

**National Vocational & Technical Training Commission
(NAVTTTC)**

Curriculum for Energy Efficiency Advisor



Islamic Republic of Pakistan
اسلامی جمہوریہ پاکستان
Islāmī Jumhūrīyah-e Pākistān



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1 INTRODUCTION

1.1 Description of the structure of the course

Module #	Title	Theory (hours)	Practical (hours)	Total (hours)
1	Acquire Project	12	40	52
2	Conduct Energy Review of the company	136	244	380
3	Advise on developing company energy policy and strategies	68	198	266
4	Monitoring the Energy Performance of the company	40	118	158
5	Develop workforce competencies of the company	34	98	132
6	Develop Professionalism	20	30	50
Total		310	728	1038

1.2 Duration of the course and delivery mechanism

The proposed curriculum is composed of 6 modules that will be covered in a total of 1038 contact hours:

Total: 1038 hours

Theory: 310 hours (29.8%)

Practical: 728 hours (70.2 %)

Number of 310 hours for theory is slightly less than the 300 hours recommended in the DACUM document elaborated by a workgroup and approved by NAVTTC. The DACUM document explicitly states that it is possible to deviate from the suggestion.

The amount of 728 for practical training is calculated based on the period of 6 months suggested in the same DACUM document. Following considerations were taken into account:

- Calculation is based on 8 hours work per day and 6 working days per week that results in a maximum of 1250 working hours in 6 months.
- Deduction of 250 hours for illness, holidays (individual and public), strikes, work-interruption due to load shedding.
- Deduction of 272 hours for work assigned to the trainees that is not related to training course. Employees of the technical capacity of the trainees are limited in the industries and thus it must be planned on the assumption that they will be burdened with work not related to the course irrespective of agreements signed with the company.

The training model must be suitable for the potential trainees. As the course is mainly designed for technical staff from the industry thus training hours should not or only to a limited extend interfere with working hours.

1. Suggested model 1: Theoretical training takes place on Saturdays (8 hours) and one evening during the week (4 hours), thus 12 hours of training contents can be covered each week. 310 hours could thus theoretically be covered in 25.8 weeks or roughly half a year. However, it must be considered that it will not be possible to divide the modules exactly in parts of 8 and 4 hours thus some more days will be required. Furthermore other factors like holidays or unavailability of teachers might cause further extension of the course.
2. Suggested model 2: Theoretical training takes place on Fridays (8 hours) and Saturdays (8 hours). Thus the complete theory part could be covered in 19.3 weeks, considering same delays as for model 1 it should still be possible to cover the theory part in less than 6 month. The model is dependent on the approval of companies of the trainees and availability of the training institute and trainers on Fridays.

The suggested models are based on following assumptions:

- Total course should not last longer than 1 year, as duration of 6 month for practical part is already decided theoretical part should last maximum 6 month as well.
- Training must take place mainly on weekends and evenings to avoid working hours.
- Complete training days (weekend days) are preferred over evening hours, as whole topics can be covered in one session and must not be split up. Furthermore trainees will be more perceptive than after a long working day and travel for trainees is reduced.

1.3 Purpose of the training program

The purpose of the training is to develop a range of skills and techniques, personal skill and attributes that are essential for performing the tasks as energy advisor, energy manager, energy efficiency consultant, energy efficiency trainer or management representative for ISO 50001 as per industry requirements.

1.4 Specific characteristics of the training program

- The training program shall be organized in a training institute where the relevant measurement equipment is available.
- The training program shall enable the student to enhance technical skills and managerial skills to pursue a career path with focus on energy efficiency either in the industry or as a consultant or trainer.
- The training program requires basic knowledge in technology, mathematics, physics and chemistry.
- The training program is comprehensive for all working areas of an energy advisor (thermal, electrical, and mechanical energy production, distribution and consumption; managerial aspects of energy efficiency) but is highly relevant for students only interested in one of the aspects as all areas are closely interlinked.
- The training program shall provide a hands-on approach on how the energy performance of a company can be analyzed and improvement measures can be planned, executed and monitored.

1.5 Main objectives of the training program

- To produce capable and skillful industry managers, consultants and trainers as per requirements of the industry.
- To develop excellent professionals in the field of energy efficiency in the industry who are capable to analyze energy performance, to identify improvement potentials and to implement and monitor energy efficiency measures efficiently and effectively.
- To enable trainees to perform all work safely, effectively and hygienically and to guide other managers or workers to do so as well.
- To develop characteristics among the trainees such as reliability, responsibility, flexibility and ethical behavior.

- To develop and promote analytical and investigative traits among the trainees.

