

# **Energy Management Systems**

**Motor Summit 2012**

**Zürich, November 4, 2012**

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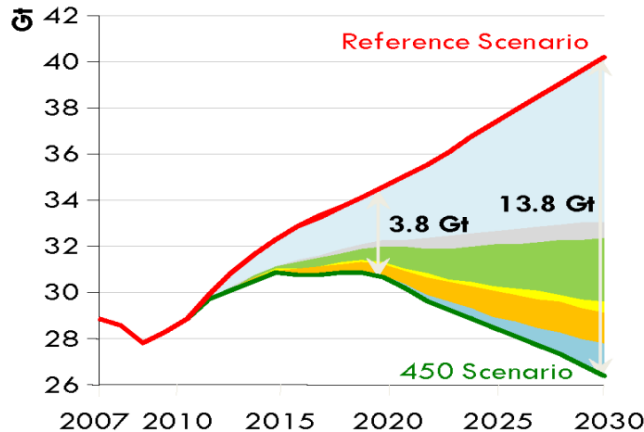
**Bundesministerium für Umwelt, Naturschutz und  
Reaktorsicherheit  
Berlin**

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## Relevance of Energy Efficiency

### World abatement of energy related CO<sub>2</sub> emissions in the 450 Scenario



	Share of abatement %	
	2020	2030
Efficiency	65	57
End-use	59	52
Power plants	6	5
Renewables	18	20
Biofuels	1	3
Nuclear	13	10
CCS	3	10

Efficiency measures account for two-thirds of the 3.8 Gt of abatement in 2020, with renewable energy contributing close to one-fifth

**World Energy Outlook (WEO) 2009**

© OECD/IEA, 2009



## Objectives and Benefits of Standards (I)

- **Baseline of Technical Rules, Techniques and Practices**
- **Systematic Analysis, Description, Documentation**
- **Functionality and Management of complex societal workshare (e. g. Craft, Production, Trade and Services)**
- **Avoiding Barriers of Shared production and Trade (national, regional und global Standards- DIN/CEN/ISO)**
- **Quality Seal and Declaration**
- **Increase of Competitiveness, better Access to Markets, higher Market Shares**

## Subjects of Standardization: General Description (II)

- **Specific Products, e.g. Screws, Paper Formate, Motors, Services**
- **Management and Processes: ISO 9000- Quality- , ISO 14000- Environmental- and 50001 Energy Management**
- **Subjects of Audits: Specific Cases**
- **Detailed Analysis, Measurement, Benchmarking, Improvement Proposals, Documentation, Verification**
- **Subjects of Certification: Rules for Certifiers  
Surveillances of Audits and Issuing Certification  
Seals/Awards**

## Goals and Benefits of Standards (III)

- **High global Competitiveness**
- **Availability and Innovation on Markets**
- **Acceptance in Primary Production, Manufacturing, Trade and Commerce**
- **Basic Element for a Common Market**
- **Avoidance of Non-Tariff Barriers (EU / WTO)**
- **Establishing high Quality Level in Products**
- **Minimizing Low Price and Quality Dumping**

## Strategies to Develop Standards

(I)

### Types of Standards:

- **Products** – e.g. Motors, Lamps
- **Extended Products** – u. a. Pumps, Kompressors
- **System-Standards:** u. a. Heating Systems, Air Conditioning, Lighting in Buildings

**Common Elements:** standardizable Products and extended Products, technical Systems with reference, defaults and benchmarks,

- **Managementsystems:** Complex Systeme- ISO 9000,14000,50000  
Target setting, Structure and Process of Organization, Data recording  
Measurement and Verification Documentation, Reporting, Checking,  
Improvement

## Economically Feasible Energy Savings

**Management Systems**

**Technical Systems**

e.g. Heating Systems, Air Conditioning

**Extended Products**

Luminaires, Pumps, Compressors,  
Ventilator(With Controls - Partial System)

**Products**

e.g. Motors, Lamps



## Strategies to Develop Standards (II)

- **Focussing Standardization:**
  - **to the Technical- System-Level**
  - **Inclusion of the Management**
  - **Holistic Treatment /Management of the System**
- **Accelerated Harmonization (DIN,CEN, ISO)**
- **Wiener Agreement on Cooperation CEN und ISO**
- **Dresdner Vereinbarung zur Kooperation IEC und CENELEC**

## Energy Audit:

- Snapshot of the System
- Energy Profile
- Normally: External Technical Assistance

