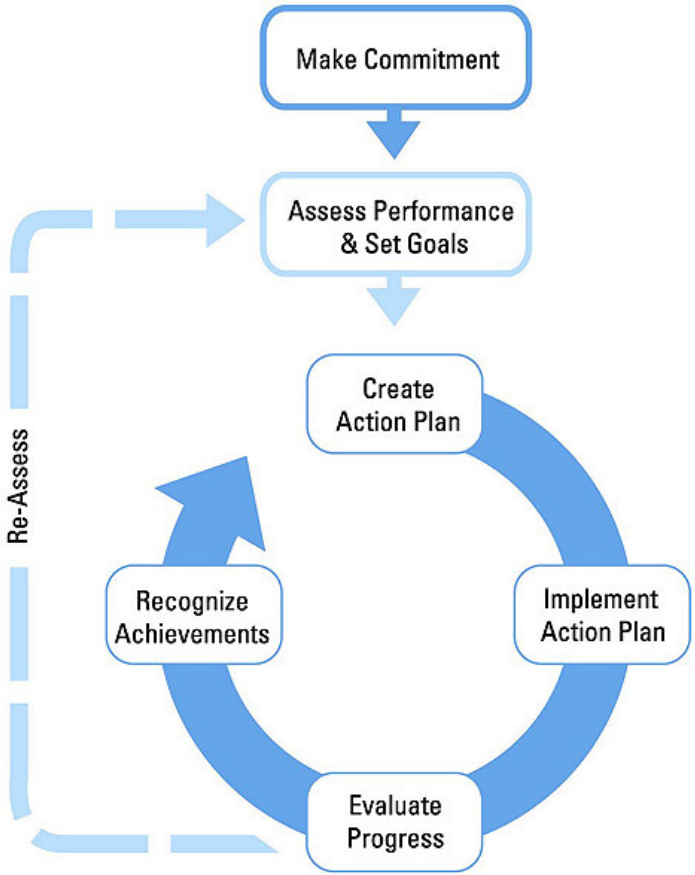
Managing Energy Across Multiple Sites

May 19, 2004

About The Web Conferences

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



Web Conference Tips

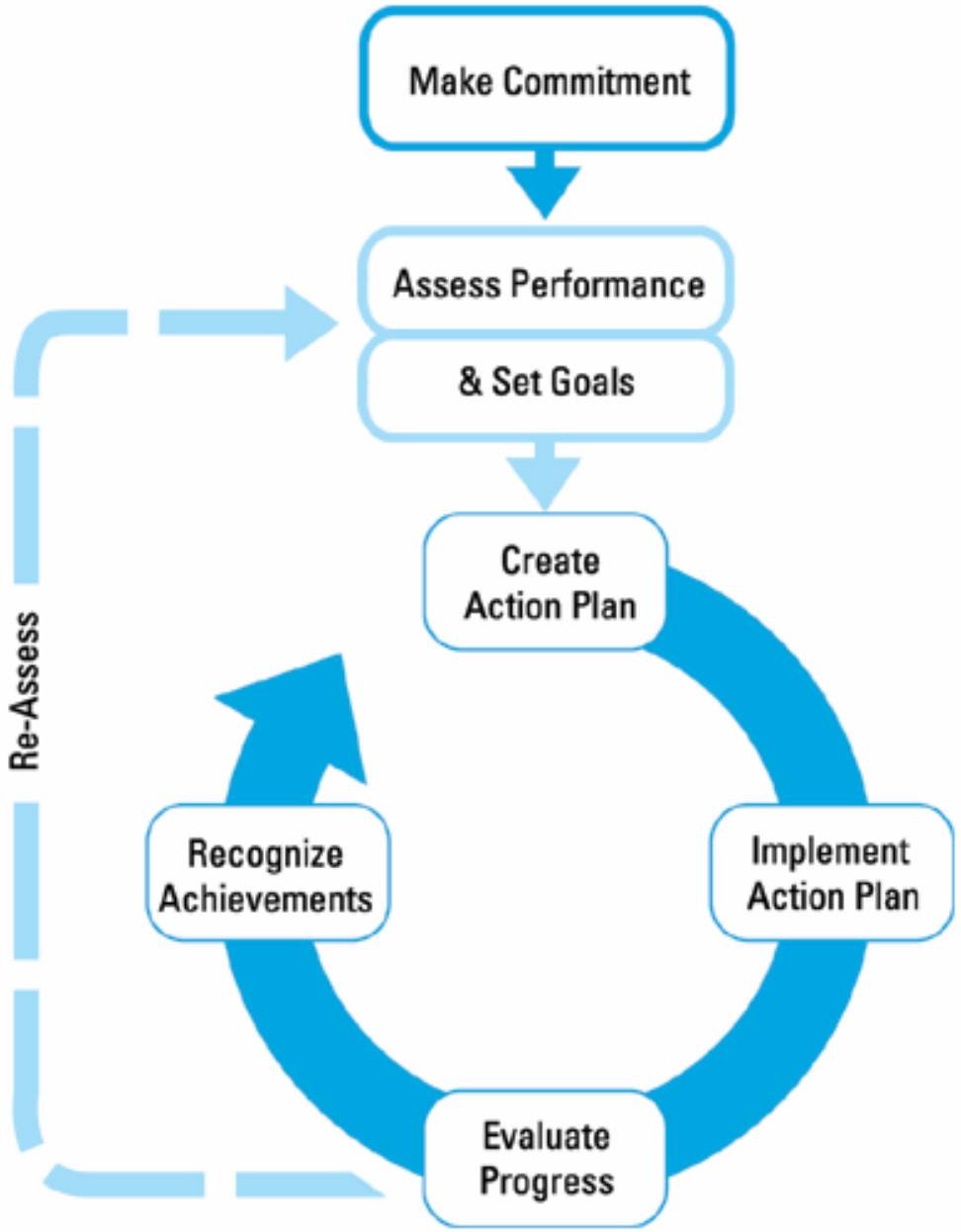
- Mute phone when listening! Improves sound quality for everyone.
- If slides are not advancing, hit refresh or close presentation window and press the re-launch button again.