1.6 Skill development by action orientation

The trainee must have the following skills after action orientation:

- Consult with teachers and other trainees to determine their ideas and requirements.
- Give a positive impression of yourself whenever any task given by teachers.
- Develop a sense of duty, patience and a desire to be helpful.
- Ensure personal & occupational health and safety precautions.
- Define and practice of good housekeeping.
- Adopt preventive maintenance of equipment and tools.

1.7 Entry level of trainees

The minimum level of education and work experience required to enter the training program:

- Education: Bachelor's degree (BSc Engineering) or Technology (B Tech).
- Work Experience: At least 5 years of work experience in the industry after graduation.

1.8 Medium of instruction

Language for verbal explanations is English and Urdu while all training material including further reading material, standards (e.g. ISO 50001), manuals of measurement equipment and machines as well as internet sources for further research are in English.

1.9 Laws and Regulations

The trainees shall learn to perform all their work in compliance with laws and legislation that apply for their field of work:

- Occupational health and safety regulations: Chapter 3 of Factories Act, 1934; Hazardous Occupations Rules, 1963; Boilers and Pressure Vessels Ordinance, 2002; West Pakistan Shops and Establishments Ordinance, 1969
- Workplace Regulations: Protection Against Harassment of Women at Work Place Act 2010
- Environmental regulations: Pakistan Environmental Protection Act 1997, National Environmental Quality Standards

1.10 Suggested distribution of modules

Module-1: Acquire Project
Module-2: Conduct Energy Review of the company
Module-3: Advise on developing company energy policy and strategies
Module-4: Monitoring the Energy Performance of the company
Module-5: Develop workforce competencies of the company
Module-6: Develop Professionalism shall be incorporated in the other modules and be taught throughout the training program.

1.11 Competencies gained after completion of the course

After completion of the course, the trainee will be able to:

- Develop project proposals, negotiate terms and fees and develop contracts.
- Measure and analyze relevant data for energy performance of a company.
- Develop an energy baseline and identify areas for improvement.
- Plan, implement and monitor measures to improve energy performance of a company.
- Develop energy policy and objectives.
- Plan, organize and evaluate trainings on energy efficiency within a company

- Perform all work according to prevailing safety precautions.
- Identify sources for continuous professional development.

1.12 Worker traits

- Presentable
- Ethical
- Social
- Patient
- Team player
- Non-political
- Adaptability
- Investigative
- Efficient
- Punctual
- Flexible to working environment
- Flexible to travel

1.13 Opportunities for employment and advancement

- Energy manager or energy adviser in the industry (textile, leather, pharmaceuticals, food processing, automotive, cement etc.)
- Energy efficiency consultant for industry and commerce.
- Energy efficiency trainer for workers and lower management of industries.

2 OVERVIEW OF THE CURRICULUM FOR ENERGY EFFICIENCY ADVISOR

Module Title and Aim	Learning Unit	Theory ¹ (hours)	Practical ² (hours)	Total (hours)
Module-1: Acquire Project Aim: Be able to prepare project proposals and to negotiate and draft a contract.	LU-1: Prepare a project proposal	8	24	32
	LU-2: Finalize the contract	4	16	20
Module-2: Conduct Energy Review of the company Aim: Be able to collect, measure and Analyze energy data, (XX), develop EnPIs and their baseline, and identify improvement areas.	LU-1: Collect available data and information of company	24	32	56
	LU-2: Measure required data of company	28	60	88
	LU-3: Analyze energy use and consumption of company	28	60	88
	LU-4: Develop Energy Performance Indicators and their baseline values for the company	8	32	40
	LU-5: Identify areas of improvement potential of the company	48	60	108
Module-3: Advise on developing company energy policy and strategies	LU-1: Develop energy policy and objectives	8	40	48
	LU-2: Identify options for improvement of energy performance	16	48	64

1 Learning hours in training center, including demonstration of portable measurement equipment

2 On-the-job practical application with regular supervision through trainers and/or experts

<p>Aim: Be able to develop energy policy and objectives, identify and prioritize options for energy performance improvement, develop and review action plan</p>	LU-3: Prioritize identified energy performance improvement options	24	40	64
	LU-4: Develop action plan for selected energy improvement options	12	30	42
	LU-5: Review progress of implementation of action plan	8	40	48
<p>Module-4: Monitor the Energy Performance of the company</p> <p>Aim: Be able to develop measurement plan, review effectiveness of action plan</p>	LU-1: Develop a measurement plan for monitoring the energy performance	16	48	64
	LU-2: Compare actual vs. target energy performance	16	30	46
	LU-3: Review effectiveness of the action plan	8	40	48
<p>Module-5: Develop workforce competencies of the company</p> <p>Aim: Be able to plan, execute and evaluate trainings.</p>	LU-1: Design training based on need assessment	24	48	72
	LU-2: Execute the training plan.	5	25	30
	LU-3: Evaluate the effectiveness of training	5	25	30
<p>Module-6: Develop Professionalism</p> <p>Aim: Be able to communicate at each level and to continuously upgrade own capacities.</p>	LU-1: Perform communication at each level	10	10	20
	LU-2: Upgrade professional skill set	10	20	30
Total		310	728	1038

3 TEACHING AND LEARNING GUIDE FOR ENERGY ADVISOR

3.1 Module 1: Acquire Project

Objective of the Module: The trainee will be able to prepare a project proposal and finalize the contract.

