Department of Minerals and Energy Pretoria

Capacity Building in Energy Efficiency and Renewable Energy

Report No. 2.3.4-41(c)

MONITORING OF ENERGY EFFICIENCY TARGETS:

Report on Stakeholder Workshops

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April 2005

Department of Minerals and Energy Pretoria

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Issue no.	
Date of issue	April 2005
Prepared	Ian Household
Checked	
Approved	

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Abbreviations and Acronyms

BEE	Black Economic Empowerment
CaBEERE	Capacity Building in Energy Efficiency and Renewable Energy
CB	Capacity Building
CEF	Central Energy Fund
DANIDA	Danish International Development Assistance
DDG	Deputy Director-General
DEAT	Department of Environmental Affairs and Tourism
DK	Kingdom of Denmark
DKK	Danish Kroner
DME	Department of Minerals and Energy
DTI	Department of Trade and Industry
EE	Energy Efficiency
ESETA	Energy Sector Education Training Authority
FIDIC	International Federation of Consulting Engineers
IDC	Industrial Development Corporation of South Africa
IPM	International Project Manager
NT	National Treasury
NER	National Electricity Regulator
NGO	Non-Governmental Organisation
PDI	Previously Disadvantaged Individual
PM	Project Manager
PQ	Pre-qualification
PSC	Project Steering Committee
PTT	Project Task Team
QA	Quality Assurance
RE	Renewable Energy
RSA	Republic of South Africa
SA	South Africa/South African
SALGA	South African Local Government Association
SANGOCO	South African Non-Governmental Organisations' Committee
SARS	South African Revenue Services
SMME	Small, Medium and Micro Enterprises
SP	Service Provider
ST	Short Term Adviser
TA	Technical Assistance
TOR	Terms of Reference
VAT	Value Added Tax
ZAR	South African Rand

1 Introduction

1.1 Background

Under the Energy Efficiency Strategy of the Republic of South Africa (Department of Minerals and Energy, March 2005) the South African Government set targets for reductions in final energy demand (both overall and sectoral) to be achieved by 2014. Under the auspices of the CaBEERE programme (Capacity Building for Energy Efficiency and Renewable Energy) supported by Danida, IIEC-Africa has been commissioned to design protocols for data gathering and processing that will allow the Department of Minerals and Energy (DME) to monitor progress towards achieving these targets.

It was considered an essential part of the design process to seek the input from key stakeholders, particularly those who are likely to be required to provide the data upon which the monitoring process will be based. To facilitate this stakeholder input, two workshops were held at the DME on 18-19 April 2005. The first workshop was aimed at those with a particular interest in the residential and transport sectors, while the second addressed the industrial and commercial / public sectors.

1.2 Stakeholder selection

The primary criterion for selecting stakeholders was their perceived importance as providers of data to facilitate the monitoring process. A preliminary assessment of data requirements is presented in the report 'Energy Efficiency Monitoring of Targets: Data Requirements' prepared under this project. Broadly speaking, the data required falls into two categories:

- 'state' data, which describes the current state of energy efficiency and is used to answer the question of *whether* South Africa is on track to meet its energy efficiency targets
- 'driving force' data, which provides an indication of *why* energy efficiency is moving in the way it is.

The 'state' data in general consists of energy consumption indicators and activity level indicators for each of the sectors, sub-sectors and industries analysed. It was expected that most of this data would already be available from official sources, although some significant gaps were anticipated in the ersidential and commercial sectors. Much of the data for the 'driving force' indicators, however, would need to be collected directly from the stakeholders in question through surveys, interviews etc. For this data, it was felt necessary to consult with the stakeholders regarding the choice of indicators and likely data availability.

In addition to their importance as potential providers of data, the stakeholders were also seen as valuable commentators on the validity of the monitoring methodology, and on the merits and shortcomings of different institutional arranegments for the monitoring system. Invitees were selected from senior technical management in each of the main energy consuming industries (both individual firms and industry associations), and from government departments, transport sector associations, Eskom, academic bodies and individual experts. A full list of invited stakeholders is provided in Annex 1.

1.3 Workshop agenda

The agendas for the two workshops were similar. In each workshop, participants were first given a broad overview of the DME's energy efficiency strategy, the role of the CaBEERE programme and the position of the energy efficiency monitoring project within this context. There then followed an overview of international best practice in monitoring, including a more detailed case-study of New Zealand's energy efficiency monitoring system. The floor was then opened for discussions on the appropriateness of the New Zealand system for South Africa, with particular emphasis on the

institutional arrangement and the overall methodology. Following a short presentation on the data requirements for implementing a system based on the New Zealand model, the floor was once again opened for a discussion on the specifics of the methodology and the likely availability of data. The workshop agenda is presented in Annex 2, a full list of workshop participants in provided in Annex 3, and copies of all presentations made are contained in Annex 4.

2 Workshop outcomes

This section summarises the main outcomes from the discussions held during the workshops on the residential and transport sectors (18th April 2005) and on the industrial and commercial / public sectors (19th April 2005). Since the discussions on the lessons learned from international best practice and the institutional arrangement were not sector-specific, the main outcomes are reported here in an aggregated form across both workshops. Sector-specific discussions on monitoring methodology and data requirements / availability are reported separately for each workshop.

2.1 International best practice and the lessons for South Africa

It was generally accepted by the participants at both workshops that the overall framework adopted by New Zealand provided a good model upon which to base a South African system. There was general agreement in favour of the approach of using a suite of carefully selected indicators to characterise the 'state' and the 'driving forces' of energy efficiency, combined with the use of decomposition to isolate the energy efficiency effect from other effects.

However, there were areas where the participants felt that the overall approach adopted by New Zealand could be slightly modified to better suit the South African context. The most important departure from the New Zealand system favoured by the workshop participants was in separating the function of monitoring from the function of implementing energy efficiency policies and programmes. In a survey of international monitoring practice, the New Zealand team were among those most strongly in favour of monitoring being conducted internally. This question is addressed in more detail in Section 2.2 below.

Some minor adjustments were suggested to tailor the methodology to the particular circumstances in South Africa. The most important of these was the use of physical indicators for activity levels, rather than financial indicators, in certain key activities. These are discussed more fully in Section 2.3 below.

2.2 The institutional arrangement for energy efficiency monitoring

One of the key issues raised in the presentations on international best practice was the question of whether the monitoring of energy efficiency targets should be conducted internally (i.e. by the same body responsible for implementing energy efficiency policies and programmes) or externally, by an independent body. Opinion among the workshop participants was divided on this question, but with the majority of participants favouring external monitoring.

