News from a State Program

Best Practices Steam Steering Committee
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Kathey Ferland
University of Texas at Austin
Center for Energy and Environmental Resources
kferland@mail.utexas.edu
512 232-4823
http://TexasIOF.ces.utexas.edu/

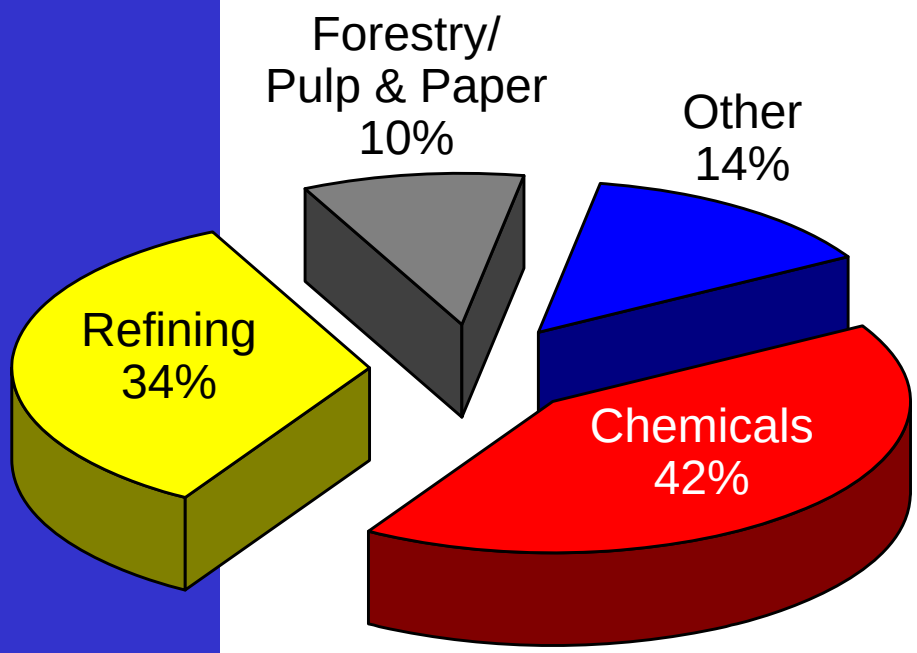
Texas Industries of the Future

Introduction to Texas Industries of the Future

- Initiated in 2001 with Advisory Board representing Industry and Academia
- Located at The University of Texas at Austin, Center for Energy and Environmental Resources
- Funded by Department of Energy and SECO- extensive leveraging of federal resources
- Focus on chemical, refining and forest products sectors
- Active Chemical and Refining Sector Advisory Committee

Texas Industries of the Future

Texas Industrial Energy Usage



Percentage of Total Energy Use by Type of Industry•

- Texas is the leading industrial energy user in the US
  - 53% of the energy used in Texas is consumed by the industrial sector
  - Texas consumes almost 20% of the energy used by industry in the U.S.
  - 8 % of the largest industrial energy users (sites) are in Texas.

Industrial energy usage in Texas region is dominated by 3 sectors.

Goal and Strategies in the Chemical and Refining Sectors

Goal: From 2002-2010 achieve a 15% reduction in energy intensity

- Increase in the adoption of technologies and best practices that improve energy efficiency and environmental performance and reduce cost.
- Increase industry and government awareness of the benefits and need for integration of industry energy efficiency and environmental technologies.
- Strengthen partnerships among Texas industries, universities, associations, governmental bodies and non-governmental organizations, so as to focus research and projects on high priority areas.

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Chemical and Refining Sector Steering Committee

- Sean Diamond, Texas Petrochemical LP, Chair
- Joe Almaguer, The Dow Chemical Company
- Dr. David Allen, University of Texas
- Frank Roberto, ExxonMobil
- Neil Lander, Shell
- Dennis Griffith, South Texas Section of AIChE
- Jeff Hackworth, Rohm and Haas Texas, Inc.
- Tony Dafft, Rohm and Haas Texas, Inc.
- Dr. Warren Heffington, Texas A&M University
- Dennis Kos, Sterling Chemicals
- Sumit Chatterjee, LyondellBasell
- John Curry, Citgo Refining