Duration: 52 hours Theory: 12 hours Practical: 40 hours

Learning Unit	Learning outcomes	Learning elements	Duration	Material required	Learning Place
LU-1: Prepare a project proposal	Trainee will be able to: <ul style="list-style-type: none"> • Interpret the requirements of the project as per terms of reference (TORs) • Conduct a market research limited to project scope for: <ul style="list-style-type: none"> • Assessing competitors (strengths and weaknesses) • Assessing your organizational capabilities • Estimate the resources as per project requirement (Human resources, Man Hours, tools and equipment, logistics, material) 	<ul style="list-style-type: none"> • Explain basic business terminologies • Read and Interpret the project requirement • Enlist commonly used sources of information • Explain the basic market research methodologies • Describe the project resources, time and cost estimation techniques • Explain the contents of project proposal 	Total: 32 hrs. Theory: 8 hrs. Practical: 24 hrs.	ICT, including computer, office software, internet, printer, stationary, and phone	Theory: Class room Practical: Office in company

	<p>consumables, Project time)</p> <ul style="list-style-type: none"> • Estimate project cost as per resources • Write the project proposal as per TOR • Validate the project proposal as perTOR 				
<p>LU-2: Finalize the contract</p>	<ul style="list-style-type: none"> • Review the roles and responsibilities of parties in the contract as per project requirement • Coordinate with relevant departments to review legal, OHS, environmental and other requirements, applicable to the project • Negotiate the terms and conditions of the contract as per project requirement • Compile the contract document as per legal and other requirements 	<ul style="list-style-type: none"> • Describe types of contracts • Explain the contract formulation • Explain basic legal, OHS, environmental and other requirements related to contractual assignments 	<p>Total: 20 hrs.</p> <p>Theory: 4 hrs.</p> <p>Practical: 16 hrs.</p>	<p>ICT, including computer, office software, internet, printer, stationary, and phone</p>	<p>Theory: Class room</p> <p>Practical: Office in company</p>

3.2 Module 2: Conduct Energy Review of the Company

Objective of the Module: The trainee will be able to collect available data and information, measure the required data, analyze energy use and consumption of the company, develop Energy Performance Indicators (ENPIs) and their baseline and identify areas of improvement potential for the company.

Duration: 380 hours Theory: 136 hours Practical: 244 hours

Learning Unit	Learning outcomes	Learning elements	Duration	Material required	Learning Place
LU-1: Collect available data and information of company	<ul style="list-style-type: none"> Determine the data requirement to initiate energy review, after understanding process flow Identify data sources for data collection, as per available resources Communicate data requirement in understandable way to relevant department Collect the required data from identified sources 	<ul style="list-style-type: none"> Explain methods of process analysis Describe forms of energy, fuel types, prices and tariffs Describe energy parameters (e.g.: calorific value of fuel, heat content, power frequency) Explain the conversion of energy units Describe data collection techniques 	<p>Total: 56 hrs.</p> <p>Theory: 24 hrs.</p> <p>Practical: 32 hrs.</p>	ICT, including computer, office software, internet, printer, stationary, phone and personal protective equipment (PPE)	<p>Theory: Class room</p> <p>Practical: Office and production floor of company</p>
LU-2: Measure the required data of	<ul style="list-style-type: none"> Determine the data measurement requirement for energy review Identify measurement points for required data 	<ul style="list-style-type: none"> Explain data gap analysis Explain major energy flows in an industry 	<p>Total: 88 hrs.</p> <p>Theory:</p>	Computer system, Energy analyzers with data logger Emission analyzer,	<p>Theory: Class room and lab (demo of</p>