The main argument in favour of conducting monitoring externally was that it ensures that the results are seen to be free of any vested interests and political 'spin'. There is a danger that the results of an internal monitoring process would not be trusted by those stakeholders whose 'buy-in' into the energy efficiency strategy is necessary for its implementation. However, to counter this danger, it was suggested that an internal monitoring system could add credibility ot the results it publishes either by subjecting itself to regular scrutiny by an independent body, or by working with a 'vetting committee' made up of external stakeholders. The difficulty of this latter approach is that of ensuring data confidentiality.

Arguments in favour of energy efficiency monitoring being conducted internally arose mainly from the DME itself. There has been a tendency within the DME recently to move data collection and processing more in-house, with capacity building where needed. In any case, they are in the process of creating a large 'data warehouse' within the DME, so the system for collecting and processing energy efficiency monitoring data should be streamlined with this. A concern was also expressed that the outsourcing of data collection might give rise to additional 'noise'.

Although there was a general feeling that the monitoring function should be external to the DME, it was also agreed that the creation of a new body specifically for this function would probably lead to prohibitively high fixed costs. The most obvious way of overcoming this would be to locate the monitoring function inside an existing body external to the DME. Another suggestion to reduce the cost of the monitoring system was to mobilise a 'research fraternity' comprising university researchers already engaged in energy data collection, particularly as a source of the 'driving force' indicators. Such a research fraternity would need to have some central coordination to ensure consistency in the type and quality of the data collected.

2.3 Monitoring methodology

2.3.1 Residential and Transport Sectors

During the presentation on international best practice, it was reported that the New Zealand team had decided after the first year to abandon attempts to analyse residential energy efficiency changes at the level of detail of individual activities (cooking, water heating, space heating, other) because the data was of insufficient quality. However, it was reported by participants at this workshop that an extensive study conducted by the University of Cape Town has been able to allocate energy usage in low-income households according to activity in a way that is both robust and reliable. It was recommended that this study be examined to see whether it could provide a useful basis for the residential sector monitoring methodology.

While there was general agreement that the use of energy consumption per household represented a good choice of headline indicator for the residential sector, participants emphasised the need to support this with information on average household size.

With regard to the transport sector, the main methodological issue raised by participants related to the effect of fare defaulting on the railways. According to workshop participants, at present approximately 35% of passenger rail journeys are not paid for and so, presumably, these journeys are not included in official figures for passenger-km travelled. If fare collection is tightened, all else being equal, this would show up as an increased activity level in passenger rail transport. This in turn would manifest itself as an increase in energy efficiency, despite the fact that no real improvement in energy efficiency had occurred. Even if the monitoring methodology cannot fully incororate fare defaulting, it should at the very least track the rate of defaults as an important indicator.

There was some doubt expressed that data on tonne-km for road freight would be available. If this proves to be true, the monitoring methodology must be alert to the possibility of double-counting in the way that the tonnage of freight transport is reported. For example, a tonne of freight being transported first by rail before being transferred to road transport would actually show up in the official statistics as two tonnes of freight being transported.

2.3.2 Industrial and Commercial / Public Sectors

It was suggested by the workshop participants that some clarification is needed regarding the apportioning of Sasol's activities between energy conversion and chemicals production. In addition, care must be taken in ensuring that the distinction between feedstock use and energy use is robstly

defined. It was suggested that, in the petroleum refining sector, a physical indicator for activity level (e.g. tonnes of product) makes more sense than a financial indicator (e.g. value-added) because petroleum products are subject to price controls, which would render a financial indicator of activity meaningless. However, in the case of the chemicals industry, the rangeof products is too diverse to permit the use of a physical indicator for activity level.

A concern was raised that the proposed methodology would not provide a true picture of energy efficiency changes in the mining industry. It was agreed that the number of tonnes of ore extracted was a useful measure of activity, as opposed to an indicator based on value, because the price of the final product is so volatile. But in deep mines there is not necessarily a close relationship between energy use and level of activity, however activity is measured. The largest energy demands are ventilating and lighting underground, and removal of water, but these demands are more or less fixed for a given mine, and independent of the level of activity. However, across different mines, there may be as much as a factor or four difference in these fixed energy demands, because of differences in mine depth and 'wetness'. Unless our analysis is done at the level of detail of individual mines, there might appear to be big changes in efficiency taking place which are not 'real' but actually represent 'structural shifts' (i.e. changes in the realtive shares of different mines in total production). There was a suggestion that this problem could be overcome if separate data were available on the 'fixed' and 'variable' components of consumption in mines. However, participants from the mining industry were doubtful that data broken down in this way would be available.

Although nobody from the iron and steel industry was present at the workshop, it was generally agreed that the outputs from this industry are too diverse to permit the use of a physical indicator for activity level.

In the commercial / public sector, it was generally agreed that the use of floor area as a proxy for activity level was both necessary and methodologically sound. However, it was pointed out that in a detailed analysis of the sector, the choice how to disaggregate into sub-sectors must be done in such a way as to ensure that each sub-sector is as uniform as possible with respect to its energy consumption patterns. For example, grouping retail activities in the same sector as hotels (as is implied in the SIC classification system) may lead to difficulties because of major differences in the types of energy-using activites undertaken.

2.4 Data requirements and availability

It was considered preferable, from the point of view of stakeholder buy-in, that the monitoring system relies on the voluntary provision of data where possible. However, the Energy Bill currently before parliament will provide for a regulatory 'stick' that would make the provision of energy consumption data mandatory. There was a suggestion from some workshop participants that a 'carrot' could be offered in the form of full access to the data-set for those who provide data. Of course, to ensure confidentiality, such access could only be provided to processed rather than raw data.

The general feeling across both workshops was that it is important to identify the priority indicators first, in order to ensure that a working system is constructed. The focus should then be on successively filling in the gaps and refining the data collection process.

2.4.1 Residential and Transport Sectors

It came as no surprise that the availability of data for the residential sector was seen as problematic. Unlike in the other sectors, it is the data underlying the 'state' indicators that is likely to present the

greatest difficulties. Sectoral level data on numbers of households and total sector energy consumption should not present problems, but the data required for a more detailed analysis of the sector is unlikely to be available in a consistent and continuous form. It is likely that reliance will have to be placed on surveys to generate new flows of data for this purpose

Workshop participants were generally confident that all of the 'state' indicators required to characterise the transport sector are already available from the Department of Transport. However, the representative of Spoornet pointed out that they do not monitor tonne-km for freight transported on their system. Concernes were also expressed that the official figures for passenger-km carried by rail may be very misleading because of the effect of fare evasion (see Section 2.3.1 above).