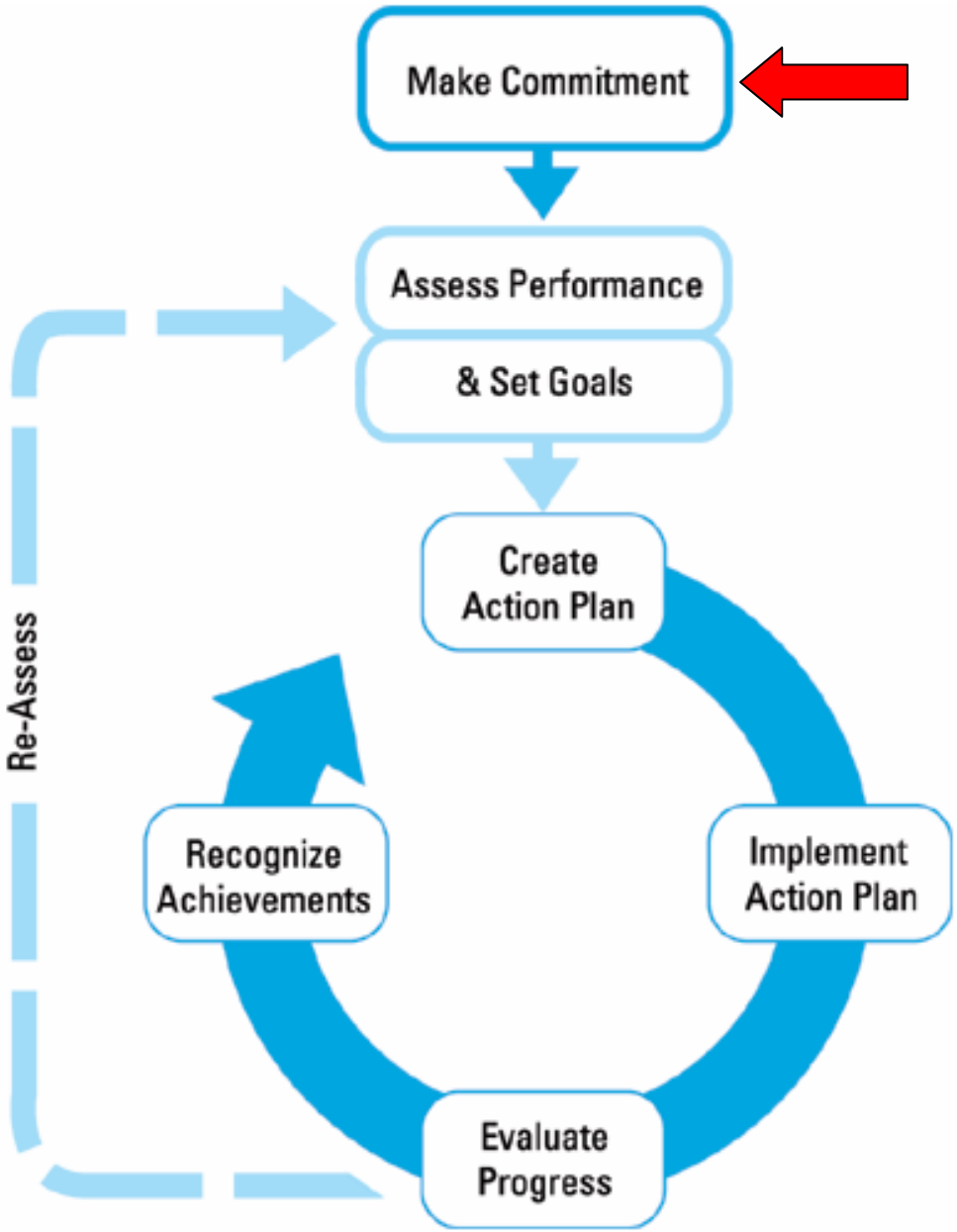
Today's Web Conference

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

Guidelines for Energy Management

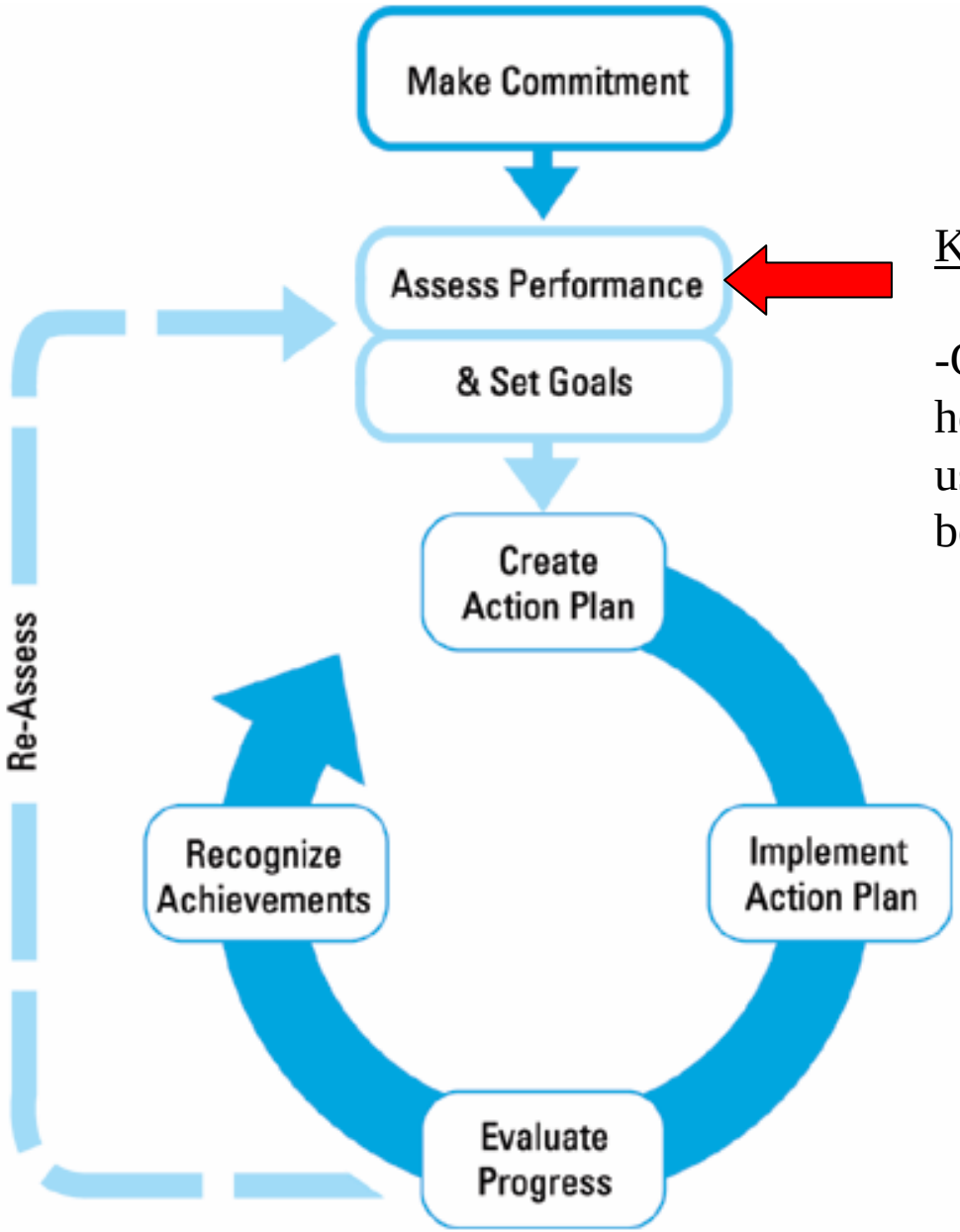