## Energy Management:

- Internalized Energy saving and Optimization Process
- Energy Audit can be the Initial Step
- Install the whole PDCA- Cycle and Process
- After Full Implementation: Certification of Compliance with ISO 50001 and Seal / Logo can be provided

## Energy Audit

## Energy Audit Models

( I )

Scanning Models  
Point Out Area

Analysing Models  
Propose measure

Walk Through  
Audit

Selective Audit

Preliminary Audit

Targeted Audit

System Specific  
Audit

Comprehensive  
Audit

Small Site

Auditor Selects

Large Site

Operating Agent  
Selects



## Energy Audit

( II )

### In-Depth Analysis and Assessment of Energy Consumption

In:

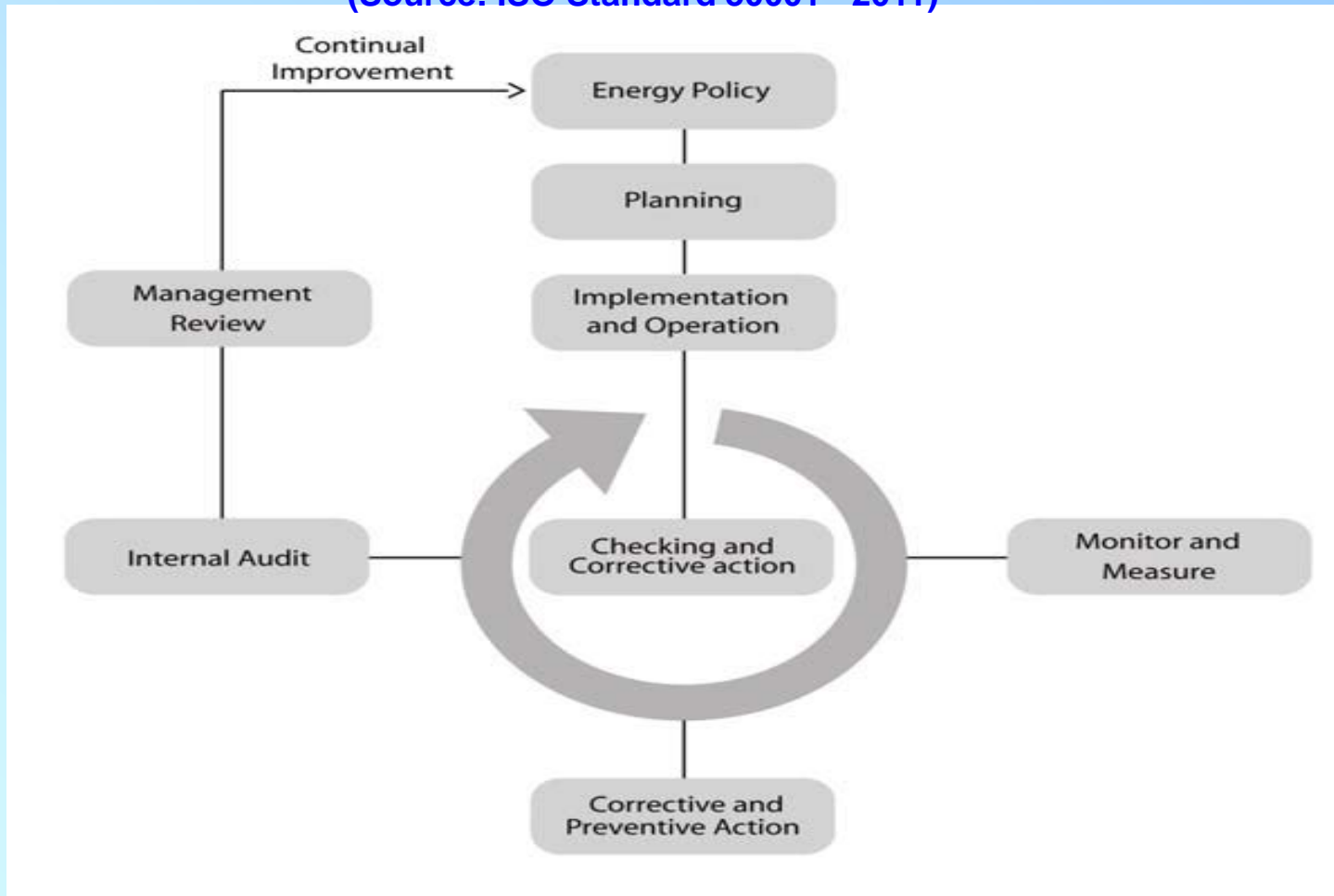
- **Building**
- **Industry**
- **Transport Sector**