company	<ul style="list-style-type: none"> • Identify Occupation Health and Safety (OHS) requirements for data measurement • Select measurement equipment as per requirement (accuracy, reliability, complexity, time, cost) • Take required measurement using selected equipment (if necessary), with safety precautions • Guide energy team to take measurement using selected equipment • Perform measurement system analysis as per MSA methodology • Compile the measured data for further analysis 	<ul style="list-style-type: none"> • Describe the energy parameters for measurement • Enlist OHS requirements for using measurement equipment • Explain working principles and usage of different measuring equipment • Describe Measurement System Analysis (MSA) 	<p>28 hrs.</p> <p>Practical: 60 hrs.</p>	<p>Thermal imager, IR temperature gun, Water flow meter, Air flow meter, Gas flow meter, Tachometer, Lux meter, Noise meter, Ultrasonic leakage detector, pH meter, TDS meter, water hardness kit, earth resistance tester, measuring tape, stop watch, PPE *All Portable Meters</p>	<p>metering equipment and PPE)</p> <p>Practical: Company (office and production floor)</p>
LU-3: Analyze energy use and consumption of company	<ul style="list-style-type: none"> • Conduct process flow analysis using collected and measured data • Develop energy and mass balance within project boundaries 	<ul style="list-style-type: none"> • Explain data analysis techniques • Read and interpret energy distribution network diagrams and drawings 	<p>Total: 88 hrs.</p> <p>Theory: 28 hrs.</p>	<p>ICT including computer system, internet facility, spread sheet, e-sankey, steam tables</p>	<p>Theory: Class room</p> <p>Practical: Company (mainly</p>

	<ul style="list-style-type: none"> • Identify patterns of energy consumption of organization • Identify areas with significant energy consumption of organization • Identify inter-relations between energy consumption and operating parameters of systems • Calculate the costs of energy flows for significant energy users 	<ul style="list-style-type: none"> • Explain procedure of energy and mass balancing • Explain the effect of operational parameters on energy consumption • Explain energy cost calculations 	<p>Practical: 60 hrs.</p>		office)
<p>LU-4: Develop Energy Performance Indicators (EnPIs) and their baseline values for the company</p>	<ul style="list-style-type: none"> • Establish energy performance indicators (EnPIs) for significant energy users • Develop baseline for established EnPIs 	<ul style="list-style-type: none"> • Explain Performance Indicators including leading and lagging indicators. • Explain criteria to identify organization's appropriate EnPIs • Explain variables effecting energy performance • Explain establishment of baseline considering controllable and uncontrollable variables 	<p>Total: 40 hrs.</p> <p>Theory: 8 hrs.</p> <p>Practical: 32 hrs.</p>	ICT including computer system, internet facility, spread sheet	<p>Theory: Class room</p> <p>Practical: Company (mainly office)</p>
<p>LU-5: Identify</p>	<ul style="list-style-type: none"> • Calculate the efficiency of significant energy users, with in 	<ul style="list-style-type: none"> • Explain the basic working principles and efficiency parameters of the 	<p>Total: 108 hrs.</p>	ICT including computer system,	<p>Theory: Class room</p>

<p>areas of improvement potential of the company</p>	<p>project scope</p> <ul style="list-style-type: none"> • Identify internal and external energy performance benchmarks • Analyze the gap between baseline and identified benchmarks • Set targets for energy performance for significant energy users 	<p>following:</p> <ul style="list-style-type: none"> • A. Compressors • B. Furnaces • C. Boilers and heaters • D. HVACR (Heating, ventilation, air-conditioning and refrigeration) • E. Expanders/ Turbines • F. Water treatment system • G. Electric motors and drives • H. Lighting systems • Energy Distribution system <ul style="list-style-type: none"> A. Steam distribution system B. Electrical distribution system C. Air distribution system • Generation Techniques <ul style="list-style-type: none"> A. Open cycle generation B. Co-generation C. Tri-generation D. Combined cycle generation • Introduction to renewable and alternate energy • Heat recovery techniques • Explain basic benchmarking techniques • Comprehend how to set realistic targets for specific industry 	<p>Theory: 48 hrs.</p> <p>Practical: 60 hrs.</p>	<p>internet facility, spread sheet</p>	<p>& visit to industry</p> <p>Practical: Company (mainly office)</p>
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3.3 Module 3: Advise on developing company energy policy and strategies

Objective of the Module: The trainee will be able to guide a company on preparing an energy policy and energy objectives, identify options for improvement of energy performance, prioritize identified energy performance improvement options, develop an action plan for selected energy improvement options and review progress of implementation of the action plan.

Duration: 290 hours Theory: 92 hours Practical: 198 hours

Learning Unit	Learning outcomes	Learning elements	Duration	Material required	Learning Place
LU-1: Develop energy policy and objectives	<ul style="list-style-type: none"> • Develop an outline for energy policy for the company based on international standard(ISO 50001) • Develop an outline for energy objectives for the company consistent with energy policy • Review the draft of the energy policy prepared by company, according to international standard (ISO 50001) • Review the draft of the energy objectives prepared by company, consistent with energy policy • Develop a methodology for 	<ul style="list-style-type: none"> • Explain the structure and contents of an energy management system according to ISO 50001 • Explain basic concepts of formulation of a policy and objective • Explain ways of adaptation and formulation of an energy policy and objectives for a specific company. • Comprehend concepts of giving constructive feedback (e.g.: sandwich methodology, distinguish between person and work) 	Total: 48hrs. Theory: 8hrs. Practical: 40 hrs.	ICT system , ISO 50001 (standard)	Theory: Class room Practical: Office and meeting room of company

