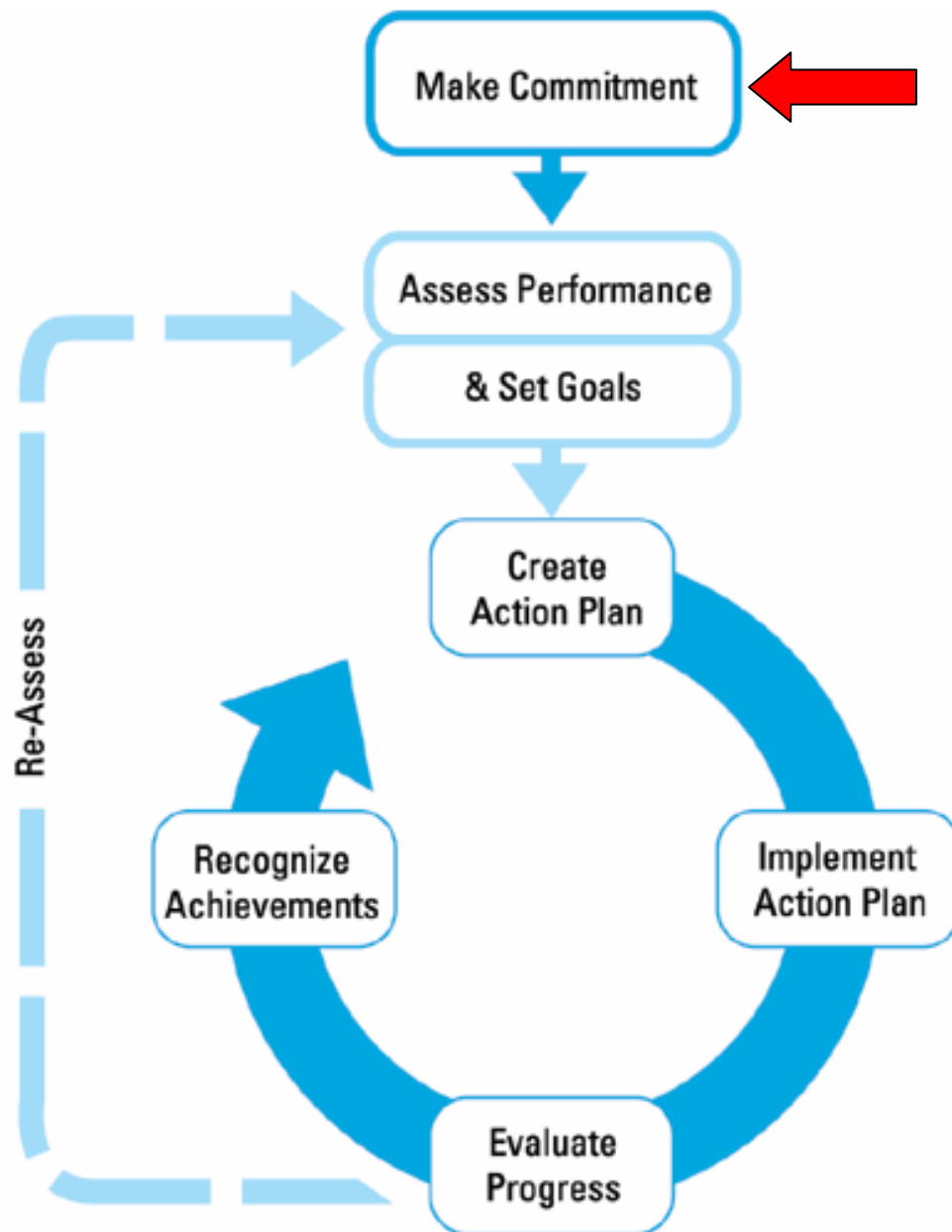
# Today's Web Conference

- Overview of energy management across sites
- Toyota's practices
- University of Michigan's methods
- Motivating people
- Wrap-up

# Guidelines for Energy Management

Learn more at  
[www.energystar.gov](http://www.energystar.gov)





Key Management Steps:

- Energy Director
- Energy Team
- Energy Policy



Key Management Steps:

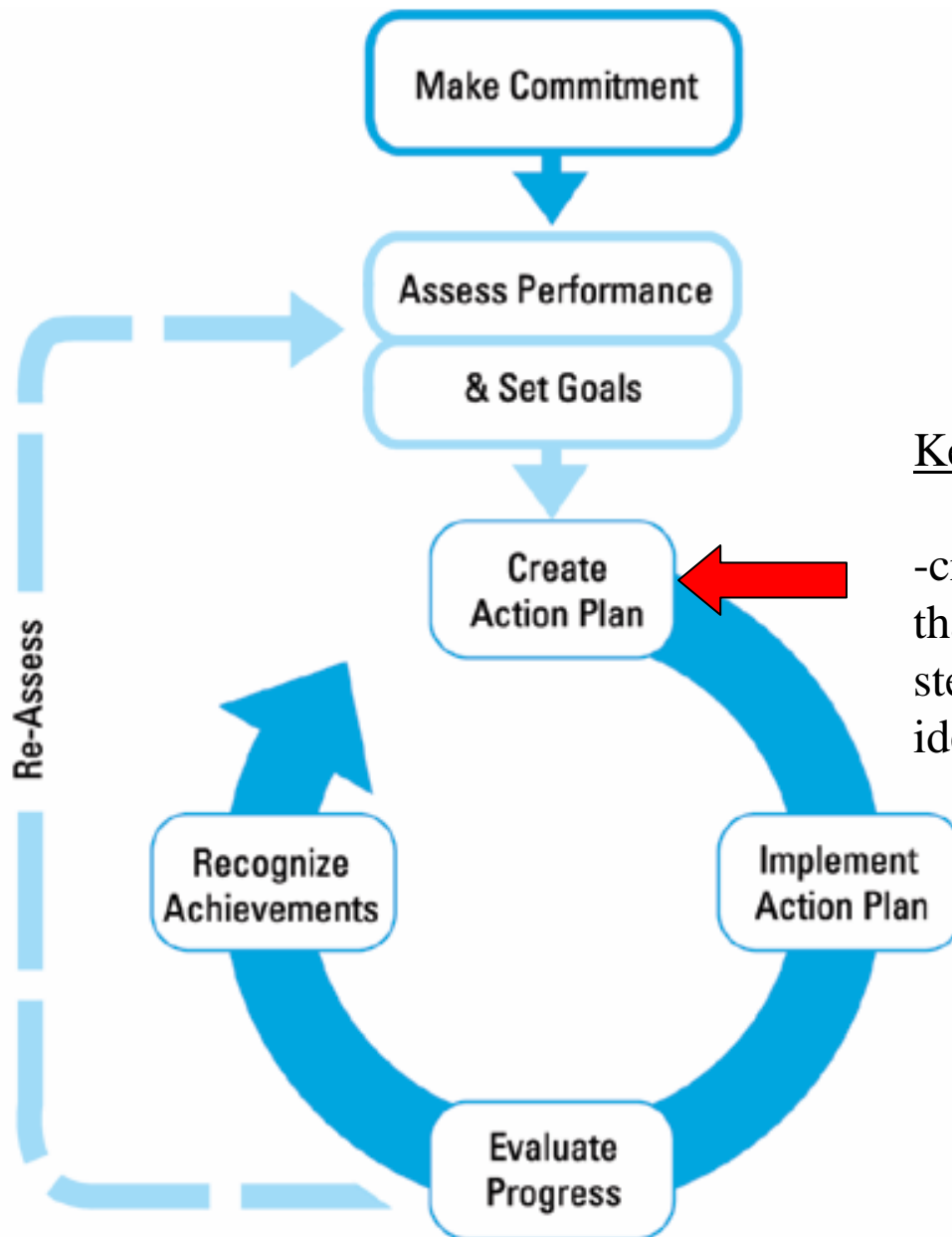
-Gather and track data; know how, when and where energy is used through tracking, benchmarking and assessments



Key Management Steps:

- Energy Director and team establish goals to drive energy management across the organization





Key Management Steps:

-create a corporate action plan that spans the sites, defines steps and targets, and identifies responsible people



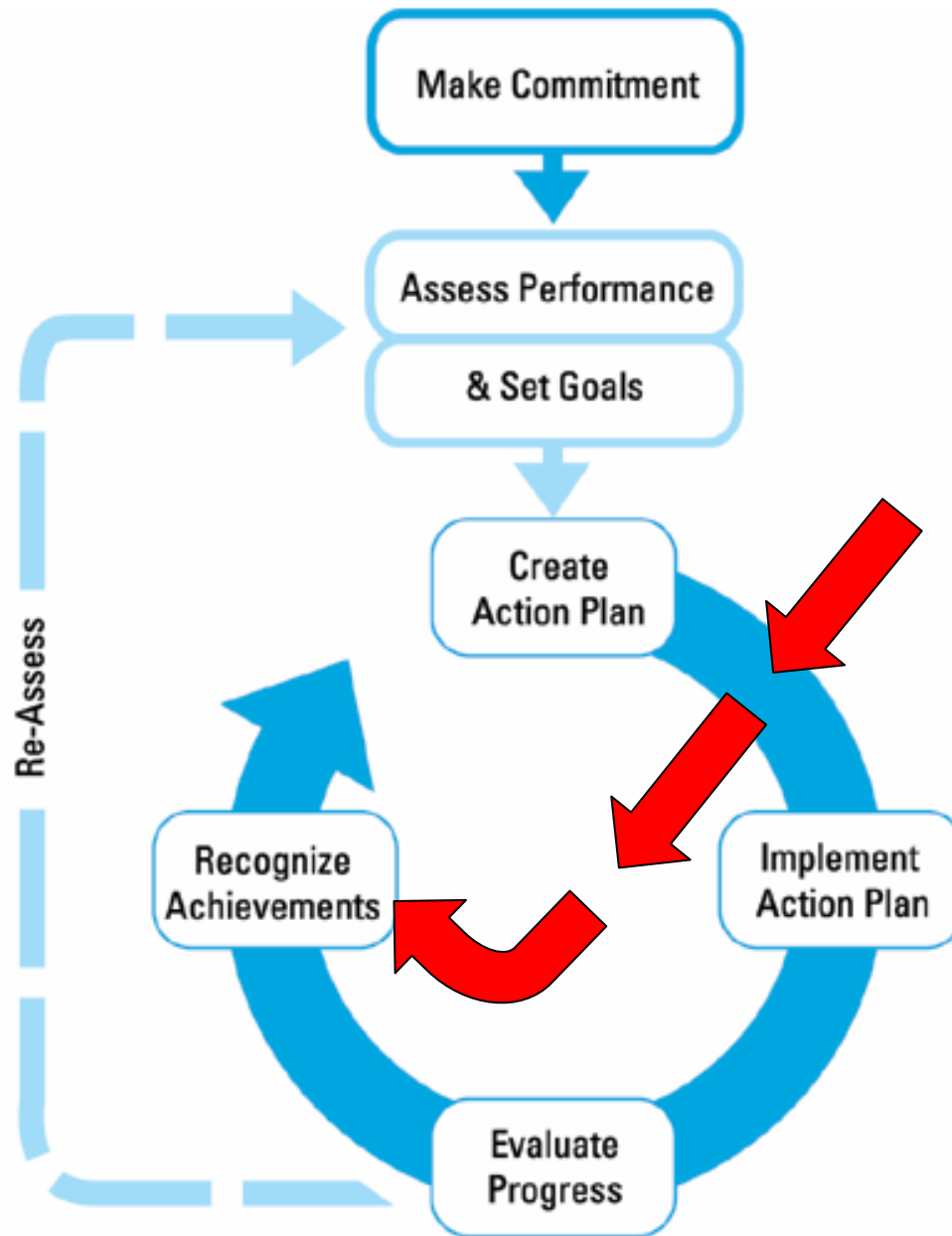
Key Management Steps:

-carry out actions;  
communication, raise  
awareness, motivate



Key Management Steps:

-measure and review plan



Key Management Steps:

- internal recognition
- external recognition



## ENERGY STAR® Guidelines to Energy Management Matrix

	0 - Little or no evidence	1 - Some elements/degree	2 - Fully implemented	Score
<b>Make Commitment to Continuous Improvement</b>				
<b>Energy Director</b>	No central corporate resource. Decentralized management.	Corporate resource not empowered	Empowered corp. leader with senior management support	
<b>Energy Team</b>	No company energy network	Informal organization	Active cross-functional team guiding energy program	
<b>Energy Policy</b>	No formal policy	Referenced in environmental or other policies	Formal stand-alone EE policy endorsed by senior mgmt.	
<b>Assess Performance and Opportunities</b>				
<b>Gather and Track Data</b>	Little metering/no tracking	Local or partial metering/tracking/reporting	All facilities report for central consolidation/analysis	
<b>Normalize</b>	Not addressed	Some unit measures or weather adjustments	All meaningful adjustments for corporate analysis	
<b>Establish baselines</b>	No baselines	Various facility-established	Standardized corporate base year and metric established	
<b>Benchmark</b>	Not addressed or only same site historical comparisons	Some internal comparisons among company sites	Regular internal & external comparisons & analyses	
<b>Analyze</b>	Not addressed	Some attempt to identify and correct spikes	Profiles identifying trends, peaks, valleys & causes	
<b>Technical assessments and audits</b>	Not addressed	Internal facility reviews	Reviews by multi-functional team of professionals	
<b>Set Performance Goals</b>				
<b>Determine scope</b>	No quantifiable goals	Short term facility goals or nominal corporate goals	Short & long term facility and corporate goals	
<b>Estimate potential for improvement</b>	No process in place	Specific projects based on limited vendor projections	Facility & corporate defined based on experience	
<b>Establish goals</b>	Not addressed	Loosely defined or sporadically applied	Specific & quantifiable at various organizational levels	
<b>Create Action Plan</b>				
<b>Define technical steps and targets</b>	Not addressed	Facility-level consideration as opportunities occur	Detailed multi-level targets with timelines to close gaps	
<b>Determine roles and resources</b>	Not addressed	Informal interested person competes for funding	Internal/external roles defined & funding identified	
<b>Implement Action Plan</b>				
<b>Create a communication plan</b>	Not addressed	Tools targeted for some groups used occasionally	All stakeholders are addressed on regular basis	
<b>Raise awareness</b>	No overt effort made	Periodic references to energy initiatives	All levels of organization support energy goals	
<b>Build capacity</b>	Indirect training only	Some training for key individuals	Broad training/certification in technology & best practices	
<b>Motivate</b>	Occasional mention	Threats for non-performance or periodic reminders	Recognition, financial & performance incentives	
<b>Track and monitor</b>	No system for monitoring progress	Annual reviews by facilities	Regular reviews & updates of centralized system	
<b>Evaluate Progress</b>				



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# Establishing Network Identity

- Use a Logo.
- Use a Network Stationery *LOOK*
- Create a Council of Site Energy Leaders. (4-6 people)
- Create a Website.
- Have a Senior Manager adopt the Network as Champion.



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# Communicate with the Network

- Monthly Feedback, News – Items.
- Share Identified Technology.
- Quarterly Status Reports.
- Annual Report of Network Activities- Status, Results and Upcoming Events.
- Conduct Annual Energy Summit.



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# Conduct Site Assessments

- At One Volunteer Site.
- Invite the Entire Network to Participate.
- Find Opportunities, Come Along Side of Facility Efforts, Find Best Practices- No Fault-Finding.
- Invite Process Participation.





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# Provide Added-value Tools

- Posters, Energy Awareness.
- CEM Certification.
- Share Expensive Diagnostic Tools Across Network.
- Identify Funding Opportunities for Projects.
- Technology Transfer from Other Companies.



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# Communicate Outside Network

- Celebrate Site Success Stories with Senior Management.
- Share Results Across All Business Units and Non-Energy Supporters. (PR, EHS, Procurement, GR, Maintenance, Engineering).
- Offer Champion to Accept Outside Recognition and Awards.
- Sell Accomplishments with Facts to Publications, internal and external.



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# **Managing Energy Across Multiple Sites.**

Toyota Motor Manufacturing  
North America

ENERGY STAR Webcast, May 19, 2004  
Bruce Bremer-Manager Facility Engineering



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# Historical Background

## Toyota Motor Manufacturing North America-TMMNA

- 6 Assembly plants-NAMCs
- 3 Engine Plants
- 4 Unit plants (Casting, wheels, etc)
- Production > 1M vehicles/year



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# TMMNA Conception

- 1997
  - Established Toyota North America Corporate Headquarters
  - Established Company Energy Key Performance Indicators



# TMMNA Facilities Engineering Responsibilities

- Energy Consumption Forecasts
- Energy Reduction Activities/Projects
- Energy Action Plan Targets
- Natural Gas strategy
- Energy Risk Management Program
- Facilities System & Equipment standards
- New Plant Site selection and Utility Infrastructure coordination
- Energy Design Feedback-Process and Utilities