Comprising:

- **Energy Profile**
- **Collection / Measurement of Data**
- **Evaluation of electrical and thermal Energy consumption and Benchmarking**
- **Improvement / Energy Conservation Proposals**
- **Support to establish and verify Effectiveness of Measures**

## Energy Management System Model

(Source: ISO Standard 50001 - 2011)



# Standard ISO 50001 Energy Management

## Principles:

- **Plan, Do, Check, Act - PDCA- Cycle**
- **Strategic Goals on Energy Policies within the Organization**
- **Responsibility from Top Management and Mandating the Energy Manager or Energy Management Team**
- **Checklist, Measures, Organization, Involvement of Personnel, Documentation**
- **Check of Impact, Measurement and Verification**
- **Monitoring and Improved Performance**
- **Continual Improvement**

## Elements of the Standard on Energy Management: Plan, DO, Check, Act – (PDCA)- Cycle

### Plan

- Measure or compile the type and use of Energy
- Identify the Users and Employees, Setting the Objectives, Consider Legal Requirements
- Potentials for Improvement, strategic und operation related Goals and Programmes

### Do

- Implementation and to set into Operation
- Identify Resources, Tasks, Responsibilities and competences
- Involve Coworkers, Training and mandating tasks and responsibilities
- Communication within the Organization
- Documentation of the Energy Management and Steering Activities

## Check

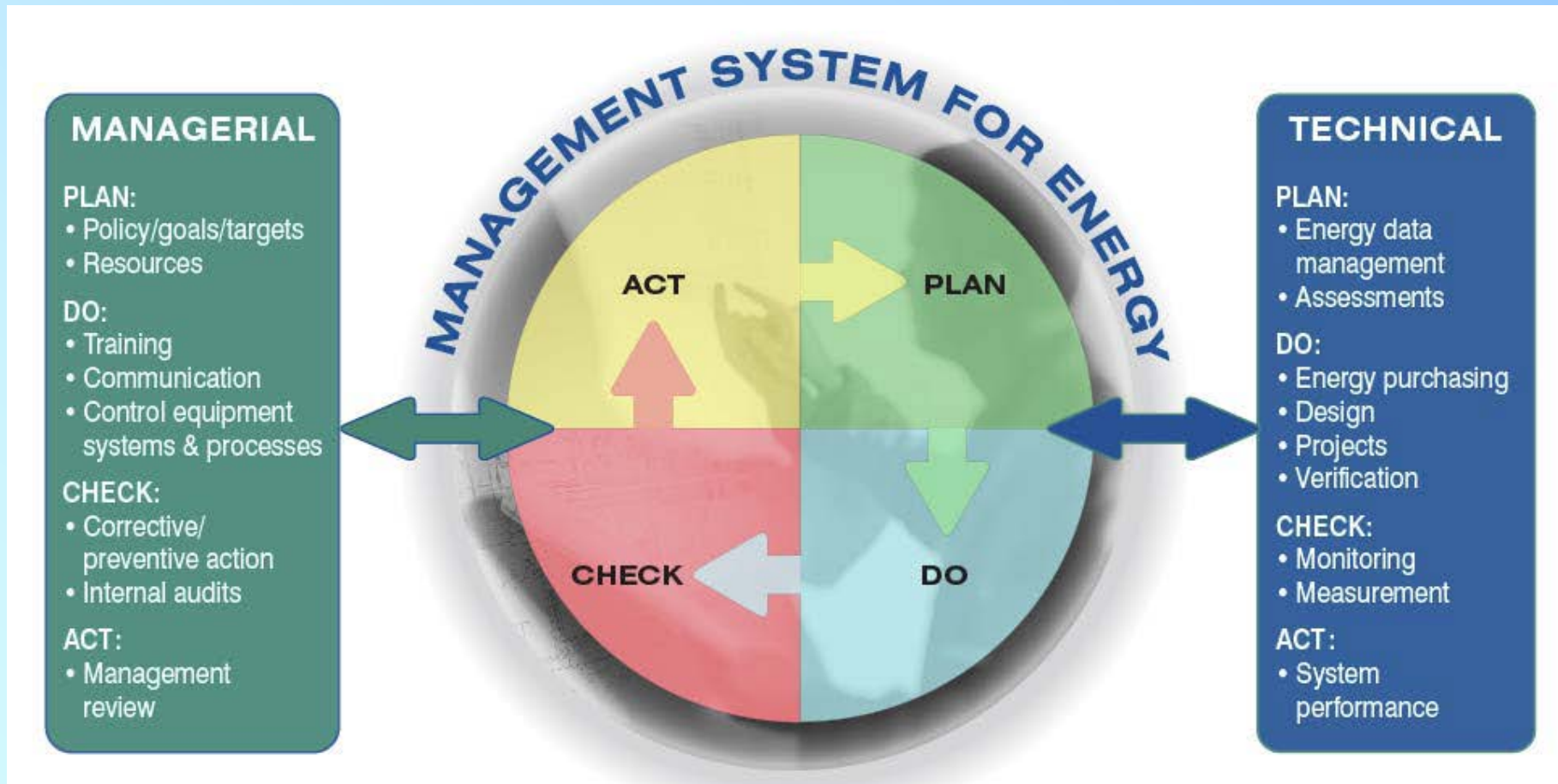
- **Monitoring, Measurement and Verification**
- **Compliance with Rules and Regulations**
- **Check Non-Conformity, Develop Corrections and Improvements**
- **Recording and Documentation**
- **Internal Audit of the Management System**