2.4.2 Industrial and Commercial / Public Sectors

Most of the 'state' data required for monitoring the industrial sector is already available either from official sources or, in the case of large industrial enterprises, directly from the firms themselves. The main issue that a monitoring system must address is the protocols necessary to ensure that this data flows to the monitoring body in a timely fashion, and in a form that is useable with the minimum of additional processing. Many firms are already publishing data of the type required in environmental statements or 'green accounts', which are subject to external scrutiny. Some workshop participants felt that the mere fact of publishing this type of data would act as a driving force to improve energy efficiency.

3 Next Steps

- Revise and update the paper 'Monitoring of Energy Efficiency Targets: Selection of Indicators' in the light of the discussions held at these workshops.
- Follow-up with selected key stakeholders, including those who were not able to attend the workshops.
- Begin to mobilise the resources necessary to respond to the DME data collection 'trigger'

ANNEX 1 – List of Invited Stakeholders

NAME	ORGANISATION	EMAIL ADDRESS	TEL. #
Mr. Zella Fuphe	Africa Energy Resources	zellaf@waigh.coza	011 783 6210
Mr. Andy Raath	Associated Octel	octelrsa@iafrica.com	021 701 5340
Mr. Alan Doble	BP Oil	allan.doble@za.bp.com	
Mr. Edu Cloete	Chemical & Allied Industries Association	ecloete@prochem.co.za /caia@caia.co.za	011 706 9095
Mr. Raoul Goosen	Chemical & Allied Industries Association	raolu_goosen@wol.co.za	011 783 2341
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Nick	Legal Resource Centre	nick@lrc.org.za	
	Japan Automobile Association	cpwers@porterovelli.com/	

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Mr. Dale Jassop	Conmesa	dale.jessop@liebherr.com	
	Southern African Long Distance Transport Organisation		
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Pasco Dyani	CCEPPAWU	cpwers@porterovelli.com/ cpwers@portermovelli.com	011 833 2878
Bheki Ntshalintsha	COSATU	csatu@sn.apc.org	011 339 4911
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Mr. Maake	NDOT	maakee@ndot.pwv.gov.za	
Erwin Obermeyer	NT	Erwin.obermeyer@treasury.gov.za	
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Pat Manders	CSIR	pmanders@csir.co.za	012 841 3680
Mr. Peter Mbulelo Mthi	Petronet	mbulelo.mthi@petronet.co.za	
Mr. Richards Willington	Earth life Africa	richardw@earthlife.org.za	
John Cotzee	SAFDA	Johan.cottze@rmi.org.za	011 789 2542
		fente@peugeot.co.za	

ANNEX 2 – Workshop Agenda

DME-Danida CaBEERE Programme

Energy Efficiency Monitoring of Targets – Stakeholder Workshop

Department of Minerals and Energy, 18th – 19th April 2005

Agenda

Part 1 Overall framework and process for energy efficiency monitoring

0900 – 0915 Elsa du Toit

Introduction and the South Africa Energy Efficiency Strategy

0915 – 0930 David Mercer

Context setting: the CaBEERE programme and this project

0930 – 1000 Jesper Vauvert

Lessons learned from international monitoring best practice

1000 – 1045 Ian Household

International best practice in energy efficiency monitoring – New Zealand case study

1045 – 1130 All

Brainstorming on how elements of best practice can be applied in South Africa

1130 – 1200 Coffee

Part 2 Indicators, Data Requirements and Data Collection Methodology

1200 – 1215 Ian Household

Summary of proposed indicators and data requirements

1215 – 1300 All

Brainstorming on data priorities, likely data availability, data collection

Part 3 Wrap-up

1300 – 1315 All

Agreement on roles and responsibilities

1315 – 1330 David Mercer

Next steps and closing comments

ANNEX 3 – Workshop Participants

Residential / Transport Sectors

Name	Organisation	Email address
Gary Ronald	AA of SA	gronald@aasa.co.za
Dana Gampel	Eskom	Dana.gampel@eskom.co.za
Apie Peens	SAPIA	Chevrontexaco.com
S. Reyner	NAAMSA	Srayner3@ford.com
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Dave Mercer	CaBEERE	Mercer@mweb.co.za
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Industrial / Commercial Sectors

Name	Organisation	Email address
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ANNEX 4 – Workshop Presentations

Minerals and Energy for Development and Prosperity

DEPARTMENT OF MINERALS AND ENERGY
SOUTH AFRICA

Energy Efficiency Targeting Workshop

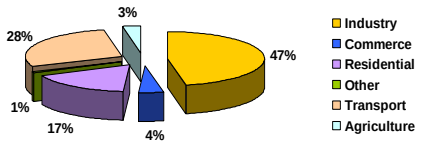
Monday 18th – Tuesday 19th April 2005

Introduction By:
Elsa du Toit
Director: Energy Efficiency & Environment
Department of Minerals & Energy

Background

- South Africa accounts for 50% of Africa's energy usage - with only 5% of her population
- We rank amongst the top 20 CO_2 emitters in the world
- South Africa's economy is energy intensive, biased towards heavy industry and mining
- Coal accounts for 80% of primary energy usage in our country
- The ability of Eskom to meet "peak" electricity demand will be challenged during the coming years

Energy End-users



Why an Energy Efficiency Strategy?

ECONOMIC REASONS

Enhanced Energy Security

Improved Industrial Competitiveness

Defer Building Additional Generation Plant

ENVIRONMENTAL REASONS

Reduce Environmental Pollution

Reduce CO_2 Emissions

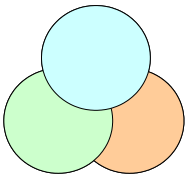
SOCIAL REASONS

Job Creation

Improve the Health of the Nation

Alleviate Energy Poverty

Why an Energy Efficiency Strategy?