	periodically reviewing and updating energy policy and objectives, based on energy performance				
LU-2: Identify options for improvement of energy performance	<ul style="list-style-type: none"> • Determine options for improvement of energy performance. • Calculate energy performance improvement potential for each identified option 	<ul style="list-style-type: none"> • Explain existing options and measures for improvement of energy performance in industries • Explain different energy efficiency labels and their signification(e.g. energy star label) • Explain source of information and methods to retrieve information on energy performance improvement options. • Explain suitability of an energy efficiency measure for a specific process • Explain how to calculate energy efficiency improvement potential 	<p>Total: 64hrs.</p> <p>Theory: 16hrs.</p> <p>Practical: 48 hrs.</p>	ICT System, equipment manuals	<p>Theory: Class room</p> <p>Practical: Office and production floor of company</p>
LU-3: Prioritize identified energy	<ul style="list-style-type: none"> • Define criteria for prioritization of identified energy performance improvement options • Calculate required resources 	<ul style="list-style-type: none"> • Explain sources of data required for energy saving calculations • Explain financial analysis techniques such as (capital expenditures 	<p>Total: 64 hrs.</p> <p>Theory:</p>	ICT system, project planning software	<p>Theory: Class room</p> <p>Practical:</p>

performance improvement options	<p>(e.g. HR, time, financial) for the identified energy performance improvement options</p> <ul style="list-style-type: none"> • Make a comparison of identified energy performance improvement options based on defined criteria. (Compare alternate improvement options) • Present priority list of energy performance improvement options to management of the company 	<p>(CAPEX), operational expenditures (OPEX), life cycle analysis, payback period, IRR, NPV)</p> <ul style="list-style-type: none"> • Explain other factors that determine implementation, like time, complexity, required expertise • Explain prioritizing techniques (e.g. Gravity Urgency and Tendency (GUT), Complexity-Investment-Savings, according to payback, cost-benefit-analysis) • Explain presentation and visualization techniques 	<p>24 hrs.</p> <p>Practical: 40 hrs.</p>		Company, office and meeting room
LU-4: Develop action plan for selected energy improvement options	<ul style="list-style-type: none"> • Define required resources (e.g. time, HR, financial) for implementation of selected energy improvement options • Acquire required resources from company management • Prepare action plan for implementation of selected energy improvement options • Present action plan to management for perusal and 	<ul style="list-style-type: none"> • Explain basic project planning methodology • Explain negotiation techniques to acquire resources from company management • Explain presentation and visualization techniques 	<p>Total: 42 hrs.</p> <p>Theory: 12 hrs.</p> <p>Practical: 30 hrs.</p>	ICT system, project planning software	<p>Theory: Class room</p> <p>Practical: Company, office and meeting room</p>

	support staff for implementation				
LU-5: Review progress of implementation of action plan	<ul style="list-style-type: none"> Analyze project progress (milestones) in set timelines Verify the implementation procedure, in accordance with action plan Suggest adaptations in action plan if actual progress is not as per plan Prepare project progress report of the implementation of action plan 	<ul style="list-style-type: none"> Explain monitoring and evaluation techniques of a project Explain ways to deal with obstacles and crises during implementation 	Total: 48 hrs. Theory: 8 hrs. Practical: 40 hrs.	ICT system, project planning software	Theory: Class room Practical: Company, office and production floor

3.4 Module 4: Monitor the energy performance of the company

Objective of the Module: The trainee will be able to develop a measurement plan for monitoring the energy performance, compare actual versus target energy performance and review effectiveness of an action plan.

Duration: 138 hours Theory: 36 hours Practical: 102 hours

Learning Unit	Learning outcomes	Learning elements	Duration	Material required	Learning Place
LU-1: Develop a measurement	<ul style="list-style-type: none"> Determine data requirements for periodic monitoring of energy performance indicators for 	<ul style="list-style-type: none"> Explain Performance Indicators including leading and lagging indicators. 	Total: 64 hrs.	ICT including computer system, office software,	Theory: Class room & factory