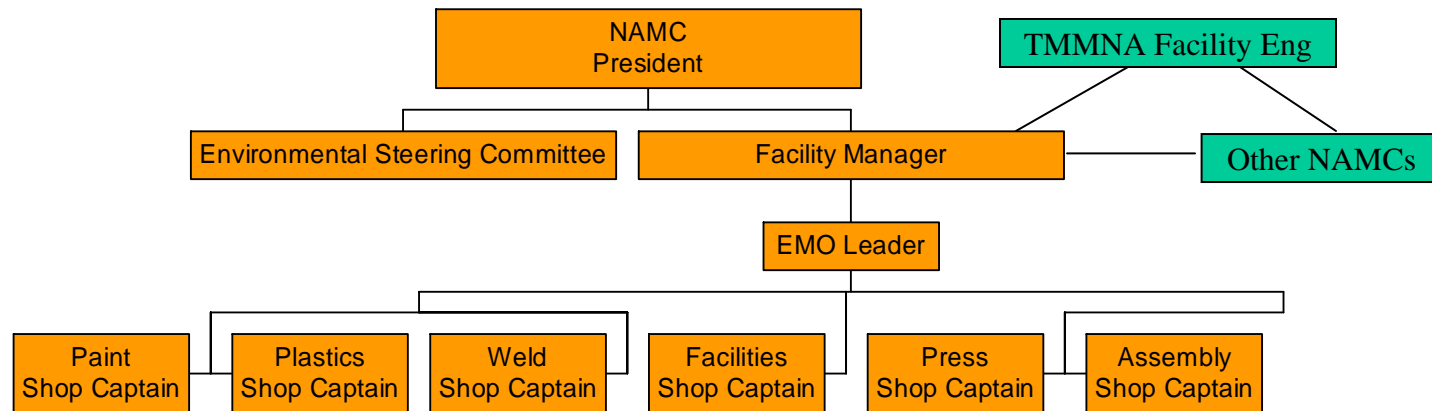


# TMMNA Energy Program Summary

- 1) Energy Management Organization
- 2) Energy Measuring Systems
- 3) Energy Target Setting
- 4) Implementation – How to Reach Targets
  - a) Kaizen database
  - b) Pilot Kaizens
  - c) Design feedback
- 5) Energy Visualization Target Tracking/Reporting



# 1) Energy Management Organization





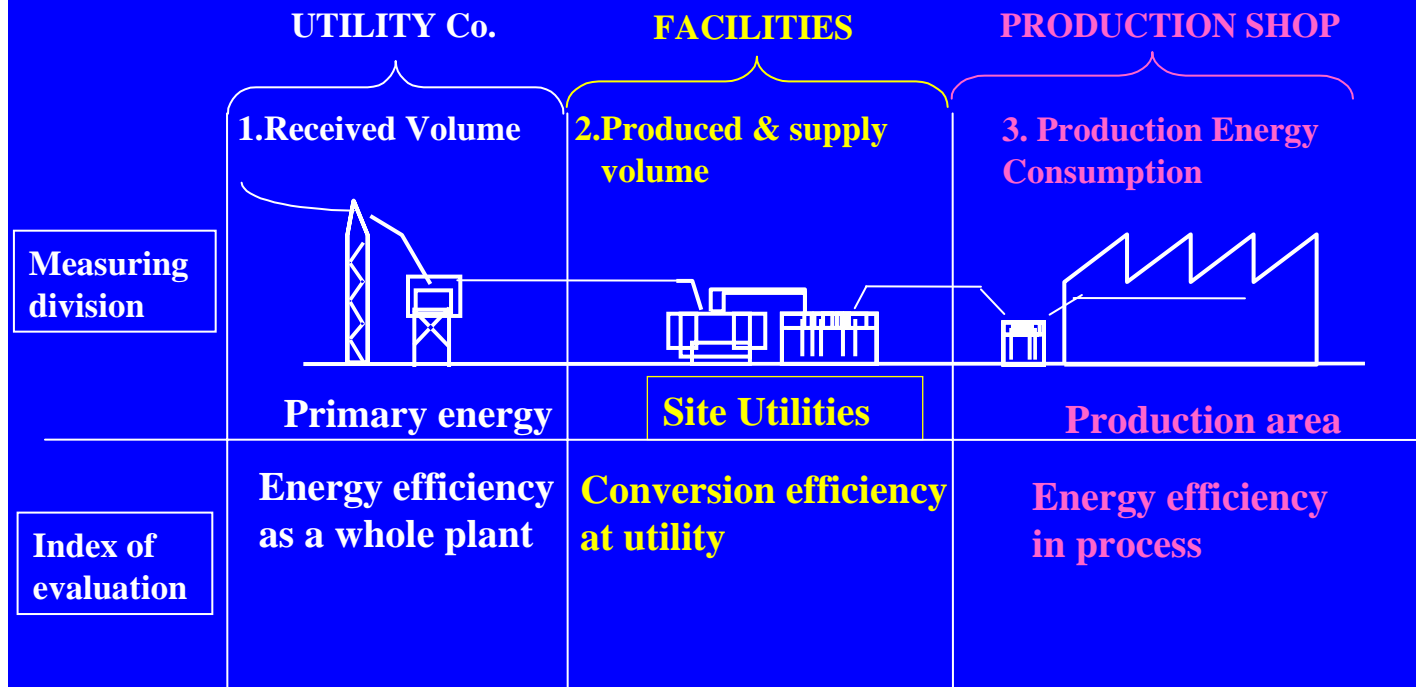


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# 2) Energy Measurement System

## Purpose

1. Promote energy management by Plant management
2. Promote energy reduction by shop management
3. Establish energy/unit as a KPI





## 2) Energy Measurement System

- All primary energy-elect, gas, water, steam, air, chilled water-sources are metered to the plant level.
- All energy sources are metered to the production shop level
- Consumption and cost are fed back to TMMNA monthly via Environmental Performance Indicator system.