For Sustainable Development

The Environmental, Social and Economic Benefits of a National Energy Efficiency Strategy make practical sense

Strategy Formulation Process

- By the Department of Minerals and Energy (DME)
- Legal mandate derived, *inter alia*, from:
  - 1998 White Paper on Energy Policy
  - The Draft Energy Bill
- Strategy formulation process commenced April 2003
- Danida CaBEERE Project involvement
- Draft completed January 2004
- Public comments invited March 2004
- Comment review process from May 2004
- Official launch in May 2005 – Energy Efficiency Month

Strategy Overview

- Provides guidelines for energy efficiency practices in all sectors, with a framework for action and coordination involving stakeholders
- Allows for immediate implementation of low-cost and no-cost interventions, based on the fact that a large savings potential exists in most sectors
- Has a 3-phase, 10 year, programme wherein medium-term and long-term investment opportunities are addressed in the latter phases
- Sets a national target for energy efficiency improvement of 12% of final energy demand by 2015. This is based on the forecast demand
- The national target is further split into sectoral targets, according to savings potential in each sector

Sectoral Targets

- Challenging, yet realistic and achievable
- Established via baseline study, benchmarking studies, energy efficiency feasibility studies, international experience, consultation with stakeholders
- Account for technical and management interventions (good housekeeping)
- Allow for sectoral activity growth
- Industrial 15%
- Commercial & Public Buildings 15%
- Residential 10%
- Transport 9%

Target Monitoring

"*A formalised system for collecting, managing data and calculating indicators is necessary for monitoring the implementation and success of activities initiated as part of the strategies for energy efficiency. It is DME's responsibility to establish such a monitoring and verification system and ensure that it is implemented*…….

The success of such a system will inevitably depend upon using a multi-stakeholder approach, including consultation with representative bodies within each sector."

(Energy Efficiency Strategy of the Republic of South Africa)

Minerals and Energy for Development and Prosperity

DEPARTMENT OF MINERALS AND ENERGY
SOUTH AFRICA

Energy Efficiency Targeting Workshop
Project Background
Monday 18th – Tuesday 19th April 2005

Presented By:
Dave Mercer
CaBEERE Project
Danida / DME

Target Monitoring

"A formalised system for collecting, managing data and calculating indicators is necessary for monitoring the implementation and success of activities initiated as part of the strategies for energy efficiency. It is DME's responsibility to establish such a monitoring and verification system and ensure that it is implemented…….

The success of such a system will inevitably depend upon using a multi-stakeholder approach, including consultation with representative bodies within each sector."

(Energy Efficiency Strategy of the Republic of South Africa)

Overview of CaBEERE

- Capacity Building in EE and RE
- Danida funded project
- Commenced August 2001
- To enhance capacity and performance of DME
- Using combination of strategies and action plans
- Objective to build capacity
- Separate budget line for "Special Projects"

CaBEERE Special Project: EE Monitoring of Targets

- Objective:

  "To facilitate and test mechanisms and systems to monitor and report on progress towards meeting the national EE targets, as prescribed within the Energy Efficiency Strategy"

(Project Terms of Reference)

The Project Team

DME:	Elsa du Toit Tony Golding Philip Tshikalanke Janneke Weidema
CaBEERE:	Helene Gron Dave Mercer
Service Provider:	IIEC – Africa (Ian Household) DEM Nano Energy

Project Outputs

- Study on International Best Practice
- Inventory of necessary Indicators
- Inventory of data "gaps"
- Inventory of Stakeholders
- Data collection protocols
- Formulation of Management Structure
- Data Processing, Dissemination

Scope of Work - 1

- Study on International Best Practice
  - Which countries have undertaken a similar process at national and sectoral levels?
  - How successful was their approach?
  - Who was involved?
  - What lessons can South Africa learn from their experiences?

Scope of Work - 2

- Inventory of Indicators and Gaps
  - International study to inform the project
  - Sectoral activity variables are necessary, not just energy usage data
  - Targeting methodology can be complex
  - Workshop

Scope of Work - 3

- Data Gathering
  - Frequency, media, units
  - Possible provision of historical data
  - Procedural issues, reporting routes, regimes and responsibilities
  - Data request "trigger"
  - Contingency procedures, response times
  - Workshop

Scope of Work - 4

- Identify Missing Data
  - Responsibility for data provision
  - Practicalities and barriers
  - Options for using proxy data

Scope of Work - 5

- Formulation of Management Structure
  - An "Institutional Arrangement"
  - Its formation mandated by DME
  - To undertake governance, control and administration of the EE Monitoring Process
  - To include representation by all relevant stakeholders

Project Workshop

- Two-day workshop
  - Monday 18th April: Residential and Transport Sectors
  - Tuesday 19th April: Industry and Public/Commercial Buildings
- A diverse range of potential stakeholders have been invited and are welcomed here today


Workshop Objectives
To share International Best Practice
To review and discuss the indicators
To commence data gathering
To identify early gaps
To invite wider input from stakeholders on the targeting process


Mineral and Energy for Development and Prosperity
DEPARTMENT OF MINERALS AND ENERGY
SOUTH AFRICA
We look forward to your participation
Thank You

International Best Practice in Monitoring

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Danish Energy Management A/S

Presented at Stakeholder Workshop, 18 April 2006

Project on Monitoring of National Energy Efficiency Targets in South Africa
CaBEERE Program, South Africa Department of Minerals and Energy

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Purpose of Strategy, Program and Project Monitoring

Results oriented information on projects and programmes are gathered, and their progress is reported both clearly and quickly to the main stakeholders

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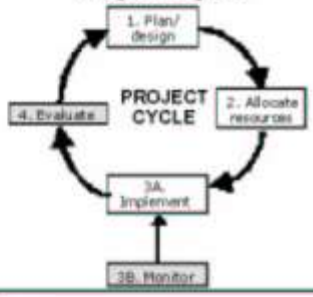
Monitoring & Evaluation in the Project Cycle



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Project vs. Strategy Level Monitoring

- Project level monitoring assesses particular program, project, or initiative
  - Progress to date
  - Relevance, sustainability
  - Barriers and how they can be overcome
- Strategy Level monitoring assesses overall progress for suite of programs
  - Progress to date across sectors
  - Which programs working, which not?
  - Macro level as well as end- use level are important
  - Barriers and how they can be overcome?