## Act

- **Implementation and to set into Operation**
- **Identify Resources, Tasks, Responsibilities and Competences**
- **Involve the Co-workers, Training and Delegating Tasks and Responsibilities**



## The Continual Improvement Process Model



## Energy Management: Examples from two sectors

### Commerce: Shopping Mall

- Ventilation, Air Conditioning, Automatic Control,
- Full Implementation of ISO 50001

### Industrial Production: Beverages

- Compressors und Pressurized Air System

## Shopping Mall: Air Supply, Air Conditioning, Sensor Control

<b>Description of Project:</b> 28,000 m <sup>2</sup> Gross Floor-space Heating Ventilation and Air Conditioning oversized  Standards: Normen: u. a. DIN V 18599-1/2/3, DIN V 18599-5, DIN V 18599-7		<b>Measures:</b> Use of Mixed Air Supply Adaptation of In-/ Outlet to the needs of Air Supply, Heating, Adaptation Hygenic Needs and Air Supply, Adaptation to using conditions Steering and control of the Garage AC by CO und Temperature-Sensors		<b>Assessment:</b> Considerable gains on Operation costs Innovative Solutions, e.g. Counting number of customers, CO Monitor und Measuring Sensor for the Underground parking and automatic control	
Energy Saving	In KWh per Year	Electricity	798,000		
		Gas	1,768,000		
Energy Saving	In %	Electricity	72		
		Gas	63		
CO <sub>2</sub> Reduction of Emissions	In Tons per Year	Electricity	351		
		Gas	488		
Savings on Energy Costs per Year in Euro		198,000			
Investment in Euro		227,500			
Pay back time in Years		1,1 Year			
Return rate in %		87 %			

## Beverage Production Pressurized Air-/Compressor-System

<b>Description of Project:</b> Optimization of Pressurized Air To Measure :Pressure- and Volume Demand Re-Design of Pressurized Air Network About 90 Employees Analysis: Re-Design of Network Spin-/Loadcontrol  Standards: ISO 10442, DIN 1945-1		<b>Measures:</b> Re-Design and unified Pressurized Air Network Lowering Level of Pressure and Load control Spin-Demand and control Elimination Idle Running Change to Load- Dependent operation Use of screw-compressor with high efficiency		<b>Assessment:</b> Considerable gains in Operation Costs Increased Competitiveness due to Reduction of Production Costs	
Energy Saving	Saving in KWh per Year and %	Electricity	775.000	( 49 % )	
	CO <sub>2</sub> -Reduction of Emissions Tons/Year		300		
Saving of Energy Costs per Year	Euro/Jahr	Electricity	55.000,-	Euro/Year	
Total Saving of Costs per Year		55.000,- Euro /Year			
Investments in Euro		62.500			
Pay Back Time in Years		1,1 Years			
Return Rate in %		88 %			

## Further Working Programme of ISO TC242 'Energy Management

- **ISO/CD 50002 Energy Audits with Annexes**
  - **Buildings**
  - **Industry**
  - **Transport Sector**
  - **Qualification of Auditors**
- **ISO/CD 50004 Energy management systems — Guidance for the implementation, maintenance and improvement of an energy management system**
- **ISO/CD 17580 Measurement and Verification of Organizational Energy Performance — General Principles and Guidelines**