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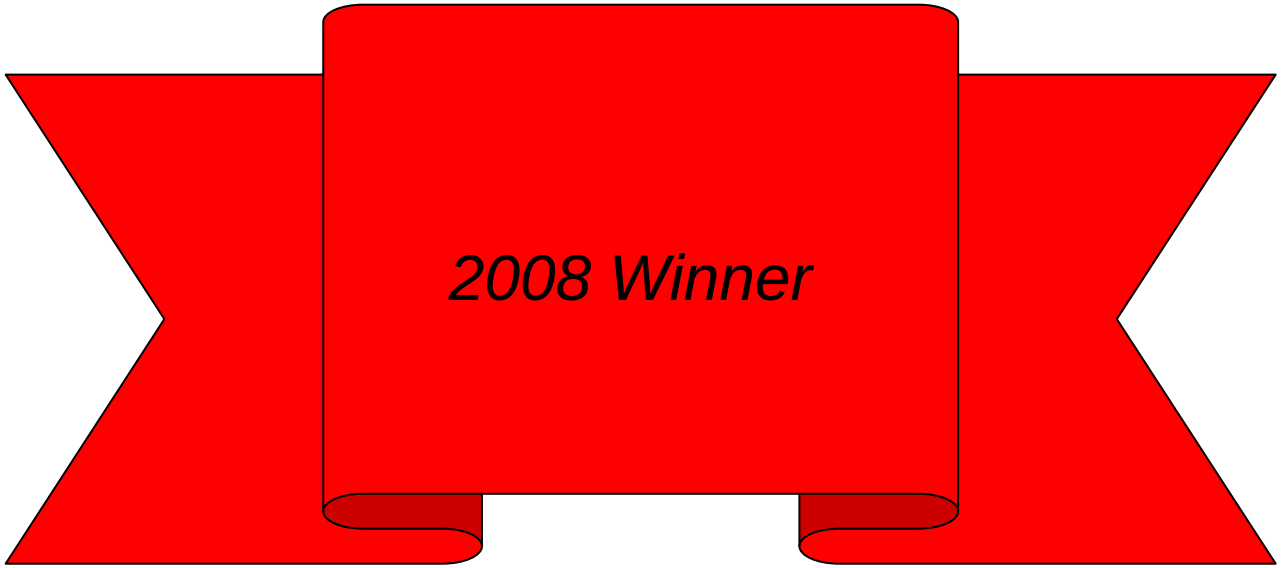
Actions to Date

- **Training.** 30 Best Practices workshops offered to 650+ process and utility engineers (steam, process heating, pumps, motors, and compressed air).
- **Tool Development.** Assess Opportunities for Energy Efficiency Projects at Small/Medium Sized Plants. Addresses energy, emissions and cost savings.
- **Peer Networking and Conferences**
  - Energy Management Forums and Roundtables reaching 900 engineers
  - Technology Showcase 2003 and 2007 focused on Best Practices and new technologies in chemicals and refining.
  - Conferences in 2001 and 2004 on reducing NOX emissions, new technologies, and energy efficiency.
- **National Program Pilot on Energy Management.** Working with DOE and EPA on launch of a national voluntary program to achieve "Superior Energy Performance" which would certify plant energy management performance

TxIOF Program Impacts 2001-2007

- Exceeded the goal to reach 25% of the largest industrial plants in Texas through training, conferences, etc. (Reached 30%.)
- Best Practice workshops are estimated to have saved 1.791 trillion Btus per year.
- The walk through manual and calculator is in use by the Texas Manufacturers Assistance Center—identifying savings of $660,000/year at 9 facilities, with replication opportunity at 13 more sites.
- Thirty of the 200 sites participating in DOE Save Energy Now plant assessments were from Texas. This is the largest number from any state.
- Two-way conduit for information between Texas industries and US DOE headquarters, leading to launch of “Superior Energy Performance” initiative with industry and government stakeholders and development of certified plant program.

Texas Industries of the Future



Industrial Energy Technology Conference

So What's Next?