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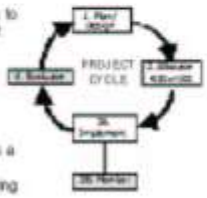
Monitoring vs. Evaluation

- Monitoring
  - Timely, speedy, and effective process to provide regular information on project progress
  - Track key indicators
  - Provides an "Early Warning System"
- Evaluation
  - Carried out at discrete point in time
  - Usually at completion, and sometimes a Mid-Term review
  - More comprehensive/in-depth – "digging in" to understand why and how



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Monitoring is the following: Monitoring

- A speedy and effective way of providing concentrated and informative reports
- An overview of project implementation at a given point in time (a "snapshot"), which is carried out against a set of objective criteria
- A transparent exercise where all parties are made aware of project progress and difficulties (if any)
- An information gathering exercise based on:
  - Knowledge of project documentation and current status;
  - Interviews with all project parties;
- The formation of a structured opinion on progress
- A facilitator for good project management
- A source of information for program analysis
- ***An early warning system***

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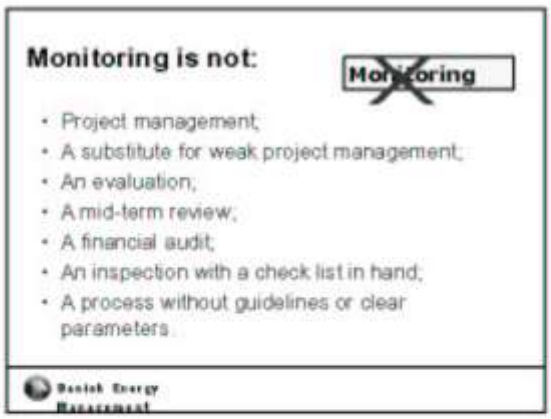
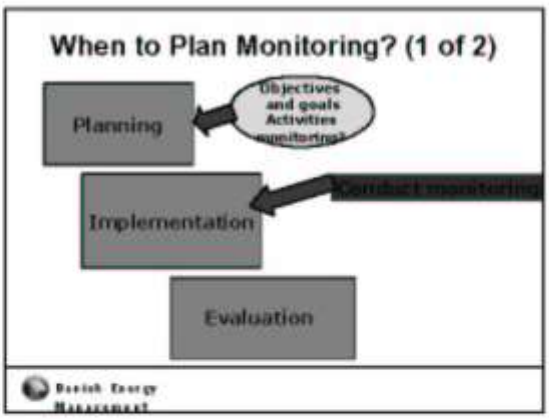
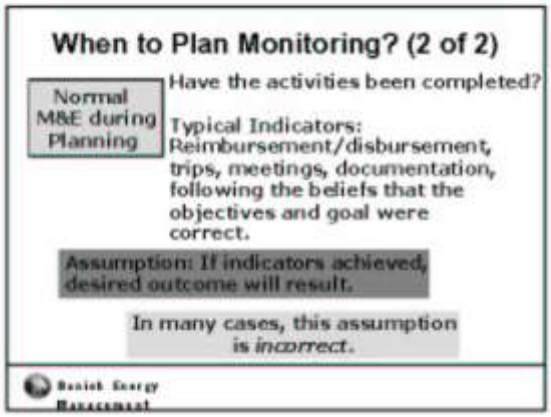
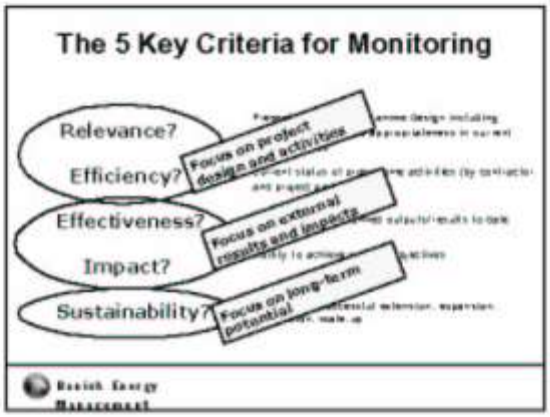
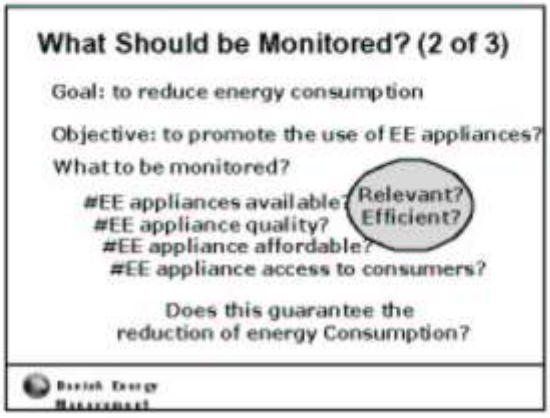

Monitoring is not:
Monitoring
• Project management;
• A substitute for weak project management;
• An evaluation;
• A mid-term review;
• A financial audit;
• An inspection with a check list in hand;
• A process without guidelines or clear parameters.

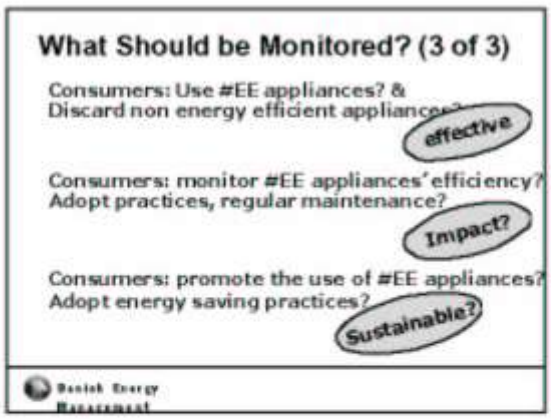

When to Plan Monitoring? (1 of 2)
Planning
Objectives and goals
Activities
Implementation
Evaluation

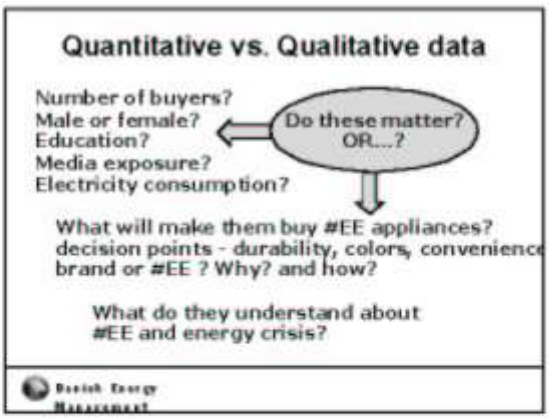

When to Plan Monitoring? (2 of 2)
Normal M&E during Planning
Have the activities been completed?
Typical Indicators: Reimbursement/disbursement, trips, meetings, documentation, following the beliefs that the objectives and goal were correct.
Assumption: If indicators achieved, desired outcome will result.
In many cases, this assumption is incorrect.