Learn more at www.energystar.gov





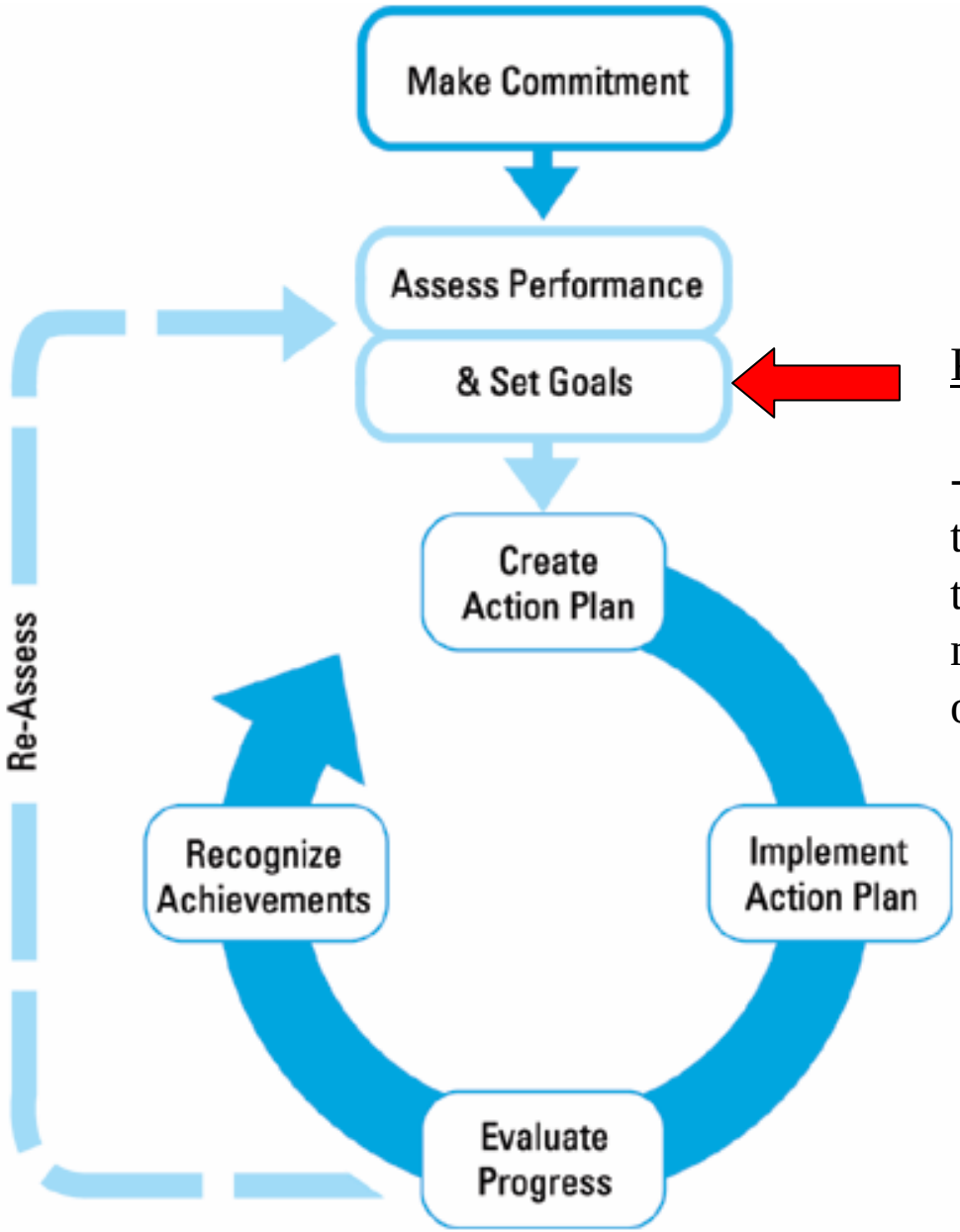
Key Management Steps:

-Energy Director
-Energy Team
-Energy Policy



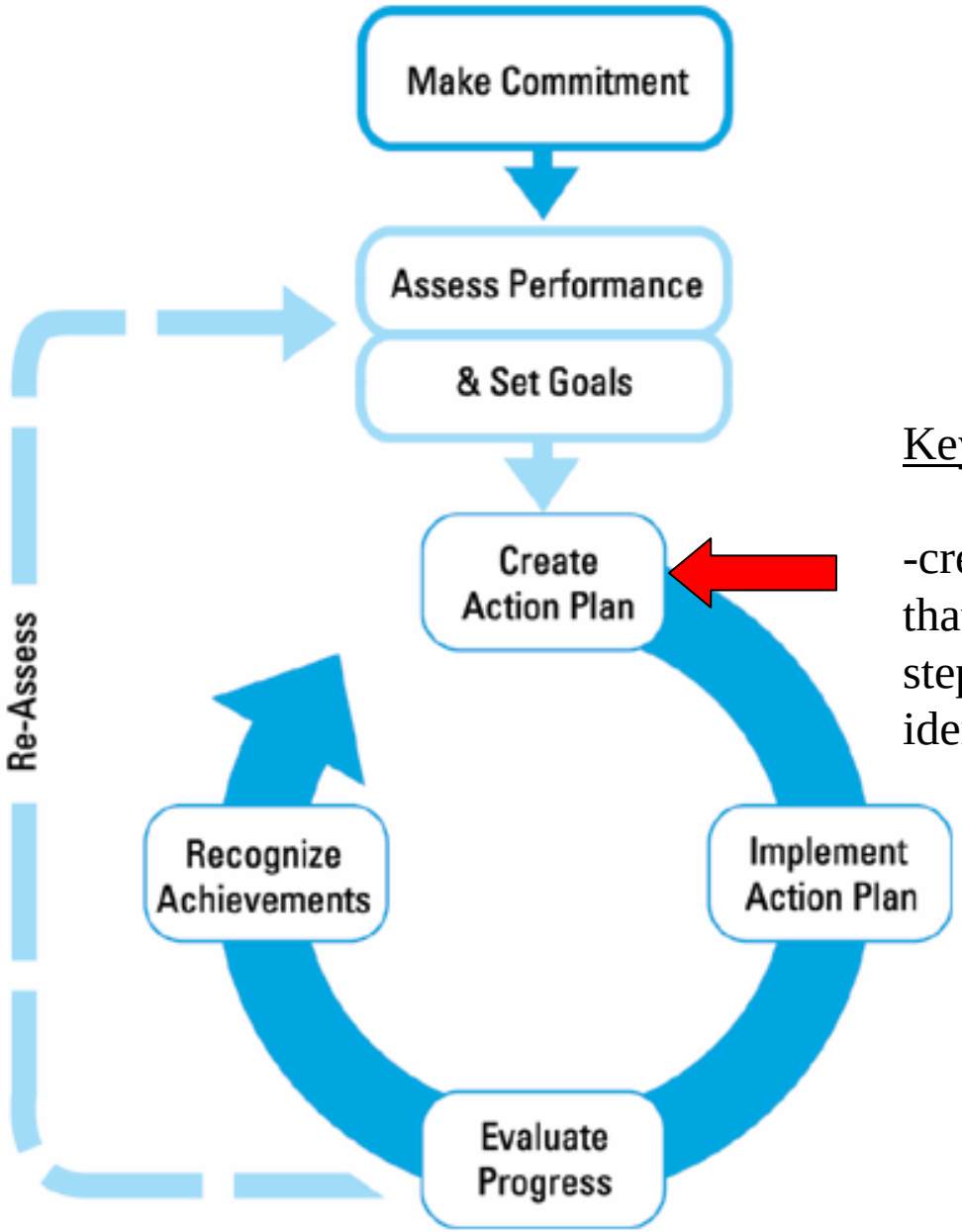
Key Management Steps:

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



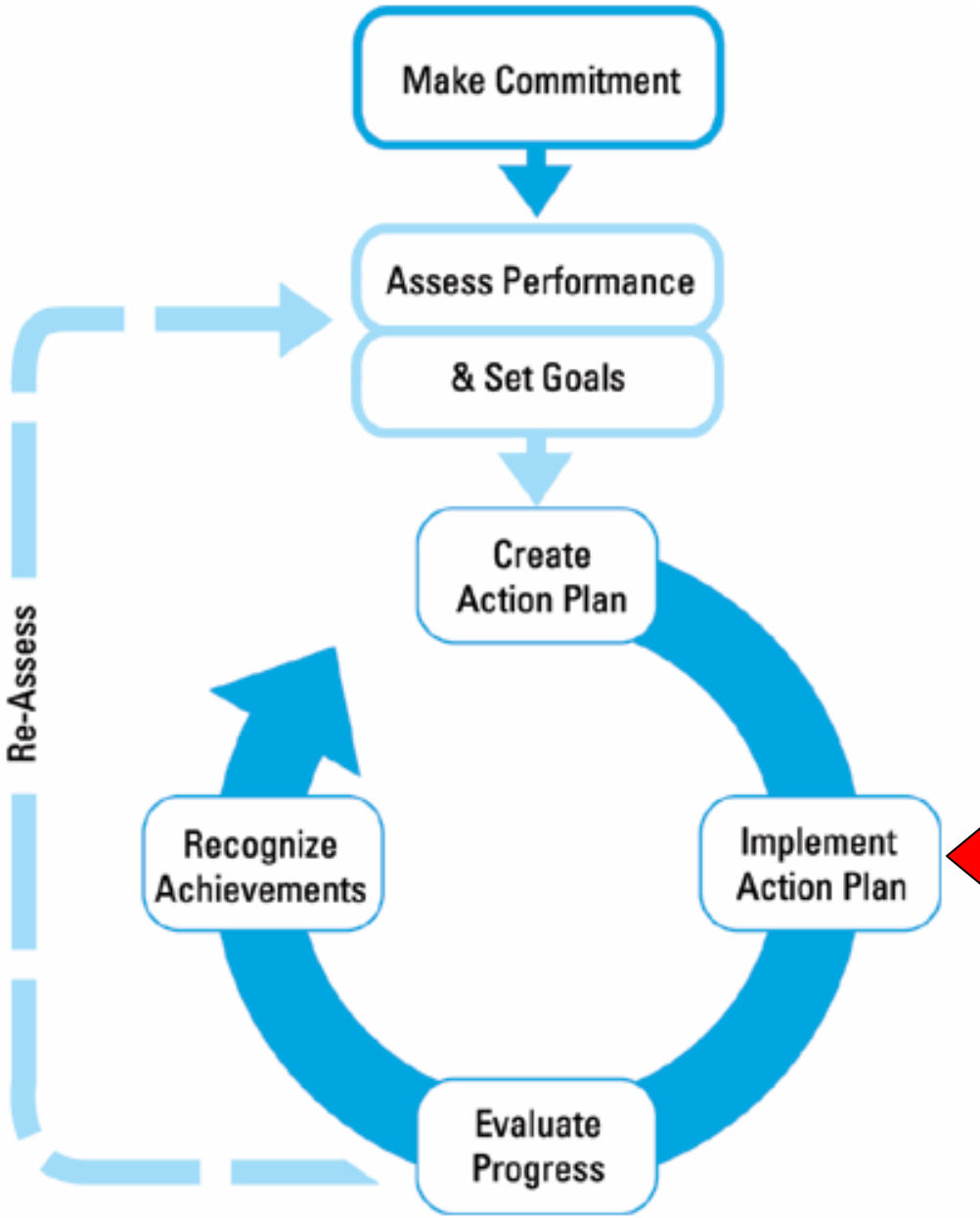
Key Management Steps:

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



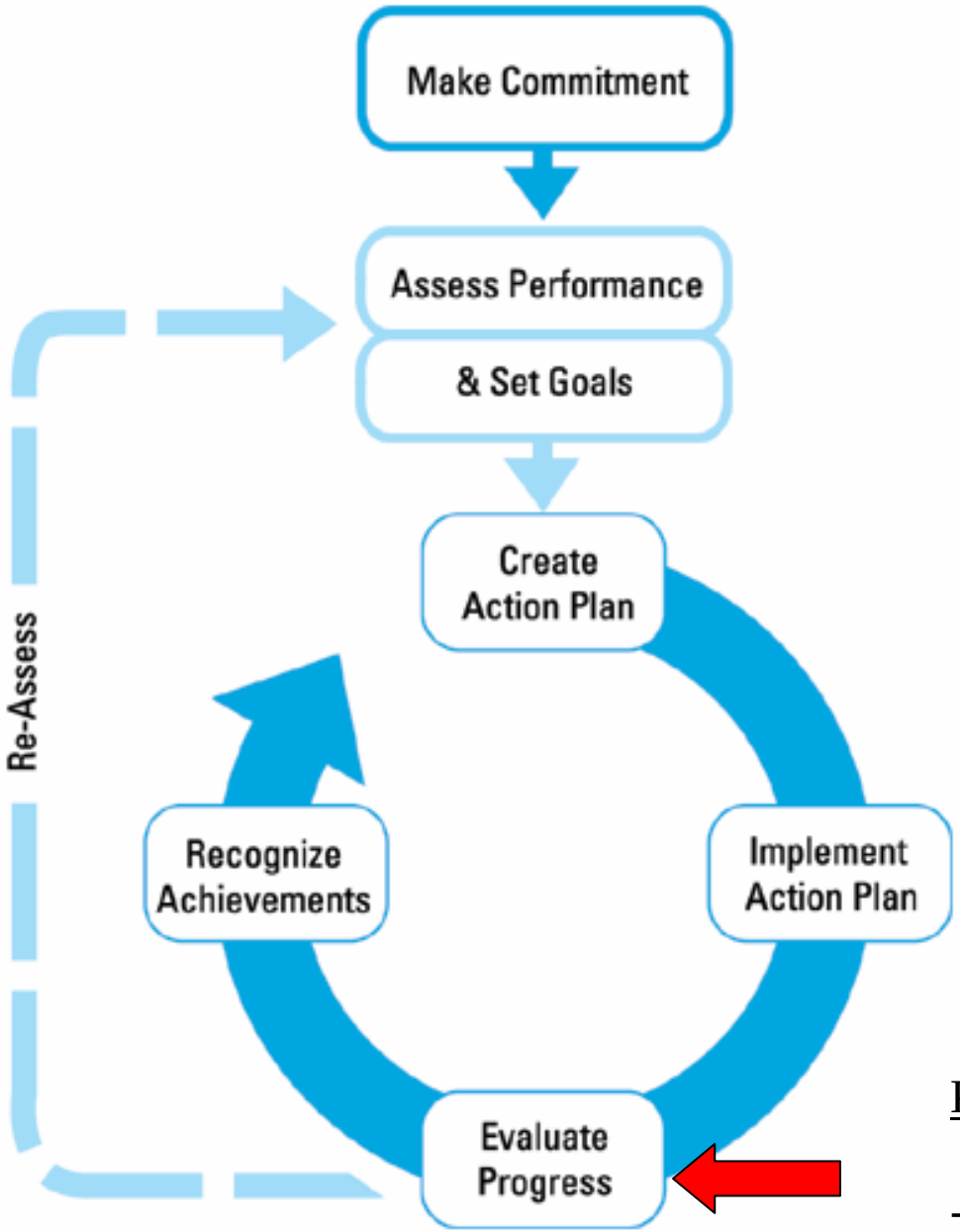
Key Management Steps:

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



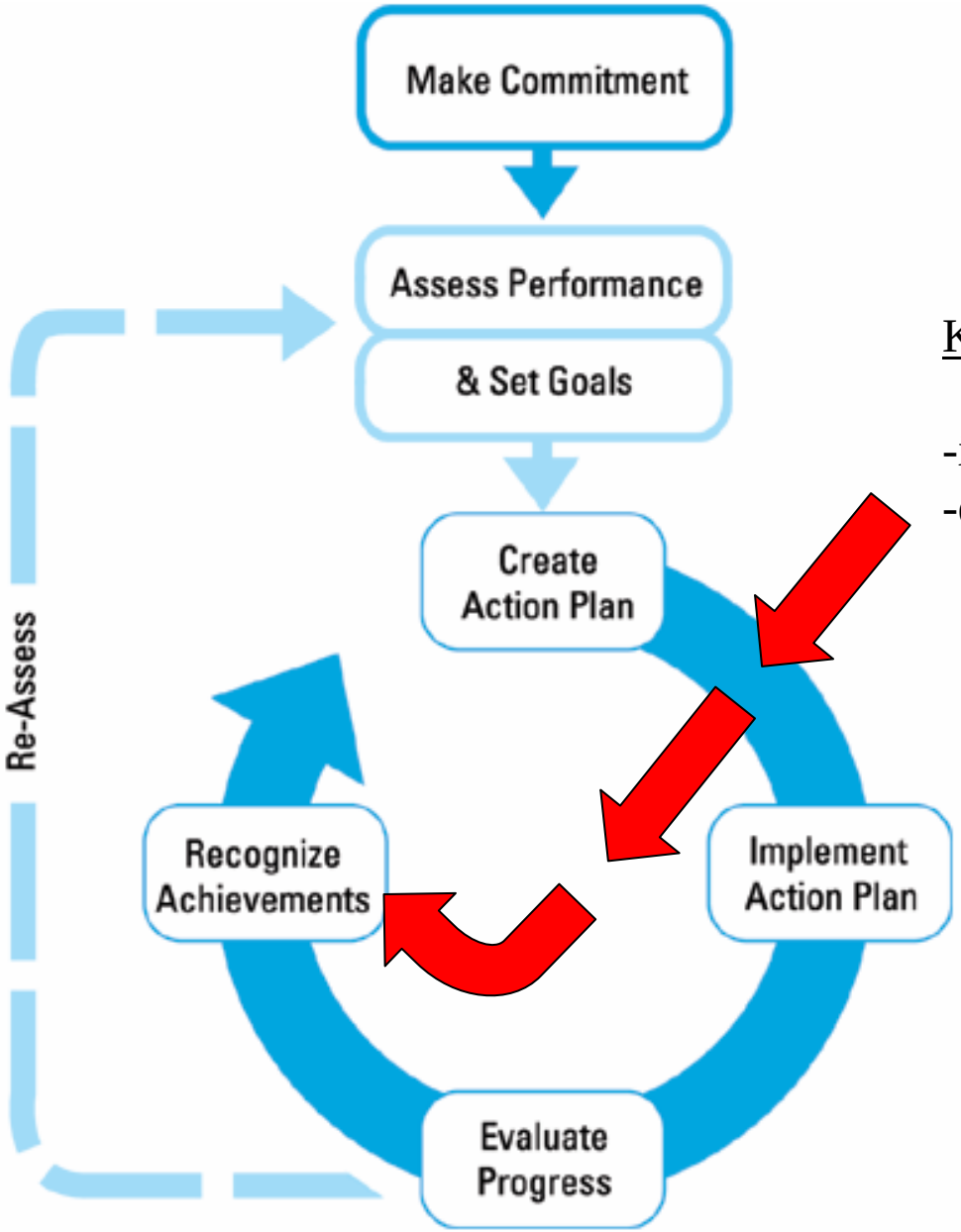
Key Management Steps:

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

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.

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.

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.

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.

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.

Managing Energy Across Multiple Sites.

Toyota Motor Manufacturing North America

ENERGY STAR Webcast, May 19, 2004

Bruce Bremer-Manager Facility Engineering

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

TMMNA Conception

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

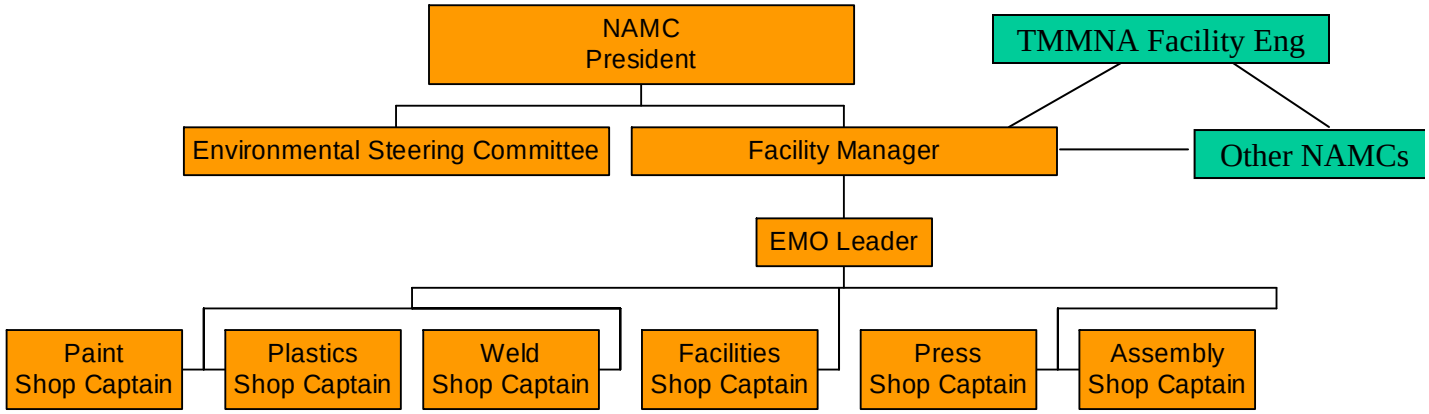
TMMNA Facilities Engineering Responsibilities

