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INDUSTRIAL DEVELOPMENT ORGANIZATION

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# Energy Management System (EnMS) Expert Training

UNIDO International Energy Efficiency and EnMS Expert

Module 2 – Operations – Day 3

Based on the contents of the UNIDO Practical Guide for  
Implementing and Energy management System



# Agenda – day 3

Topic	Duration (mins)	Exercise (mins)	Break duration	Start Time	End Time
<b>DAY 3</b>					
<b>Develop measurement plan</b>	<b>15</b>	<b>45</b>		<b>08:30</b>	<b>09:30</b>
Measurement and Verification of savings from action plan items	30	30		09:30	10:30
<b>Break</b>			<b>15</b>	10:30	10:45
Measurement and Verification of savings from action plan items		30		10:45	11:15
Discussion: linkages of module 2 and overall EnMS	5	45		11:15	12:05
Preview of checking and module 3	20			12:05	12:25
<b>Lunch</b>			<b>45</b>	12:25	13:10
Test on module 2	5	75		13:10	14:30
Workshop to work on specific issues raised by national experts		60		14:30	15:30
<b>Break</b>			<b>15</b>	15:30	15:45
Closing remarks		15		15:45	16:00
<b>TOTALS</b>	<b>1.25</b>	<b>5.00</b>	<b>1.25</b>		



## What needs to be measured?

- For each SEU where practical
  - Energy consumption
  - Driver data (relevant variables)
  - Consider proxies for variables, e.g. meals served for occupancy
  
- For each SEU
  - Critical operating parameters





## Data Collection Sources

- Billing data
- Energy meters
- Automation control systems, e.g. BMS
- Local instrumentation
- Internet, e.g. degree days
- Security systems, e.g. for occupancy





## Define measurement needs

- What must be measured/monitored?
- What degree of accuracy is required?
- What is required to provide this accuracy?
- What is already in place?
- What are the calibration requirements?
- How often should the measurement needs be reviewed?





# Energy Measurement Plan

## What has to be done

- A measurement plan is developed.
- The plan is implemented.
- Used to manage the monitoring and measurement of the key characteristics

## Ways it might be done

- Maintenance software
- Checklist
- Work Instructions
- Schedules
- Charts
- Others



# Calibration

- Ensures accuracy and repeatability of data
- Allows data to be compared over time
- Is required for equipment used in key characteristic measurements
- Typically a calibration form or record is used





# Exercise

Consider your measurement needs

EnPIs

Critical operating parameters





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## M&V of savings from action plan items

- Has each item achieved its intended savings?
- Actual savings are always different to estimated
- M&V plan recommended in advance of implementation





## Worked example of a simple M&V - 1

- Replacement of light fittings
- 100 units with 100 W lamps replaced with 75 units of 30 W lamps
- What are the annual savings?
- Make any assumptions needed



## Worked example of a typical M&V - 2

- Fitting a variable speed drive to a centrifugal pump
- 30 kW motor
- What are the annual savings
- Make any assumptions needed



## Worked example of a typical M&V - 3

- Training operators in reducing temperature lift of a refrigeration system
- 50 kW motor on compressor
- What are the annual savings
- Make any assumptions needed



## Worked example of a regression based M&V - 4

- Show the effect of a project on a CUSUM chart
- How to interpret the savings
- What assumptions are made?



## M&V exercise

- Consider some of your action plan items.
- How can you verify the actual savings?
- What additional instrumentation is required and economically practical?
- What duration of monitoring is appropriate?



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# See you in 15 minutes!







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## Discussion

- SEUs are central to everything
- Operational control, competence and training
- Roles and responsibilities
  - Procurement
  - Design (Projects People)
  - Document control



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## Preview of checking and module 3



# Module 3 – Checking – Day 1

Topic	Duration (mins)	Exercise (mins)	Break duration	Start Time	End Time
<b>DAY 1</b>					
Registration			15	8:30	8:45
Welcome and opening remarks	10			8:45	8:55
Review targets, action plans, improvements using EnPIs	5	45		8:55	9:45
Review Operations	5	45		9:45	10:35
Break			15	10:35	10:50
Overview of checking	15			10:50	11:05
Performance Checking: EnPIs and Action plan savings total	20	30		11:05	11:55
Checking of Operational control	10	30		11:55	12:35
Lunch			45	12:35	13:20
Internal Auditing: Purpose, Driver and Types	45	60		13:20	15:05
Break			15	15:05	15:20
Non Conformances	30			15:20	15:50
Reviewing and sustaining the system	20			15:50	16:10
Certification to ISO 50001	20			16:10	16:30



## Module 3 – Checking – Day 2

Topic	Duration (hours)	Exercise (mins)	Break duration	Start Time	End Time
<b>DAY 2</b>					
Opening Remarks Company Representative	15			9:00	9:15
Internal Audit Schedule review	5			9:15	9:20
Commitment		30		9:20	9:50
Break			15	9:50	10:05
Planning		45		10:05	10:50
Implementation and Operation		45		10:50	11:35
Lunch			45	11:35	12:20
Site Tour to review operational control		90		12:20	13:50
Checking and Management Review		30		13:50	14:20
Break			15	14:20	14:35
Review the Audit in group		30		14:35	15:05
Prepare Audit report		60		15:05	16:05
Daily Wrap up	5			16:05	16:10



## Module 3 – Checking – Day 3

Topic	Duration (hours)	Exercise (mins)	Break duration	Start Time	End Time
<b>DAY 3</b>					
Team 1 Audit Review presentation	15	5		09:00	09:20
Team 2 Audit Review presentation	15	5		09:20	09:40
Q&A on internal audit process		40		09:40	10:20
Break			20	10:20	10:40
Review of a whole EnMS	35			10:40	11:15
test on module 3		75		11:15	12:30
Lunch			45	12:30	13:15
Optional review of any topic required by national experts	90			13:15	14:45
Closing remarks	15			14:45	15:00
Refreshment and celebration			90	15:00	16:30
<b>Total</b>	<b>2,83</b>	<b>2,08</b>	<b>2,58</b>		





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# See you in 45 minutes!





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