The 5 Key Criteria for Monitoring
Relevance?
Efficiency?
Effectiveness?
Impact?
Sustainability?
Focus on project design and activities
Focus on external results and impacts
Focus on long-term potential


What Should be Monitored? (1 of 3)
Relevance?
Efficiency?
Effectiveness?
Impact?
Sustainability?

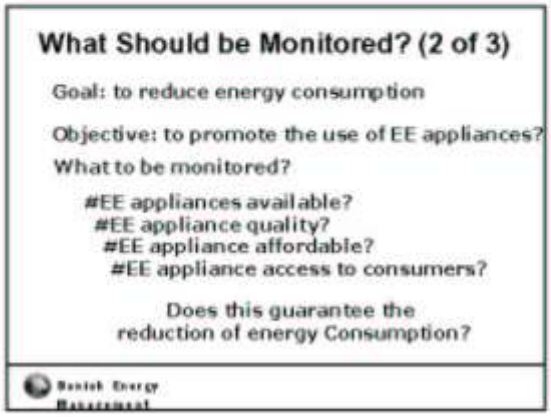

What Should be Monitored? (2 of 3)
Goal: to reduce energy consumption
Objective: to promote the use of EE appliances?
What to be monitored?
#EE appliances available?
#EE appliance quality?
#EE appliance affordable?
#EE appliance access to consumers?
Relevant? Efficient?
Does this guarantee the reduction of energy Consumption?


What Should be Monitored? (3 of 3)
Consumers: Use #EE appliances? &
Discard non energy efficient appliances?
effective
Consumers: monitor #EE appliances' efficiency?
Adopt practices, regular maintenance?
Impact?
Consumers: promote the use of #EE appliances?
Adopt energy saving practices?
Sustainable?


Quantitative vs. Qualitative data
Number of buyers?
Male or female?
Education?
Media exposure?
Electricity consumption?
Do these matter?
OR....?
What will make them buy #EE appliances?
decision points - durability, colors, convenience
brand or #EE ? Why? and how?
What do they understand about
#EE and energy crisis?


Quantitative vs. Qualititative Data
How do we know we got the truth?
Interviews?
Questionnaires survey?
In-depth interview?
On-site?
Observe their action?
Community participation?


What Can be Monitored?
Knowledge and awareness
Interest?
Intention?
Commitment?
Knowledge?
Understanding?
Agreement?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Does this guarantee the
reduction of energy Consumption?


Feedback from International
Survey of Energy Experts on
monitoring


Lessons from International Survey
Lesson 1. Many conditions for successful monitoring process
Must be political will and sufficient resources are allocated to the monitoring effort.
Most of the respondents made a clear statement that monitoring system was working well in their country
Monitoring schemes will have to be adjusted along the way to make up for deficiencies that are discovered during implementation. It must be a balance, though to avoid unnecessary discontinuities – i.e. adjustments rather than abrupt change.
Lesson 2. Need incentives or mandatory requirements for data submission
These can significantly ease the task of data collection, verification and improve accuracy and quality as well as reduce costs for monitoring.
Lesson 3. Failure if inadequate resources
Monitoring needs to be adequately funded and staffed by skilled personnel.
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Lessons from International Survey
Lesson 4. Monitoring is more than just tracking numerical indicators
Need for regular evaluations to supplement indicator tracking data. Such evaluations provide more insight and qualitative information to explain WHY progress are working or are not working – i.e. identify mechanisms and key relationships – "drivers"
Lesson 5. Feedback loop essential
Information compiled through monitoring (and evaluation) need to be fed back into the policy formulation and implementation process as well as to key target groups of the activities
Lesson 6. Independent monitoring
Monitoring should preferably be carried out by an independent body free from various vested interests.
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International Best Practice in Energy Efficiency Monitoring:
A New Zealand Case Study

DME Danida CaBEERE Programme
Stakeholder Workshop on Energy Efficiency Monitoring of Targets
18th – 19th April 2005

Ian Househam, IEC-Africa
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IEC-AFRICA

Overview of presentation

- Why New Zealand ?
- Conceptual framework
- Methodology → Technical diversion
- Communication of results
- Institutional framework
- Challenges faced
- Lessons for South Africa

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Why New Zealand ?

- Their approach represents a distillation of the best features from other countries' approaches
- They have been conducting energy efficiency monitoring for just long enough to be able to provide some useful lessons
- Their methodology is very well-documented
- They have been able to advance the technical aspects of the monitoring methodology

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EE Monitoring in New Zealand: Background

Energy Efficiency and Conservation Act 2000

National Energy Efficiency and Conservation Strategy (NEECS)

Ministry of Environment

Energy Efficiency and Conservation Authority (EECA)

Energy efficiency target: "20% improvement in economy-wide energy efficiency by 2012"

System for monitoring EE progress

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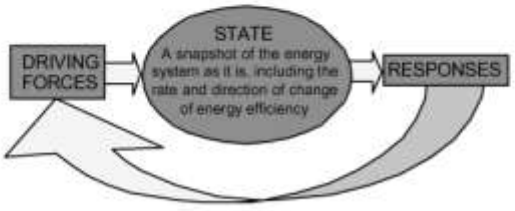
EE Monitoring in New Zealand: Conceptual framework

'Driving Force – State – Response' model



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EE Monitoring in New Zealand: Conceptual framework

'Driving forces' are factors that have an impact on energy efficiency and its direction of change e.g.

- Prices
- Attitudes
- Awareness
- Stock turnover
- Existing programmes

'Responses' are how policymakers and society as a whole react to the observed changes in energy efficiency

- Legislation and regulation
- Economic instruments
- New programmes
- Information campaigns

"... for a rich picture of energy efficiency in New Zealand, EECA must monitor 'driving forces' and 'responses' as well. These will assist with answering the question of 'why' energy efficiency changed as it did."

EE Monitoring in New Zealand: Driving forces

- Attitudes towards energy efficiency
- Stock turnover
- Technology development and deployment
- Capacity utilisation
- Energy prices
- Capital goods prices
- Labour cost
- Consumer price index
- Business confidence

EE Monitoring in New Zealand: Methodology

- Define energy efficiency !
- Use a suite of indicators
  - Economy-wide headline indicator is the energy : GDP ratio
  - Sectoral level indicators are energy : value-added ratios
  - Residential sector indicator is energy per household
  - Transport sector indicators are energy per tonne-km or passenger-km
- Use 'decomposition' to factor out non-efficiency effects:
  - Structural effects
  - Changes in activity level

EE Monitoring in New Zealand: What is energy efficiency ?