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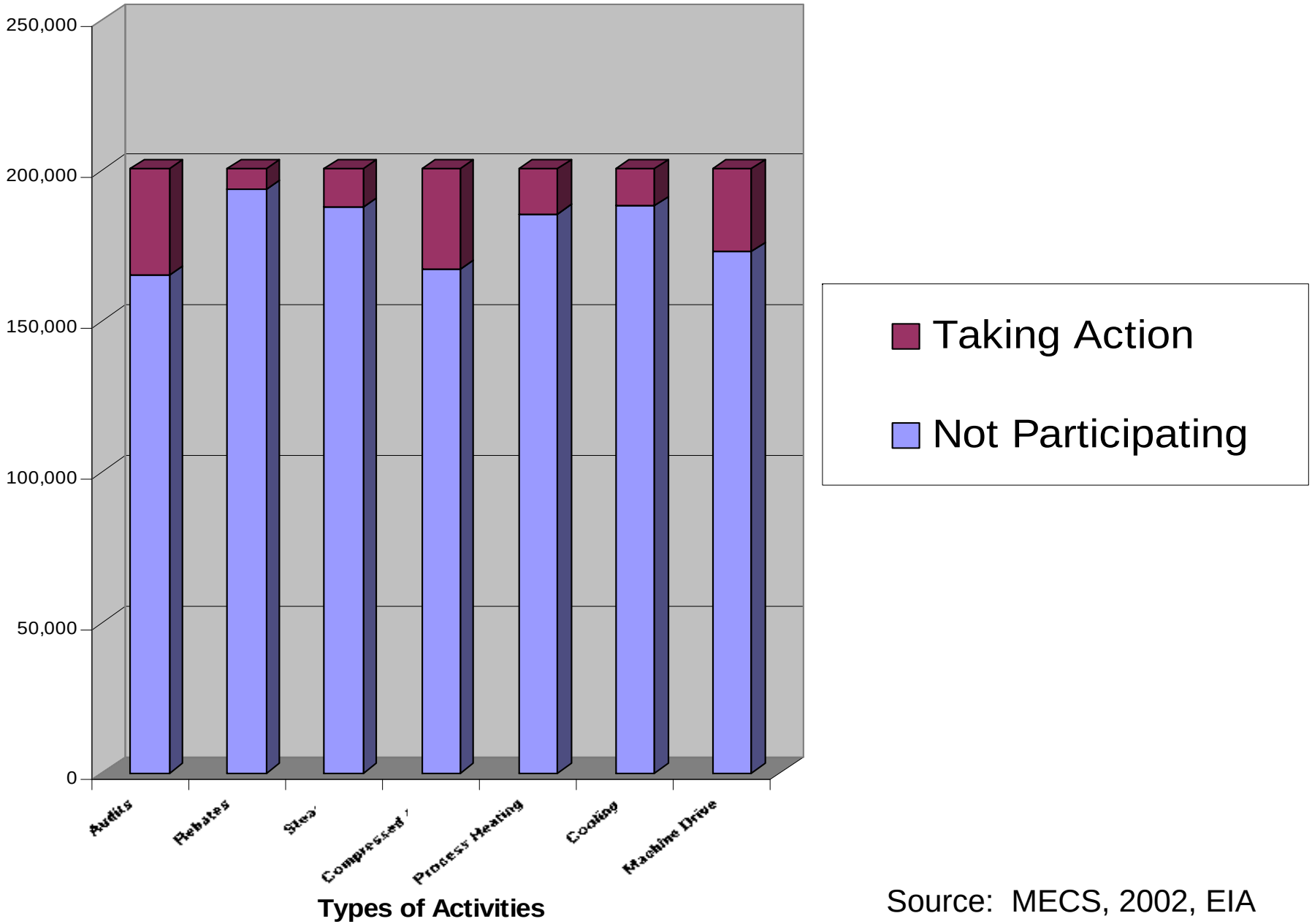
Establishments Participating in Energy Management-2002



Source: MECS, 2002, EIA

Barriers to Continuous Improvement in Energy Management

- Thinking that “Energy is a utility issue.”
- Uncertainty in the price of energy makes projections difficult.
- Energy is not a line accountability
- Energy is not integrated with business objectives
- No context of continuous improvement
- Experience has shown:
  - Energy studies and projects often do not result in sustained savings
  - Slow uptake of energy savings projects
  - Less than half of technical recommendations are typically implemented
  - Good practices in one unit/plant not widely diffused in organizations

Energy Management System Benchmarking Study of Ten Chemical Plants in Texas

Goals:

- To identify common gaps in energy management systems performance at Texas chemical plants. Provide program direction for state energy efficiency efforts.

- To determine whether a management system approach and/or benchmarking was a useful tool in working with large energy users and would result in improvements in their management systems and energy productivity.

Approach

Management Diagnostic Session and Benchmarking

- Conducted an energy management diagnostic session with a team at each plant site. Ideally, interviews included plant leadership, energy coordinator, manufacturing, accounting, maintenance and utilities.

- Major categories address leadership, understanding, planning, people, finances, supply, operations and maintenance, plant and equipment, monitoring and reporting, and achievement.