### 3) Energy Target Setting: Energy Action Plans

- Part of Company's Environmental Targets
- Roadmap to Energy Reduction
  - Established yearly energy targets/unit of production
  - Major kaizen activities planned to achieve targets
  - Established funding and manpower
- Subject to Revision
  - Greater challenges not lesser

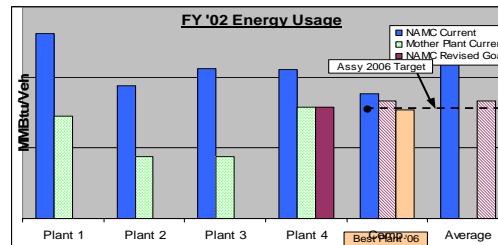


# 3) Energy Target Setting

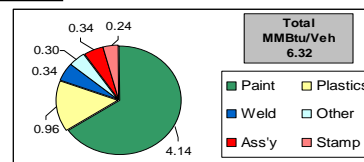
## 2006 Energy Action Plan

### Purpose :

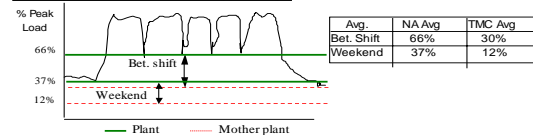
### Current Situation



### Energy Usage



### Non-Production Time Energy Usage



### Key Activities:

- 1) Focus on paint shop energy reductions
- 2) Optimize Non-production energy

### Energy Metering :

All shop metering is operational and meets TMC's requirements.

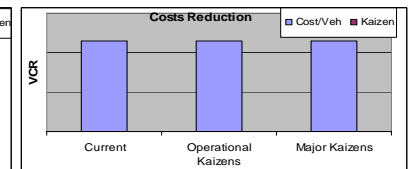
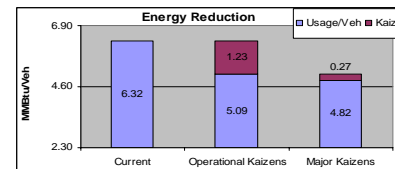
Develop plan and implementation costs for measuring all utilities ED, Primer, T/C Booths, and all Ovens by the end of November 2002.

### Kaizen Scenarios:

Operational Kaizens	Dept.	Energy Savings (MMBtu/Veh)	Savings (\$/Veh)	Implement. \$/Veh	Impl. Costs (\$)
A. Reduce NAMC electrical loads to TMC BS and WE stds; Tahara BS=30 WE=12, TMM Current BS=66 WE = 37	All	0.56			\$ 50,000
B. Reduce painting booth air flow IAW NFPA 91. 10% reduction from existing 1,266,250 cfm.	T/R	0.18			\$ 20,000
C. Eliminate air flow in portions of paint booths that work is not being performed in. Reduce booth area 3% average.	T/R	0.14			\$ 50,000
D. Reduce air volume at lunch and between shifts to 50% of 1,033,000 cfm. Total of 4.7 hours day. (Gas Savings)	T/R	0.05			\$ 20,000
E. Database Kaizens not yet implemented	All	0.29			\$ 550,000
<b>Sub-Total</b>		<b>1.23</b>	<b>- \$</b>	<b>- \$</b>	<b>\$ 690,000</b>

- Investigate and Plan Operational kaizens by 3<sup>rd</sup> Qtr FY04  
- Evaluate Major kaizen budget in 4<sup>th</sup> Qtr of FY04

Major Kaizens	Dept.	Energy Savings (MMBtu/Veh)	Savings (\$/Veh)	Implement. \$/Veh	Impl. Costs (\$)
1. Steam Generation through Incinerator Waste Heat Recovery: 6 klb/hour 60 psi steam	T	0.22			\$ 1,000,000
2. EnergySaver panels: 2,000 HIDs, 24 x 365 and 100T base-load cooling 8 months year	ALL	0.03			\$ 1,100,000
2. Add De-Superheater: Recover heat from ACU for pre-heating boiler water make-up water.	F/C	0.02			\$ 100,000
<b>Sub-Total</b>		<b>0.27</b>	<b>- \$</b>	<b>- \$</b>	<b>\$ 2,200,000</b>
<b>Project Payback = #DIV/0!</b>	<b>Total</b>	<b>1.50</b>	<b>- \$</b>	<b>- \$</b>	<b>\$ 2,890,000</b>



### Yearly Energy Targets

Plant	FY 01	FY 02 (Base Year)	FY 03	FY 04	FY 05	FY 06	Total
<b>Current Plan</b>			3%	3%	3%	3%	12%
<b>Additional Plan</b>							
<b>New Annual Reduction Targets</b>							
<b>Actual Target (MMBtu/Veh)</b>	8.12	6.32	6.319	6.319	6.319	6.319	0.00

0.00 - Total Reduction required to achieve target ( FY02 - FY06)



## 4) Implementation – How to Reach our Targets

- Energy Kaizen Database – Tool
  - Kaizen ideas
  - Implementation details
- Information Source
  - All team members can view on Intranet
  - Only authorized team members can modify details



# 4a) Database Home Page

TMMNA Facilities Engineering Kaizen Website - Microsoft Internet Explorer provided by Toyota Motor Manufacturing

Address: http://t00vm105t.tmmna.tmm.toyota.com/FEKaizens/NewDataSearch.aspx

### Tracking Information

Kaizen ID:  Shop:   
 Type:  Process:   
 Yokoten Item:  Date:

[NAMC Kaizen Database](#)

Page though the Kaizen records

### Quick Search

Advanced Search

Step 1

Select which fields will be returned, or choose one of the defaults

Standard Fa

## Facilities Engineering Kaizen Website

**NEW Note:** The Kaizen ID numbering system has changed, [click here to read about it](#)

[Login](#) [Help And Tutorials](#)

Create a new Kaizen using this simple form†  
(Last updated: Sunday, February 15, 2004)

[Detail Sheet with Calculations](#)

APRex Kaizen

Variable	Value	Unit
hours/day	22	hr
days/month	22	Day
months/year	12	Month
operation Time	5808	hours

†Make sure to save a local copy of this Detail Sheet before filling it out

Browse through a listing of every detail sheet

[Detail Sheets](#)

View information regarding NAMCs and their Kaizens

[Standard Reports](#)

Please let us know how we can improve our Website. All comments will be reviewed.  
[Click here to submit a comment or suggestion.](#)

The Production Kaizen Website was last updated: 3/22/2004 3:03:00 PM

Taskbar: Start, Brad Reed..., Completed..., TMMNA Ene..., Untitled - Paint, Microsoft E..., TMMNA Fa..., Local intranet, 9:17 AM