Three possible definitions:

- Theoretical minimum energy requirement for performing task ÷ energy actually used
- Current best practice energy requirement for performing task ÷ energy actually used
- Useful output obtained ÷ energy used

EECA chose the third of these definitions, observing that:

"There is no unequivocal quantitative measure of 'energy efficiency'. Instead, one must rely on a series of indicators relevant to the context…"

EE Monitoring in New Zealand: What is an indicator ?

- "…they extend beyond basic statistics to provide a deeper understanding of the main issues and to highlight important relations that are not evident using basic statistics."
- "They are essential tools for communicating energy issues… to policymakers and to the public, and for promoting institutional dialogue."
- "Each set of indicators expresses aspects or consequences of the production and use of energy."
- "Taken together, indicators give a clear picture of the whole system… as well as the longer-term implications of current decisions and behaviour."

EE Monitoring in New Zealand: What is decomposition ?

- Energy saving is not necessarily the same thing as energy efficiency
- Energy consumption can be reduced (increased) by:
  - Doing less (more)
  - Doing different things
  - Doing the same things more (less) efficiently
- Decomposition breaks down the observed changes in energy consumption into components attributable to these three factors

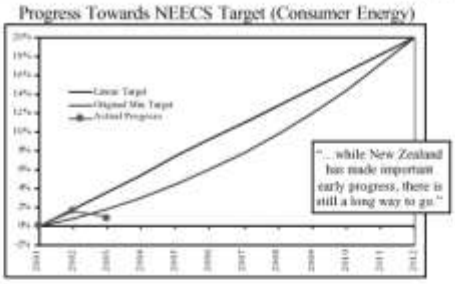
EE Monitoring in New Zealand: Decomposition

- In addition to activity, structural and efficiency effects, EECA also considered:
  - Fuel quality effect – represents the effect of changes in the fuel mix
  - Weather effect – in the residential sector only
- Decided to exclude the energy quality effect until such time as data quality has been improved
- Found that the weather effect is relatively small, and should average to zero over the longer term
- First year analysis disaggregated residential use by application (cooking, water heating etc.) but this was abandoned due to poor quality data

EE Monitoring in New Zealand: Communicating results

- Annual report, but not specifically targeted at a particular audience
- Chapters on economy-wide results and on individual sectors (residential, commercial / public, industrial, passenger transport, freight transport, primary production)
- Simple graphical representation of progress towards targets, both economy wide and sector-by-sector
- Driving forces receive very scant attention in report – short sections only on 'anecdotal evidence'

EE Monitoring in New Zealand: Example of results presentation



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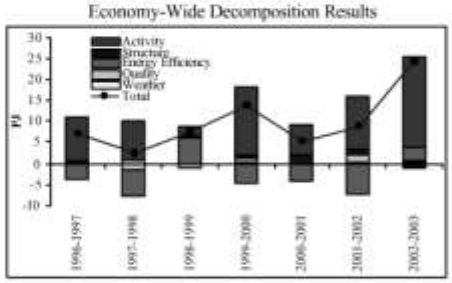

EE Monitoring in New Zealand: Institutional structures

- Entire process is the responsibility of EECA
  - Established as a 'Crown entity' in July 2001
  - Staff of 59, operating budget of NZ$12.5 million (ZAR 55.8 million)
  - Responsible for running a range of energy efficiency and renewable energy programmes, not just monitoring
- Main institutions responsible for data provision are:
  - Statistics New Zealand
  - Ministry for Economic Development
  - Property Council
- Proposal to government for a biennial energy survey was turned down due to budgetary constraints

EE Monitoring in New Zealand: Challenges faced

- Poor data quality and reliability
- Difficult to derive time series as data quality is continually being improved (need to back-cast)
- Entirely dependent on existing data sources – no resources available for conducting surveys or otherwise generating new data
- Cogeneration (particularly in pulp & paper) – no commonly accepted way of quantifying inputs and outputs

Lessons for South Africa from the New Zealand experience

- Decomposition is a powerful tool for isolating energy efficiency changes from other factors affecting energy consumption – but…
- …there's no point in monitoring energy efficiency unless you are equipped to affect it. This requires an understanding of the 'driving forces'
- Monitoring of energy efficiency progress requires significant resources, particularly if new data sources are to be created
- Data quality is likely to be a very major challenge

Technical diversion on decomposition analysis
An illustrative example

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Table 1 Data for a hypothetical industrial sector consisting of two industries

		Industry A	Industry B	Sector total
Output	Year 0	50 tonnes	320 items	-
	Year 1	28 tonnes	180 items	-
Energy consumption	Year 0	240 GJ	240 GJ	480 GJ
	Year 1	196 GJ	142 GJ	338 GJ
	change	-44 GJ	-102 GJ	-58 GJ
Physical energy intensity	Year 0	8 GJ / t	2 GJ / item	-
	Year 1	7 GJ / t	1.9 GJ / item	-
	% change	-12.5%	-5.0%	
Value added per unit of output	Year 0	1000 € / tonne	500 € / item	
	Year 1	900 € / tonne	350 € / item	

What is the overall change in industrial sector energy efficiency ?

Technical diversion on decomposition analysis
An illustrative example

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- Aggregation seeks to combine the 12.5% improvement in Industry A and the 5% improvement in Industry B in a meaningful way
- Decomposition seeks to apportion the 58 GJ increase in overall energy consumption to a number of causes:
  - Increases in overall activity
  - Structural changes
  - Efficiency improvements
- The two approaches are arithmetically equivalent, but decomposition provides a more complete picture

Technical diversion on decomposition analysis
An illustrative example

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Log-mean Divisia decomposition:

$\Delta E = \Delta P + \Delta I + \Delta S$ where:

$$\Delta P = \ln\left(\frac{Y_t}{Y_0}\right) \propto \sum_i F\left(E_{i,0}, E_{i,t}\right)$$

$$\Delta I = \sum_i \left[F\left(E_{i,0}, E_{i,t}\right) \propto \ln\left(\frac{I_{i,t}}{I_{i,0}}\right) \right]$$

$$\Delta S = \sum_i \left[F\left(E_{i,0}, E_{i,t}\right) \propto \ln\left(\frac{S_{i,t}}{S_{i,0}}\right) \right]$$