- 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

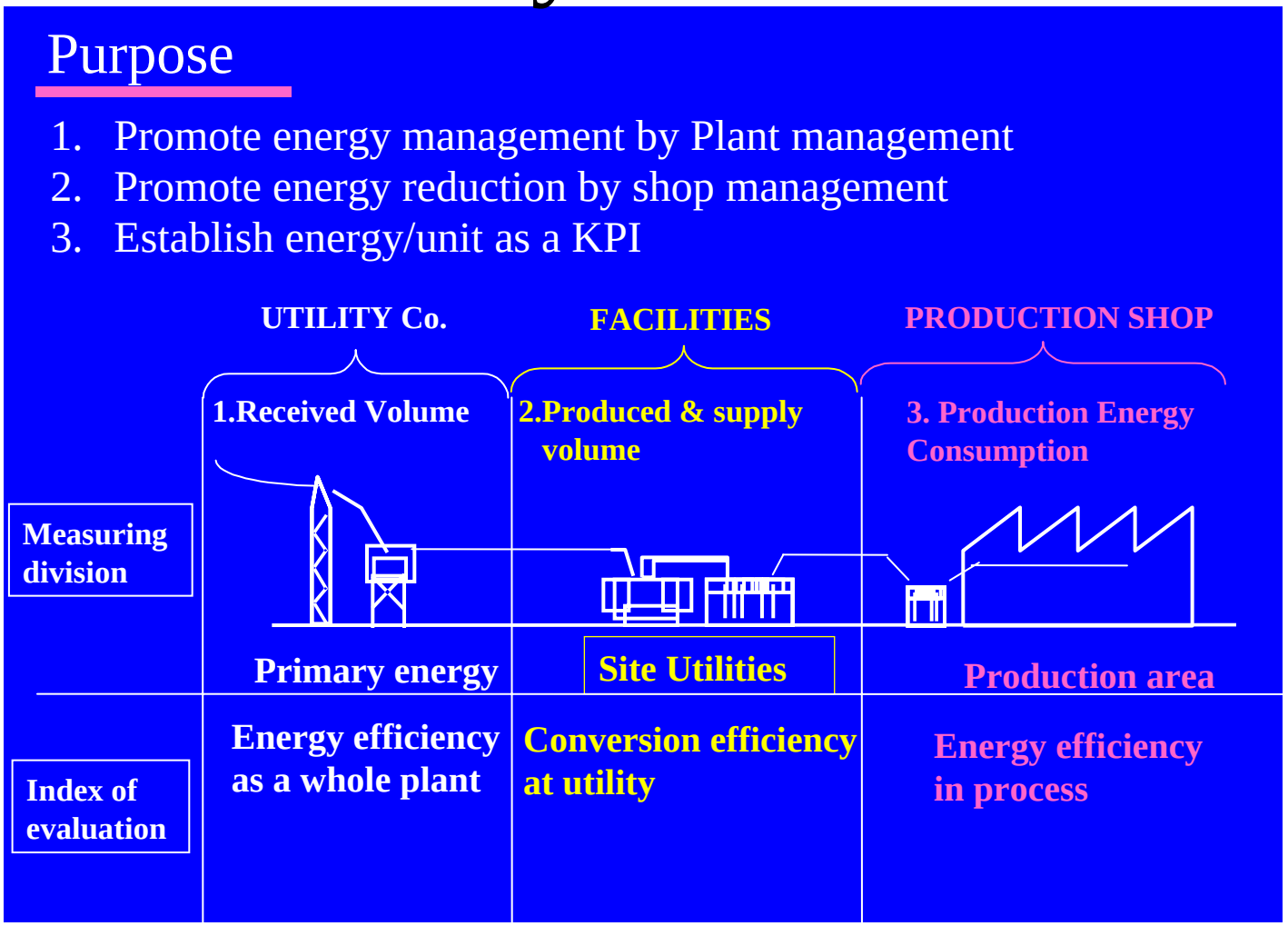
1) Energy Management Organization



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

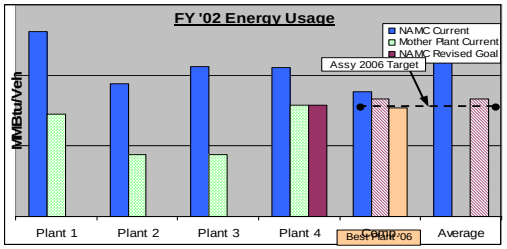
- Part of Company's Environmental Targets
- Roadmap to Energy Reduction
  - Established yearly energy targets/unit of production
  - Major kaizen activities planned to achieve targets
  - Established funding and manpower
- Subject to Revision
  - Greater challenges not lesser

3) Energy Target Setting

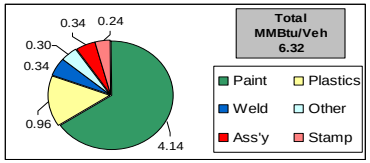
2006 Energy Action Plan

Purpose :

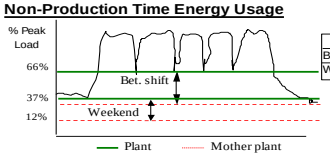
Current Situation



Energy Usage



Non-Production Time Energy Usage



Avg.	NA Avg	TMC Avg
Bet. Shift	66%	30%
Weekend	37%	12%

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.

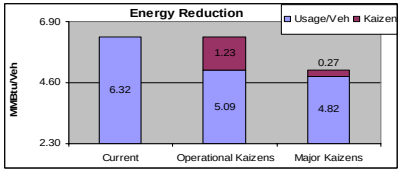
Kaizen Scenarios:

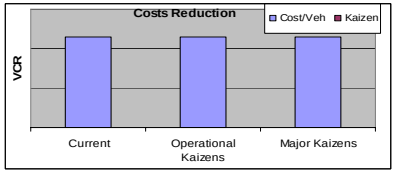
NAMC $/MMBTU = (US) Operational Kaizens	Dept.	Energy Savings (MMBtus/Veh)	Savings ($)/Veh	Implement. $/Veh	Impl. Costs ($)
A. Reduce NAMC electrical loads to TMC BS and WE stds; Tahara BS=30 WE=12, TMMI Current BS=66 WE = 37	All	0.56			$ 50,000
B. Reduce painting booth air flow IAW NFPA 91. 10% reduction 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
Sub-Total		1.23	-	$ -	$ 690,000

- Investigate and Plan Operational kaizens by 3rd Qtr FY04

- Evaluate Major kaizen budget in 4th Qtr of FY04

Major Kaizens					
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 baseload 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
Sub-Total		0.27	-	$ -	$ 2,200,000
Project Payback = #DIV/0!	**Total**	1.50	-	$ -	$ 2,890,000