<p>t plan for monitoring the energy performance</p>	<p>significant energy users</p> <ul style="list-style-type: none"> • Identify locations for data collection as per data requirements • Identify measurement equipment with specifications as per data requirements and identified locations • Devise selection criteria for measurement equipment (OHS, Reliability, Calibration, Accuracy, Frequency, Cost, Time) • Devise timelines and responsibilities for execution of measurement plan based on review requirements 	<ul style="list-style-type: none"> • Explain criteria to identify organization's appropriate EnPIs • Explain variables affecting energy performance • Explain working principles and usage of different measurement equipment • Enlist OHS requirements for using measurement equipment • Explain the contents of measurement plan 	<p>Theory: 16 hrs.</p> <p>Practical: 48 hrs.</p>	<p>internet facility, printer, stationary items</p>	<p>visit</p> <p>Practical: Office and production floor of company</p>
<p>LU-2: Compare actual vs. target energy performance</p>	<ul style="list-style-type: none"> • Perform measurement system analysis as per MSA methodology • Compile the measured data for further analysis • Analyze gap between actual vs. baseline and target energy 	<ul style="list-style-type: none"> • Describe Measurement System Analysis (MSA) • Explain statistical analysis techniques • Describe key contents of effective report writing 	<p>Total: 46 hrs.</p> <p>Theory: 16 hrs.</p> <p>Practical: 30 hrs.</p>	<p>Computer system, office software, internet facility, printer, stationary items</p>	<p>Theory: Class room</p> <p>Practical: Company office</p>

	<p>performance</p> <ul style="list-style-type: none"> • Identify patterns of energy performance of significant energy users • Document energy performance based on gap analysis 				
<p>LU-3: Review effectiveness of the action plan</p>	<ul style="list-style-type: none"> • Calculate energy savings of implemented actions as per action plan • Analyze gap between proposed and actual energy saving of implemented actions • Assess impact of realized saving on Energy Performance Indicators • Recommend corrective and preventive measures to mitigate gaps identified in gap analysis 	<ul style="list-style-type: none"> • Explain root cause analysis techniques • Explain how to calculate energy efficiency improvement 	<p>Total: 32 hrs.</p> <p>Theory: 8 hrs.</p> <p>Practical: 24 hrs.</p>	<p>Computer system, office software, internet facility, printer, stationary items</p>	<p>Theory: Class room</p> <p>Practical: Company office</p>

3.5 Module 5: Develop workforce competencies of the company

Objective of the Module: The trainee will be able to design trainings based on need assessment, execute the training plan and evaluate the effectiveness of trainings.

Duration: 132 hours Theory: 34 hours Practical: 98 hours

Learning Unit	Learning outcomes	Learning elements	Duration	Material required	Learning Place
LU-1: Design training based on need assessment	<ul style="list-style-type: none"> • Determine training needs to promote energy efficient operations of the organization for each level • Develop the training plan (objectives, topics, resources, target audience and schedule), based on training needs • Communicate the training plan within the organization according to organizational guidelines 	<ul style="list-style-type: none"> • Explain the training need assessment methodology • Describe the best practices for designing the effective training. • Identify factors required to communicate effectively and precisely within organization. 	<p>Total: 72 hrs.</p> <p>Theory: 24 hrs.</p> <p>Practical: 48 hrs.</p>	ICT including computer system, office software, internet facility, printer, stationary items	<p>Theory: Class room</p> <p>Practical: Office and training room of company</p>
LU-2: Execute the training plan	<ul style="list-style-type: none"> • Review progress of implementation of trainings against designed plan • Identify barriers in execution according to training plan 	<ul style="list-style-type: none"> • Explain monitoring and evaluation techniques • Explain ways to deal with obstacles and crises during implementation 	<p>Total: 30 hrs.</p> <p>Theory: 5 hrs.</p>	ICT including computer system, office software, internet facility, printer, stationary	<p>Theory: Class room</p> <p>Practical: Office and</p>

	<ul style="list-style-type: none"> • Modify training plan to tackle the identified barriers 		Practical: 25 hrs.	items	training room of company
LU-3: Evaluate the effectiveness of training	<ul style="list-style-type: none"> • Design criteria for evaluation of trainings as per training need assessment (TNA) • Perform evaluation of conducted training as per TNA • Analyze effectiveness of trainings based on results of evaluation • Recommend improvements in training plan based on effectiveness analysis 	<ul style="list-style-type: none"> • Explain training evaluation techniques 	Total: 30 hrs. Theory: 5 hrs. Practical: 25 hrs.	ICT including computer system, office software, internet facility, printer, stationary items	Theory: Class room Practical: Office in company

3.6 Develop Professionalism

Objective of the Module: The trainee will be able to perform communication at each level and upgrade professional skill set.