Technical diversion on decomposition analysis
An illustrative example

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Extended data for a hypothetical industrial sector

		Industry A	Industry B	Sector total
Output	Year 0	50 tonnes	320 items	-
	Year 1	28 tonnes	180 items	-
Energy consumption	Year 0	240 GJ	240 GJ	480 GJ
	Year 1	196 GJ	142 GJ	338 GJ
	change	-44 GJ	-102 GJ	-146 GJ
	log-mean	217.2	206.9	505.2
Value added per unit of output	Year 0	1000 € / tonne	500 € / item	
	Year 1	900 € / tonne	350 € / item	
Total value added	Year 0	450,000	450,000	900,000
	Year 1	425,200	433,000	858,200
Share of value added	Year 0	45.45%	54.54%	
	Year 1	28.57%	71.43%	
Energy intensity	Year 0	8.00 MJ / €	0.47 MJ / €	
	Year 1	7.76 MJ / €	0.41 MJ / €	

The 58 GJ increase in sectoral energy consumption can be attributed as follows:

- +146.5 GJ due to activity increase
- -23.2 GJ due to structural effects
- -65.3 GJ due to efficiency improvements

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International Best Practice in Energy Efficiency Monitoring:
Data requirements

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Passenger transport sector Data requirements (1 of 2)

- Sector contribution to GDP
- Total passenger-km
- Total energy consumption
- Passenger-km and energy consumption by mode:
  - Private car
  - Urban bus / minibus
  - Intercity bus
  - Urban rail
  - Intercity rail
  - Domestic flights

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Passenger transport sector Data requirements (2 of 2)

- Sales of new vehicles
- Average fuel consumption of new vehicles sold
- Average age of road vehicle stock
- Scrapping rates
- Fuel prices
- Survey data on drivers' attitudes to and awareness of energy efficiency

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Freight transport sector Data requirements (1 of 2)

- Sector contribution to GDP
- Total tonne-km
- Total energy consumption
- Tonne-km and energy consumption by mode:
  - Road haulage
  - Rail freight
  - Domestic air freight

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Freight transport sector Data requirements (2 of 2)

- Sales of new vehicles
- Average fuel consumption of new vehicles sold
- Average age of road vehicle stock
- Scrapping rates
- Fuel prices
- Fraction of haulage companies' total costs accounted for by fuel
- Survey data on haulage companies' attitudes to and awareness of energy efficiency

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Residential sector Data requirements

- Total number of households
- Total sector energy consumption
- Other data requirements will depend on the type of detailed analysis being conducted. Examples include:
  - Analysis of overall energy consumption in terms of living standard measure (LSM)
  - Analysis of electricity consumption only, in terms of ownership levels of electrical appliances

Residential sector
(analysis by electrical appliance ownership)
Data requirements

- Total sector electricity consumption
- Number of households having electricity
- Ownership levels and average energy consumption in use for major electrical appliances:
  - lamps
  - space heater
  - water heater
  - stove / cooker
  - refrigerator
  - washing machine
  - clothes dryer

Residential sector
(analysis by LSM)
Data requirements

- Total sector energy consumption
- Number of households in each LSM category
- Total energy consumption of each LSM category

Residential sector
'Driving force' data requirements

- Electricity and fuel prices
- Energy efficiency of new electrical appliances on the market
- Sales figures of appliances by efficiency category
- Turnover of housing stock
- Average insulation levels of new homes
- Survey data on:
  - Awareness of energy costs
  - Attitude towards energy bills (are they seen as a significant burden on household budget?)
  - Awareness and understanding of opportunities for energy saving
  - Level of exposure to, and impact of energy efficiency campaigns

Industrial sector
Data requirements

- Sector contribution to GDP
- Total energy consumption
- Value-added and energy consumption by sub-sector:
  - Iron and steel (SIC Major Group 351)
  - Mining and quarrying (SIC Major Division 2)
  - Pulp and paper (SIC Major Group 323)
  - Chemicals (SIC Division 33)
  - Non-ferrous metals (SIC Major Group 352)
  - Non-metallic minerals (SIC Division 34)
  - Construction (SIC Major Division 5)
- For mining sub-sector only, total tonnage of material extracted
- Are physical indicators of activity (as opposed to value-added) practical and useful for other industry sub-sectors?

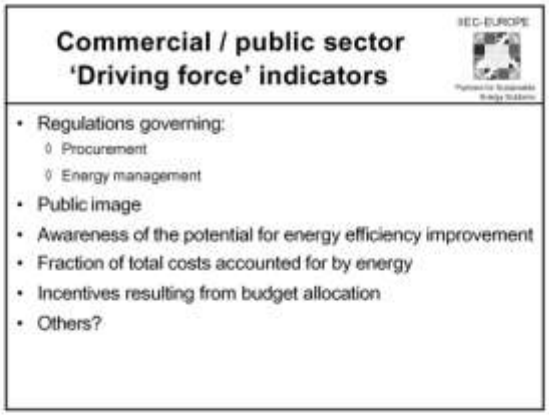
Industrial sector
More detailed analysis ?

- Some industrial sub-sectors are such large energy users that more detailed analysis may be useful– but is it feasible?
- Analysis of mining in terms of the relative contributions to energy efficiency changes of:
  - Gold mining
  - PGM mining
  - Diamond mining
  - Coal mining
- Analysis of iron and steel in terms of the relative contributions to energy efficiency changes of…

Industrial sector
'Driving force' indicators

- Fraction of total costs accounted for by energy
- Capacity utilisation
- Awareness of potential for energy efficiency improvement
- Environmentally responsible image
- Procurement procedures
- Capital stock turnover
- Others ?


Commercial / public sector
Data requirements
• Sectoral contribution to GDP
• Total sector energy consumption
• Contribution to GDP, energy consumption and activity level for sub-sectors:
◊ Retail and wholesale trade (including hotels and restaurants)
◊ Commerce (financial, insurance, property, business services)
◊ Government (local and national)
◊ Public institutions (education, healthcare)
• Use floor area as an indicator for activity level


Commercial / public sector
'Driving force' indicators
• Regulations governing:
◊ Procurement
◊ Energy management
• Public image
• Awareness of the potential for energy efficiency improvement
• Fraction of total costs accounted for by energy
• Incentives resulting from budget allocation
• Others?