# 4a) Database Kaizens

29 Discrete Categories,  
16,000 Ideas

Master Kaizen Modification Form - Microsoft Internet Explorer provided by Toyota Motor Manufacturing

Address: http://t00vm105t.tmmna.tmm.toyota.com/FEKaizens/Default.aspx

Kaizens... Standard Reports Master Menu... Detail Sheet with Calculations Help Search Results

### Search Kaizens

Enter KaizenID  Search [Home Page](#)

First Previous Next Last **Master Kaizen Modification Form** 1 of 1829 Records

Tracking Information		Contact Information	
Kaizen ID	A-0000-0001	Shop	Assembly
Type	Operational	Process	Lighting
Yokoten Setup/NAMC Database Add		Yokoten Item? <input checked="" type="checkbox"/>	
<b>Yokoten to Shops:</b>			
<input type="checkbox"/> Assembly <input type="checkbox"/> Casting <input type="checkbox"/> Paint			
<input type="checkbox"/> Facilities <input type="checkbox"/> Machining <input type="checkbox"/> Plastics <input type="checkbox"/> Stamping <input type="checkbox"/> Bodyweld			
Resources			
Elect <input checked="" type="checkbox"/> NG <input type="checkbox"/> CA <input type="checkbox"/> Steam <input type="checkbox"/> CW <input type="checkbox"/>			
WWTP <input type="checkbox"/> POTW <input type="checkbox"/> Other <input type="checkbox"/> Water <input type="checkbox"/>			
Kaizen Information			
Kaizen Item	Turn off high bay lights on weekends.		
Kaizen Content	Educate team members to turn off the lights or set up an automatic		

**Actions**

Add Kaizen  
Save Changes  
Delete Kaizen

Start | Brad Reed - Inb... | FY03 - 06 NAM... | TMMNA Energy ... | Master Kaizen... | Local intranet | 9:03 AM



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# 4a) Data Base Reports

Standard NAMC Reports - Microsoft Internet Explorer provided by Toyota Motor Manufacturing

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Print Mail

Address <http://t00vm105t.tmmna.tmm.toyota.com/FEKaizens/default.aspx> Go Links

[Kaizens...](#) [Standard Reports](#) [Master Menu...](#) [Detail Sheet with Calculations](#) [Help](#) [Database Modification Login](#)

## Standard Kaizen Reports [Home Page](#)

**Kaizen Status** [Example](#)  
Provides the current status of all active kaizens for the selected NAMC. Complete and Not Applicable Kaizens are not active.

**Kaizen History** [Example](#)  
Lists every Kaizen for the selected NAMC.

**Shop Kaizen Yokoten** [Example](#)  
Reports all Kaizens that are Yokoten Kaizens for the selected Shop.

**Pie Chart Status** [Example](#)  
Generates pie charts of Kaizen activity specific to the selected shops at each NAMC. Includes only those reports that are applicable to the selected shop.

**Progress/Savings Status**  
Generates a report that includes the kaizen ID, the kaizen description, its process, any comments, its progress, KGAL saved, KWH saved, and MMBTU saved.

**Treasure Hunt Status**

**Savings Report**  
Shows the Savings Report for each NAMC and also has total savings numbers.

**Master Kaizen & NAMC Table**  
Dumps all of the data in both the Master and NAMC databases.

**Recently Completed Kaizens**  
Returns the information of Kaizens where the ModProgress field equals 1 (???)

**Orphaned Kaizens**  
Produces a report containing Kaizens yokotened to NAMCs, but don't appear in the Master database

**Yokotenless Kaizens**  
Selects Master Kaizens where the Yokoten box is checked, but the Kaizen is not yokotened to any NAMC

Local intranet

Start | Brad Reed - Inb... | FY03 - 06 NAM... | TMMNA Energy ... | Standard NAM... | untitled - Paint | 9:07 AM





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## 4b) Pilot Kaizens

- Pilot Kaizens are Designed and Implemented to Prove Concept.
  - Sourcing may be NA, NAMC external-ENERGY STAR/benchmarking.
  - Labor is often split between NA and NAMC.
  - Data collection is strictly enforced.
  - Results are shared with all NAMCs
  - Successful pilots are yokotened to other NAMCs



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## 4c) Design Feedback

- Establish Energy Ideas into New Plant Construction.
- Sources:
  - Kaizen database
  - New technology
  - Benchmarking
- Cost Justification is Required.