- Key to success: Manufacturing and Management Input

Energy Management with One-2-Five Energy

Achievement

10.1 Energy cost performance in the past 12 months
10.2 Auditing progress

Plant & Equipment

8.1 Procedures for new facilities design
8.2 Procedures for equipment selection
8.3 Innovation & new technology

Monitoring & Reporting

9.1 Metering & monitoring
9.2 Reporting, feedback & control systems
9.3 Documentation & records

Financial Management

5.1 Criteria/budgets for capital expenditure (CAPEX)
5.2 Energy operating budgets

Supply Management

6.1 Purchasing procedures & alternative energy options
6.2 Quality & reliability of supply
6.3 Optimizing purchasing within supply agreement

Operations & Maintenance

7.1 Operating procedures
7.2 Maintenance procedures

Leadership

1.1 Demonstrated corporate commitment

Understanding

2.1 Understanding of performance & opportunities

Planning

3.1 Targets, performance indicators (KPI) & motivation
3.2 Plans

People

4.1 Accountabilities
4.2 Awareness & training
4.3 Resourcing

ENVINTA
A member of the Tersus Energy Plc. group of companies.

Background on EnVinta One-2-Five Energy Rating System

- Bronze, Silver, Gold, Platinum Rating System
- Rating system applied to 22 separate elements in 10 key subject areas
- Participants were benchmarked against other sites in the sector by the 22 elements.
- Participants received a list of recommended actions to move their program forward.

Yet to Quality	Bronze	Silver	Gold	Platinum
Little has been done	Basic waste reduction through one-off technical projects.	Has established basic energy management systems.	Formal and effective integration of energy management.	Integrated management systems drive continual improvement.

10 Participating Plants

- Albemarle, Pasadena
- Bayer Material Science, Baytown
- Celanese
- Chevron Phillips Chemical Company LP, Cedar Bayou
- Huntsman Chemical, Alvin
- Lanxess, Orange
- Lubrizol, Deer Park
- Lyondell, Channelview North Plant
- Solutia, Chocolate Bayou; and
- Texas Petrochemicals LP, Houston

Top Five Areas Recommended for Action

- 1.1 Demonstrated corporate commitment (60% of plants)
- 3.1 Developing targets, KPIs and motivation (50% of plants)
- 7.1 Incorporating energy efficiency into equipment operating procedures, especially during turndowns, delays, etc. (40% of plants)
- 9.1 Adequate, accurate metering (50 % of plants)
- 9.2 Access to adequate reporting, feedback and controls (80% of plants)

Preliminary Results: The Best and the Better

Where Plants Excelled as a Group (Best in Class)