Yearly Energy Targets

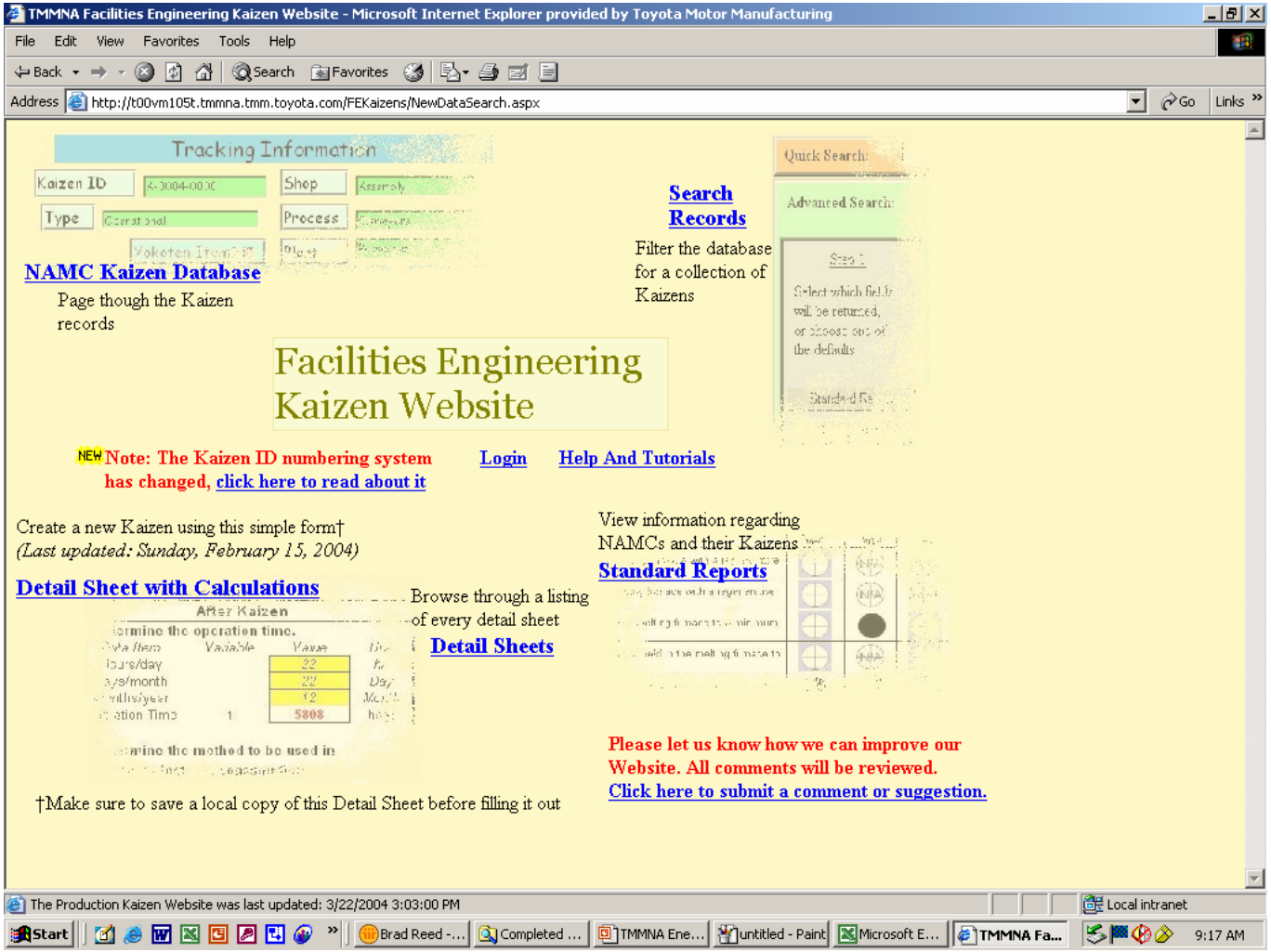
Plant	FY 01	FY 02 (Base Year)	FY 03	FY 04	FY 05	FY 06	Total
Current Plan			3%	3%	3%	3%	12%
Additional Plan							
New Annual Reduction Targets							
Actual Target (MMBtu/Veh)	8.12	6.32	6.319	6.319	6.319	6.319	0.00

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

4) Implementation – How to Reach our Targets

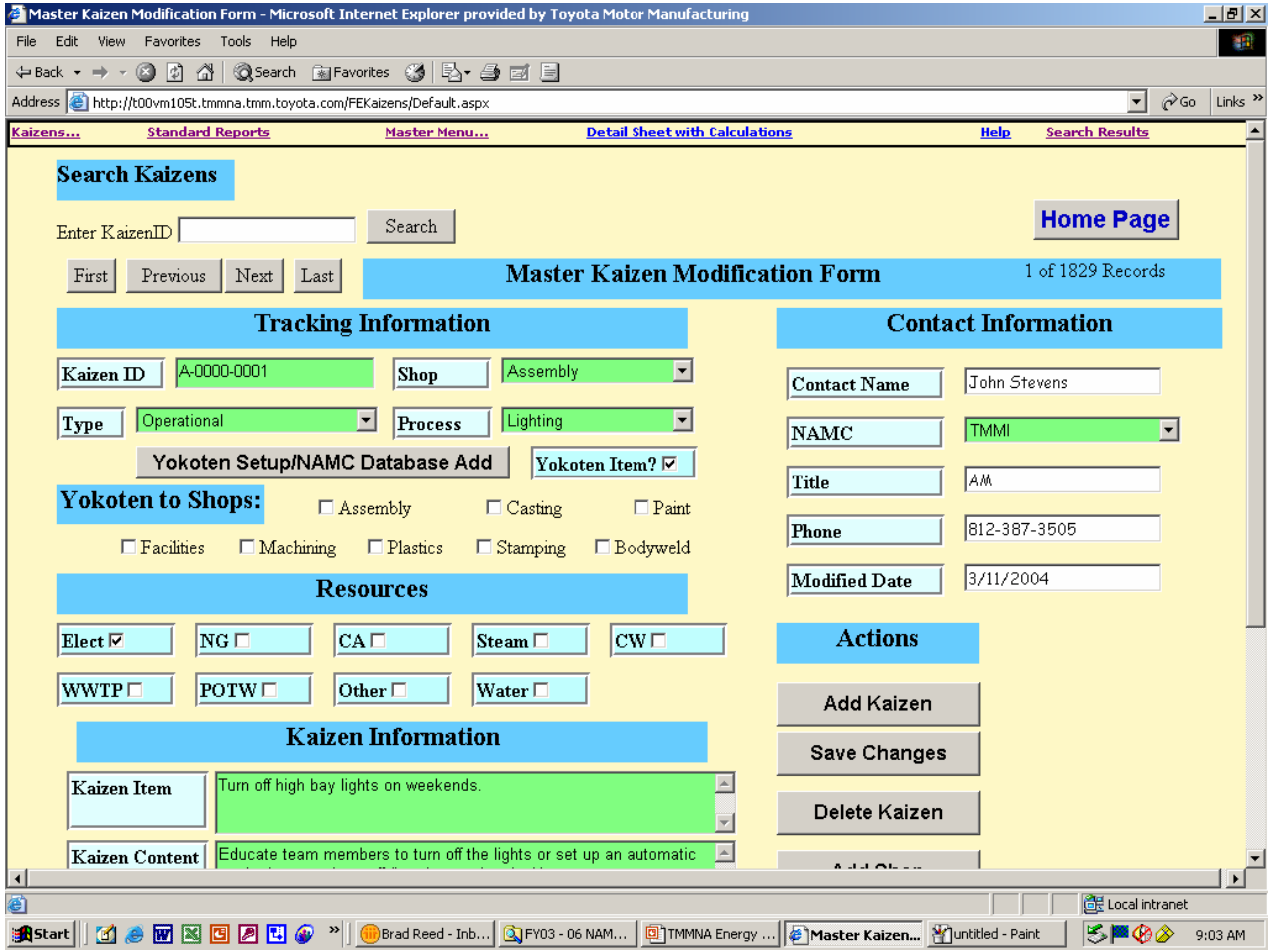
- Energy Kaizen Database – Tool
  - Kaizen ideas
  - Implementation details
- Information Source
  - All team members can view on Intranet
  - Only authorized team members can modify details