Duration: 50 Theory: 20 Practical: 30

Learning Unit	Learning outcomes	Learning elements	Duration	Material required	Learning Place
LU-1: Perform communication at each level	<ul style="list-style-type: none"> • Communicate within organization according to organizational guidelines (management, energy team, employees) • Communicate with business partners according to organizational guidelines • Communicate with relevant authorities according to organizational guidelines • Prepare reports appropriate for the audience • Present information to different 	<ul style="list-style-type: none"> • Explain how to communicate at different levels • Explain how to write reports for specific purpose and audience • Explain how to present specific information for a specific audience • Explain how to negotiate effectively with relevant stakeholders 	Total: 20 hrs. Theory: 10 hrs. Practical: 10 hrs.	ICT system	Theory: Class room Practical: Office, meeting room, production floor of company

	<p>audience</p> <ul style="list-style-type: none"> • Negotiate with management and business partners 				
<p>LU-2: Upgrade professional skill set</p>	<ul style="list-style-type: none"> • Improve professional skills in current career path on continuous basis • Seek learning opportunities in new relevant areas to diversify skill set. • Adapt to changing business environment 	<ul style="list-style-type: none"> • Explain sources for professional development: (professional bodies, prevailing standards, certification courses, online libraries, webinars, technical journals, conferences or other events) 	<p>Total: 30 hrs.</p> <p>Theory: 10 hrs.</p> <p>Practical: 20 hrs.</p>	<p>ICT system</p>	<p>Theory: Class room and event (e.g. trade fair, conference etc.) if applicable</p> <p>Practical: Office in company and participation in at least one event (trade fair, seminar, conference)</p>

4 ASSESSMENT GUIDANCE

Assessment is the process of collecting evidence and making judgments on whether competences have been gained by the trainee. The assessment confirms that an individual can perform work to the standard expected as expressed in the nationally endorsed competency standards. The assessment practices should include sessional assessments to test the learning progress of the trainees and final assessments to verify if the aspired competency standard is met. Good practices by vocational training providers during sessional and final assessments will form the basis of qualifying the trainees.

4.1 From competency standards to assessment judgment³

Benchmarks are standards against which the trainees are assessed. In case of this competency based training the benchmarks are the defined units of competency that are reflected in the learning units shown in chapter 3. Example: Develop a measurement plan for monitoring the energy performance.

Evidence requirements are the information which when matched against the benchmark show that a trainee is competent. Thus the defined units of competency determine the evidence requirements, for which suggestions are given in chapter 4.4.2. Examples: Determine data requirements for monitoring of energy performance indicators. Identify locations for data collection.

Assessment techniques are techniques to gather different types of evidence. Suggestions for assessment techniques are given in chapter 4.4.2. Example: Real work observation.

Assessment tools are instruments and instructions for gathering and interpreting evidence. The tools have to be defined in an assessment plan. Example: Observation checklist.

Evidence produced is the information on which the assessment judgment is made. Example: Data requirements for monitoring ascertained. Location for data collection identified.

³ See Department of Education and Training of Western Australia: <http://www.serviceskills.com.au/sites/default/files/files/Resources/Foundation%20Skills/Designing-assessment-tools-for-quality-outcomes-in-VET.pdf>

4.2 Methods of assessments

4.2.1 Difference between individual, social and criteria benchmarking in an assessment

Assessments based on **individual benchmarks** use the improvement or decline of the performance of an individual trainee for rating. Tasks are adapted to the level of an individual trainee.

Assessments based on **social benchmarks** use the comparison of performance among the trainees as basis for rating. Tasks are the same for all trainees but the rating is not based on certain competencies but depends on the performance in relation to the other trainees.

Assessment based on **criteria benchmarks** target the acquisition of specific knowledge and skills. Assessment for a competency based training course must be based on criteria benchmarks as this is the only method that allows verifying if the trainee has acquired the knowledge and skills defined in the curriculum.

4.2.2 Difference between formative and summative assessment⁴

The goal of **formative assessment** (or sessional assessment) is to monitor trainee learning to provide ongoing feedback that can be used by instructors to improve their teaching and by trainees to improve their learning. More specifically, formative assessments:

- help trainees identify their strengths and weaknesses and target areas that need work
- help teachers recognize where trainees are struggling and address problems immediately

Formative assessments are generally low stakes, which means that they have low or no point value. Examples of formative assessments include asking students to:

- draw a concept map in class to represent their understanding of a topic
- submit one or two sentences identifying the main point of a lesson
- quick written or oral test that covers key areas of the lesson (multiple choice and/or open questions)

⁴ See Elderly Colleague, USA, <https://www.cmu.edu/teaching/assessment/basics/formative-summative.html>

- practical demonstration of an individual operation/ work step

Assessors need to advise formative assessments for both theoretical and practical work. Guidance for design of the assessment is provided in the assessment strategy (see chapter 4.4).

The goal of **summative assessment** (final assessment) is to evaluate student learning at the end of an instructional unit by comparing it against some standard or benchmark.

Summative assessments are often high stakes, which means that they have a high point value. Examples of summative assessments include:

- a written exam
- a final project
- a paper

The final assessment is fairly formal and security – ensuring that the student who gets the credit is the person who did the work – is of considerable importance.