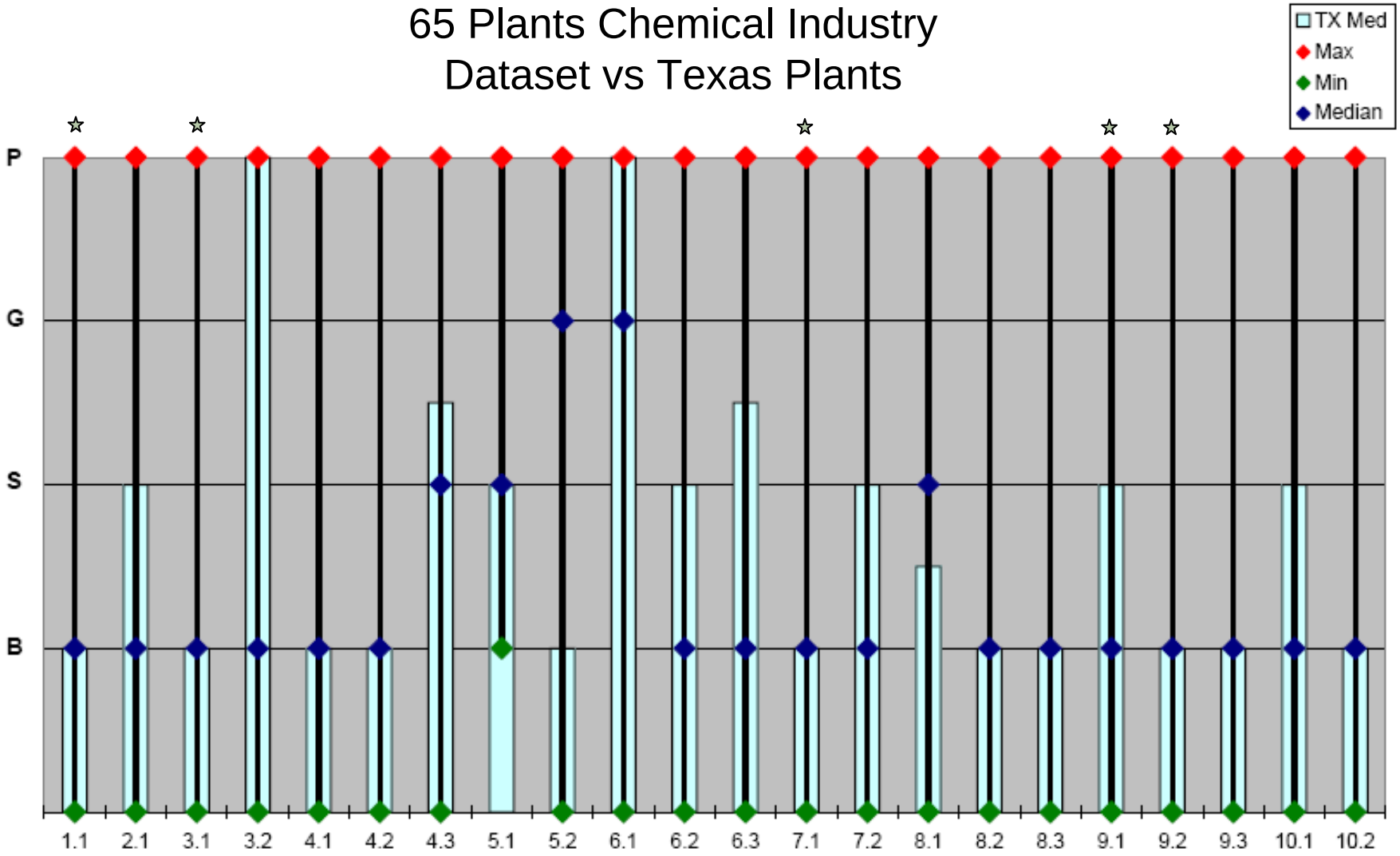
- **Purchasing Procedures**
- **Planning**

Where the Groups' Median Exceeded the Sector's Median

- **Understanding of performance and opportunities**
- **Quality and reliability of supply**
- **Optimizing purchasing within supply agreements**
- **Maintenance procedures**
- **Metering and monitoring**
- **Cost performance over last 12 months**

Results From Benchmarking

65 Plants Chemical Industry
Dataset vs Texas Plants



Responses to Technical Assistance Offer

Why No Takers?

- Could take many months for a plant to begin implementation. Beyond project timeframe.
- Plants so strapped for internal resources they wouldn't be able to respond to, review, approve or implement the recommendations from the technical assistance provider.
- Not significant enough assistance to counter inertia.

Differences

In other states, this type of technical assistance offered to smaller plants with fewer technical resources and technical assistance was tied to implementation funding. $$$

Did Plants Implement Recommendations?

Three Months to One Year Later:

- Seven out of eight plants reported action on the recommendations.
- Three of the eight companies reported that they will be leveraging this management system review and benchmarking process to other sites in Texas or the US.

Difficulty in Quantifying Energy or Cost Savings Due to Nature of Recommendations and Timing of Follow-up:

Examples of recommendations: Form a cross functional energy team, conduct awareness campaigns, install metering, institute monthly reporting on energy at manager's meetings.

Participants' Evaluations

- It assisted them in ***focusing their efforts***, getting ***management's attention*** and in ***bringing managers together*** from throughout the facility to discuss energy using a structured format.

- The format addressed two key barriers:
  - Lack of management support
  - Energy is a "utility" issue versus a cost that end users can impact.

Next Steps in Building Support for Management Systems Approach to Energy

- Participate in revision to MSE 2000 and development of ISO energy standard.
- Conduct Energy Efficiency Plant Certification Program Pilot Project (June 2008-Oct. 2009)
- Illustrates the opportunity of working with entities with multiple sites in Texas—Leverage the corporation!

Conclusions

- A structured approach to establishing or improving an energy management system provides value, as it has in other plant work processes (safety, environmental, quality).
- The process got the subject OUT of the domain of utilities and engages management.
- It is difficult to quantify the benefit of these types of activities (ex: gain corporate commitment, metering) versus a technical assessment which identifies specific projects and associated BTU savings. Yet they are the foundation of a successful, sustainable program.