4a) Database Home Page



4a) Database Kaizens

29 Discrete Categories,
16,000 Ideas



4a) Data Base Reports

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

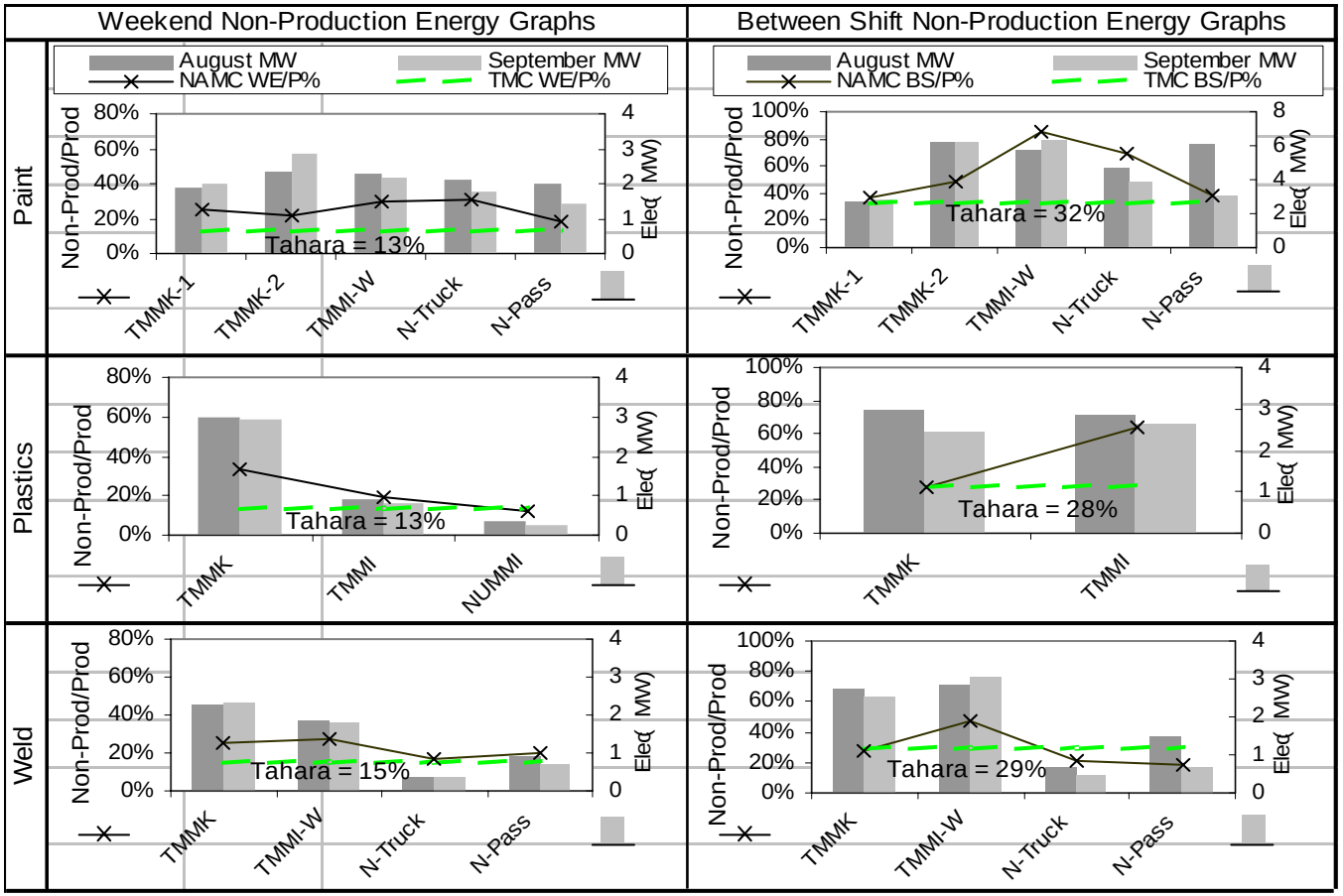
4c) Design Feedback

- 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

Non-Production Energy Report



Benefits

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

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

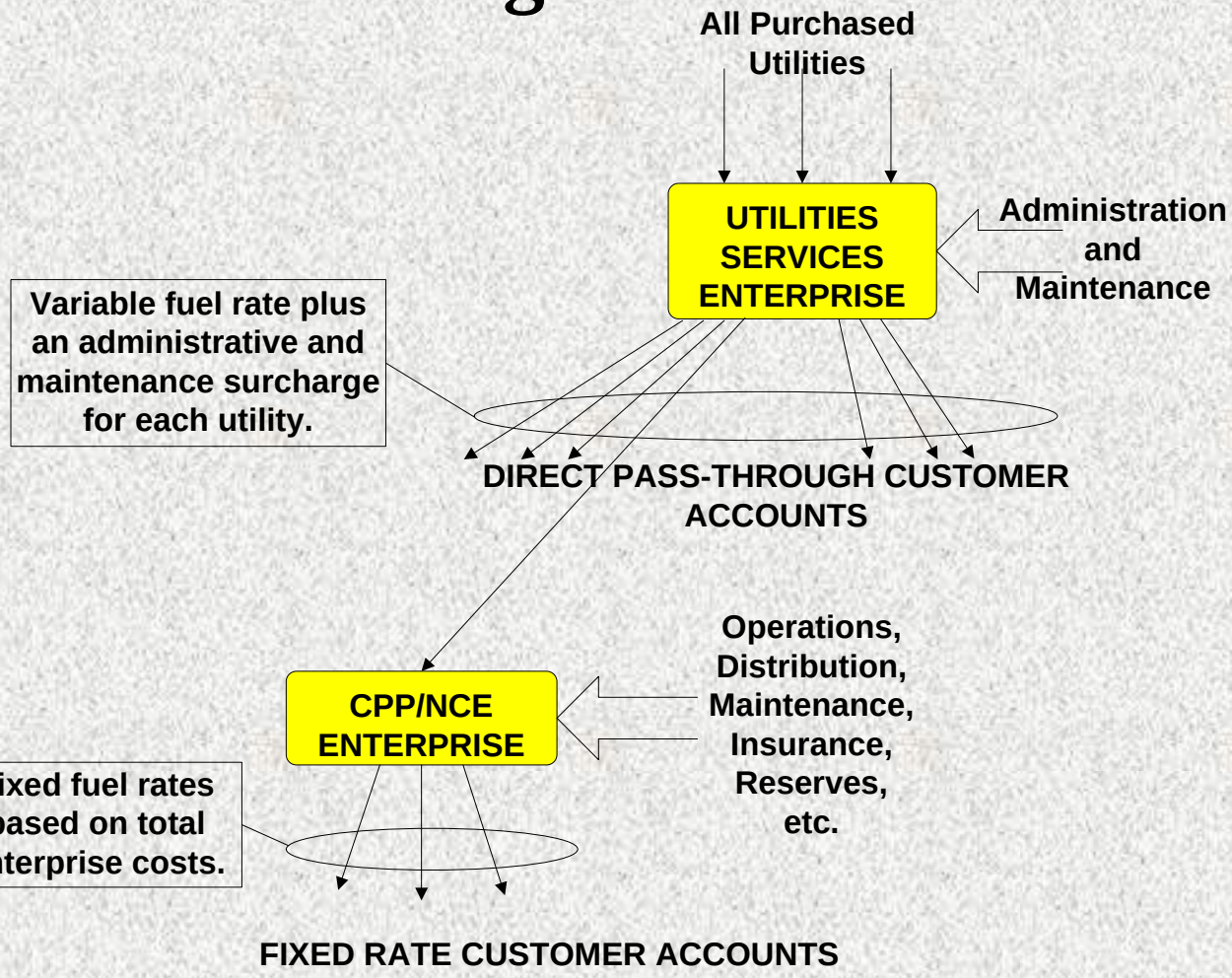
The University:

- 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

- 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

The University of Michigan

Utilities Accounting



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

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

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 resourced, rater that 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

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

Tune-up Crews
Student Interns
Contract Engineers

Energy Conservation Committee
(Energy Project Funding)

Plant Engineering (2)
Facilities Planning & Design
Faculty Representative

The University of Michigan

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	$0.4 million/year
– Total	$4.4 million/year

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**

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

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

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

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.

The University of Michigan

Questions & Discussion

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

Thank You!