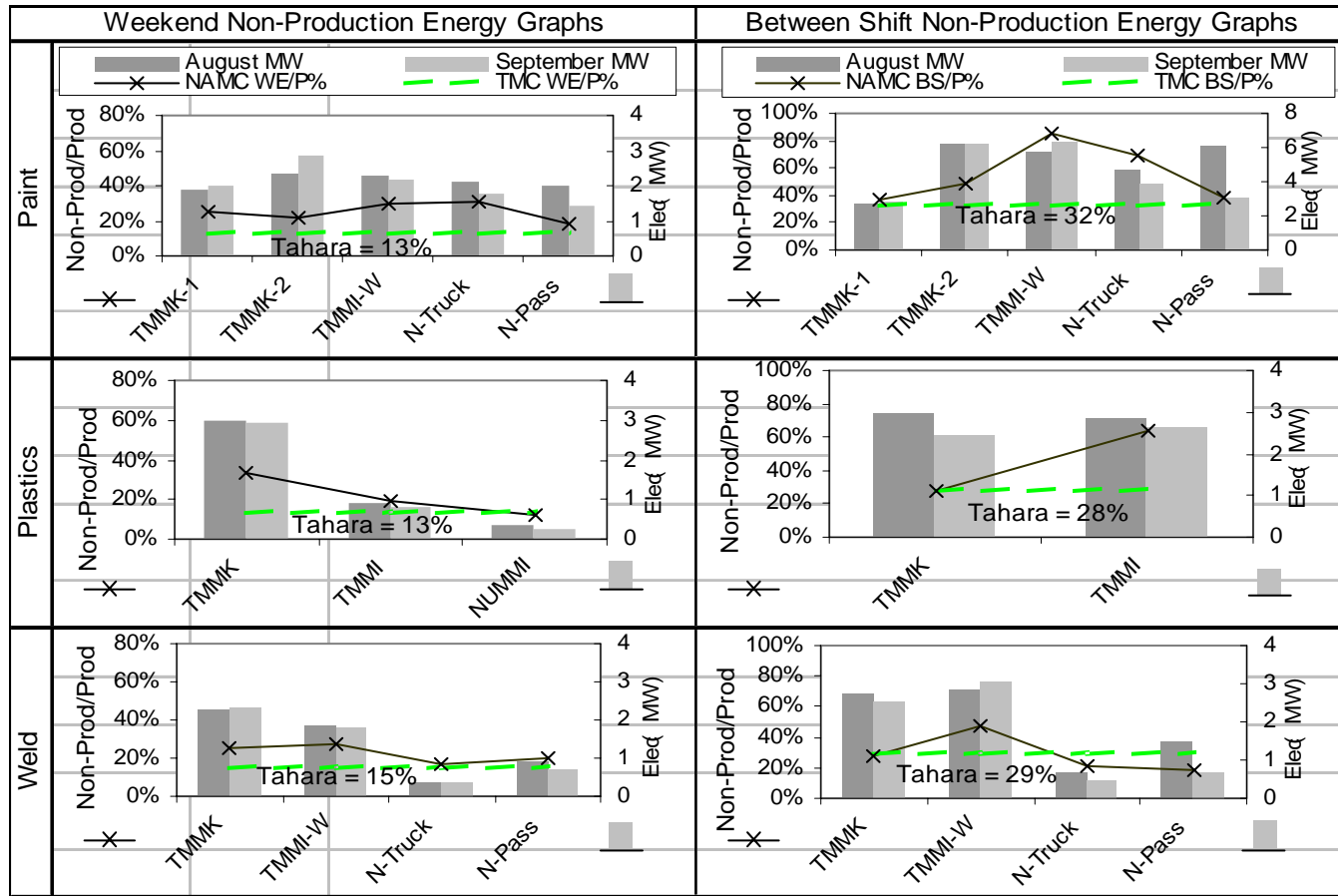
## 5) Visual Target Tracking

- Monthly/Quarterly/Yearly NAMC energy comparison reports to all Management
  - Plant
  - Shop
  - Consumption
  - Cost
  - Previous Year
  - Non-production/weekend



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# Non-Production Energy Report





# Benefits

- Lower Operating Costs
- Lower Capital Costs
- Reduce Environmental Impact  
Internal and External
  - Lower emissions
  - Lower consumption



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## Future

- Continue to Set Aggressive Energy Reduction Targets
- Continue to Implement Best Practice Sharing
- Continue to Enhance Toyota as an Environmental Leader



# EPA ENERGY STAR Webcast Presentation

Bill Verge, P.E.

Plant Operations Associate Director for Utilities & Plant  
Engineering

The University of Michigan  
Ann Arbor, Michigan

May 19, 2004



The University of Michigan





## The University:

- A World Class University
- Energy Accounting
- Energy Management in the Past
- The ENERGY STAR Program
- Program Successes
- Future Program



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## The University:

- Supports 19 schools and colleges – decentralized administration
- There are 35 centers and 18 institutes of related research and education
- Offers 600 degree programs
- And an extensive medical center
- With a daytime population of 70,000 including 36,000 students



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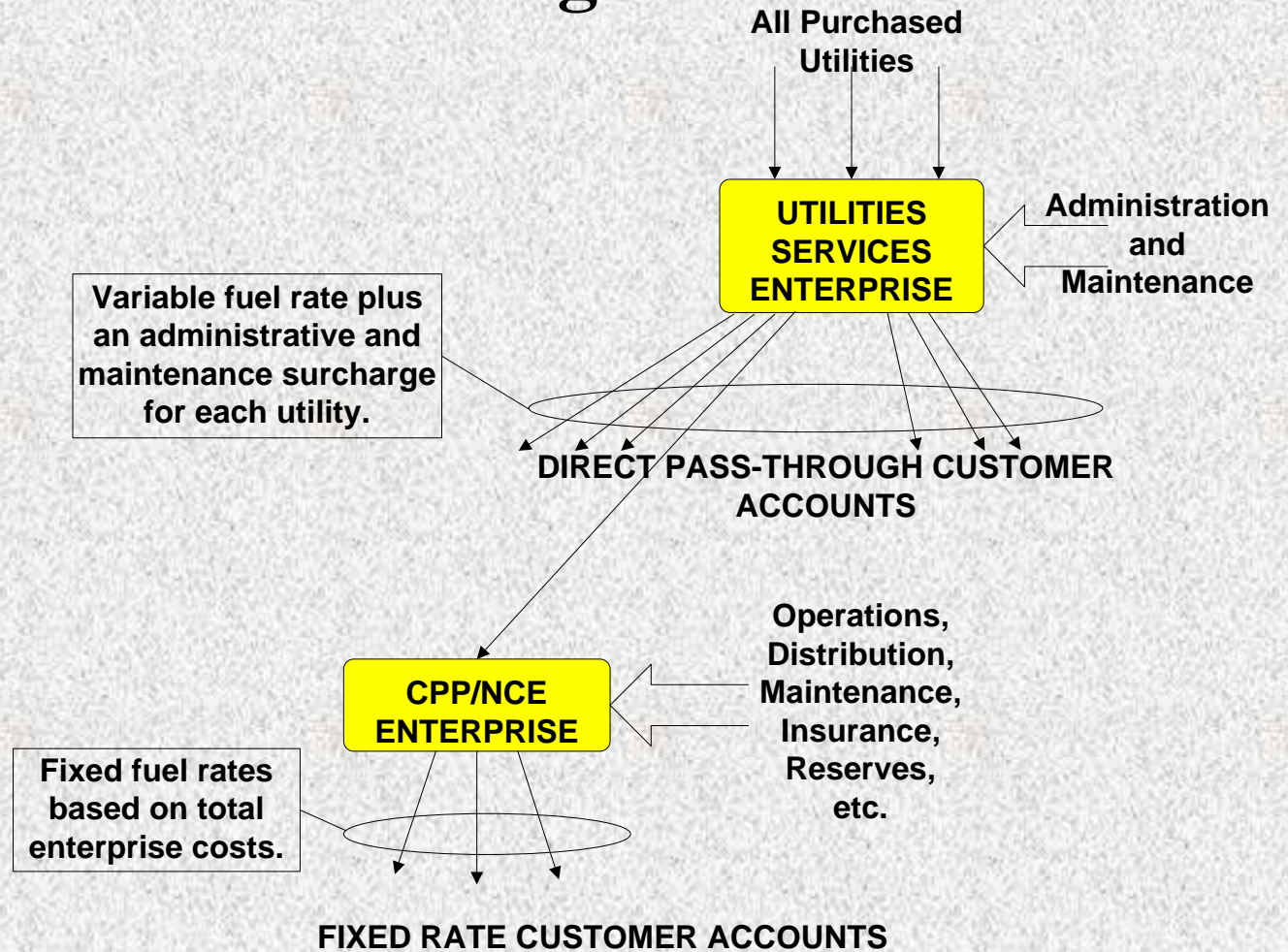
- UM has a budget of \$3.6 billion a year
- That includes a research budget of \$656 million
- There are over 315 major buildings from offices to very energy intensive research facilities
- Annual energy costs of \$71 million
- The UM consumes 5.05E12 btu of energy per year in over 28,000,000 sq ft of space
- Enough to supply the City of Ann Arbor with over 125,000 people in 46,000 households



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# Utilities Accounting



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## Energy Conservation before 1997

- Dispersed commitment to energy conservation existed prior to the ENERGY STAR program.
  - Funding was available for ECMs
  - Energy conservation engineers on staff
  - Maintenance engineers on staff
  - Steam trap program in place
  - Lighting program getting started
  - Building automation systems growing rapidly
- But no campus wide energy conservation initiative



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## Energy Management Vision

- Focus and Organization of Existing Energy Management Activities and Resources
- Fair Allocation of UM Energy Conservation Accounts to General Fund Units
- Services More Conspicuous to UM Community
- Vehicle for Communicating with UM Units
- Valuable Service Provided at a Time When Utility Costs are Shifting to Departmental Budgets
- Opportunity to Implement a Program with Strong Student Support



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## The Plan – Campus-Wide Adoption of the ENERGY STAR Program

- Detailed proposal was submitted to upper management recommending implementation of the ENERGY STAR program and laying out costs and benefits.
- Primarily based on reorganizing existing resources, rather than adding new resources.
- Extensive data was provided supporting expected costs and savings.
- Beginnings of campus wide “selling” of the program.
- Memorandum Of Understanding was signed with E.P.A on June 19, 1997 for 14 million gsf in seven years



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# Energy Star Program Implementation

**Energy Management  
Division Team**  
(Administration)

Energy Engineering  
BAS System Management

**ENERGY STAR  
Implementation Team**  
(Operation)

Energy Engineering  
Maintenance Services Engineering  
A/C Shops  
Zone Maintenance  
BAS System

**Energy Conservation  
Committee**  
(Energy Project Funding)

Plant Engineering (2)  
Facilities Planning & Design  
Faculty Representative

Tune-up Crews  
Student Interns  
Contract Engineers



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# Costs

– Lighting Retrofit Projects	\$1.9 million/year
– Energy Conservation Projects	\$1.1 million/year
– Tune-Up Personnel	\$0.6 million/year
– Tune-Up Materials	\$0.4 million/year
– Engineering Staff	<u>\$0.4 million/year</u>
– Total	\$4.4 million/year



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# Cost Reductions

- **- Added Each Year of Program:**

- Lighting Retrofits \$0.42 million/year
- Mechanical Systems Tune-ups \$0.38 million/year
- Energy Conservation Measures \$0.22 million/year
- Total \$1.02 million/year

- **Estimated Cost Reduction**

**Achieved At End of Program** \$5.7 million/year

- **Savings Now Projected to Reach \$9.7 million/year**



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# Intangible Benefits of the Program

- **ENERGY STAR Building Reference Manual**
  - Building Floor Plans Showing HVAC Zones
  - Schedules of Mechanical Equipment
  - HVAC Control Diagrams
  - BAS Point Log Software Listings
  - BAS Log of Building Complaints
  - Energy Consumption Data and Trends for Seven Years
  - List of Maintenance Work Orders Issued During the Last Two Years
- **ENERGY STAR Tune-Up Data Book**
  - Equipment Surveys and Inspection Reports
  - Steam Trap Surveys and Reports



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## Biggest Reason for Success of the Program: Improved Communications

- Annual Utility Report
- Annual ENERGY STAR Status Report
- Facilities Users Network
- UM ENERGY STAR web site
- Energy Fest each September
- ENERGY STAR Progress Posters



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## Communications

- ENERGY STAR Certificates of Completion
- Presentations to the Board of Regents
- Celebration and Appreciation Luncheons
- Press Releases and Articles to student, internal, and local media.
- Publication of Brochures
- Energy Conservation Posters, light switch covers, pocket thermometers
- ENERGY STAR Award for Excellence in Energy Management



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# ENERGY STAR - The Next Steps

## The Energy Conservation & Outreach Program

- New Energy Conservation Liaison Position
- Work with University departments to recruit and train “building energy proctors”
- Educate and Promote responsible energy conservation practices
- Advocate Energy Standards and Policies
- Re-commission all HVAC systems on a six year cycle.



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# Questions & Discussion



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# Upcoming Web Conferences

June 23\* – ENERGY STAR Leaders

July 21 – From 40 to 75: How did you do it?

August 18 – Avoid the O & M Rollercoaster

[www.energystar.gov/networking](http://www.energystar.gov/networking)



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Thank You!