4.2.3 Direct versus indirect assessment

Direct assessments are based on direct observations of the performance by looking at the work of a trainee. Direct assessments are the most desirable form of assessments.

Examples for direct assessments of an Energy Advisor:

- Written examination (multiple choice or open questions)
- Direct questioning by the assessor regarding specific operational steps
- Reports (e.g. Audit Report, Monitoring report)
- Presentations
- Portfolio of evidence – such as compilation of work done during the training course

- Financial analysis of an energy saving option/ Feasibility study
- Measurement report
- Activity plan

Indirect assessment is gathering information about student performance by looking at indicators of learning other than trainee output. Indirect assessments shall be used where the performance could not be observed directly or in addition to the direct assessment.

Examples for indirect assessment of an Energy Advisor:

- Outcome of group work during the training
- Self-Assessment
- Survey of employer or supervisor of the trainee
- Feedback from customers (for trainees working for a consultancy company)
- Selection of accurate products (e.g. energy efficiency equipment or metering equipment) on the basis of a market survey

4.3 Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Validity means that a valid assessment assesses what it claims to assess. For example, if the ability to make a financial analysis of two alternative energy saving measures shall be assessed, the assessment should involve performance criteria that are directly related to financial analysis of energy saving measures. An interview about methods of financial analysis would not meet the performance criteria.

Reliability means that the assessment is consistent and reproducible. For example, if the preparation procedure of workplace/services area has been assessed, another assessor (e.g. the future employer) should be able to see the same work performance and witness the same level of achievement.

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information. Provide all learners with an equal opportunity for and access to assessment.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the trainees' needs.

4.4 Assessment strategy for Energy Efficiency Advisor

This curriculum for an Energy Advisor consists of 6 modules:

- Module 1: Acquire Project
- Module 2: Conduct Energy Review of the company
- Module 3: Advise on developing company energy policy and strategies
- Module 4: Monitoring the Energy Performance of the company
- Module 5: Develop workforce competencies of the company
- Module 6: Develop Professionalism

4.4.1 Suggestions for formative assessment

The formative assessment for all modules shall be in two parts: assessment of theoretical part of a learning unit and assessment of a practical part of a learning unit. Marks for formative assessments may contribute to the final qualification.

- Assessments of theoretical parts of learning units can consist of written tests (multiple choice and short answer questions), individual presentations, small case studies (e.g. comparison of different energy saving options), demonstration of correct usage of metering equipment, calculation of energy saving potentials or financial benefits.
- Practical part of the training will consist of an energy audit in the industry and initial steps for implementation of an energy management system. Assessments of practical parts shall be based on working samples, like draft of an energy policy, metering protocols, action plan, training needs assessment and training plan, survey/ feedback from employer.

4.4.2 Suggestions for summative assessment

The summative assessment shall be in two separate part for theoretical part and practical part.

- Theoretical assessment shall be in form of a written exam including multiple choice, short answer questions, and calculations (e.g. conversion of units, calculation of energy savings) covering all modules.
- Practical assessment shall comprise of two parts:
 - The trainee shall provide a complete portfolio of all practical work for energy auditing and introduction of an energy management system in the company, including an energy audit report, metering results, energy baseline, results of data analysis, action plan, financial feasibility for selected energy saving options, draft of energy policy and objectives, energy performance indicators, training needs assessment and training plan.
 - Presentation of results in front of company management and assessors with following question and answer session. This is to assess presentation and communication skills of the trainee and to verify if all contents of the portfolio were developed by the trainee personally.

The final assessment marks shall contribute primarily to the final qualification.

It is proposed that the tasks during the assessment are clearly assigned to one module and that time and markings are distributed according to the importance of the module that is reflected from the time invested during teaching.

Module/ Learning Unit	Practical	Theory
Module 1	Acquire Project	

<p>LU-1: Prepare a project proposal</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Interpret the requirements of a project as per terms of reference (TORs) • Conduct a market research limited to project scope for: <ul style="list-style-type: none"> • Assessing competitors (strengths and weaknesses) • Assessing capabilities of own company/ organization • Estimate the resources as per project requirement (Human resources, man hours, tools and equipment, logistics, material consumables, project time) • Estimate project cost as per resources • Write the project proposal as per TOR • Validate the project proposal as per TOR 	<p>• Trainee will be asked to:</p> <ul style="list-style-type: none"> • Highlight all information that is required to develop a proposal in a given sample Tore. • Name sources and strategies to assess competitors and capabilities of own organization. • List down and explain variables that must be considered when estimating the required resources (e.g. for project time: time required on-site, time required for analyzes in office, time required for presentation and reporting, time required for monitoring, time required for travel, buffer-time for unavoidable delays) • Name and explain all relevant elements/ headers of a project proposal.
<p>LU-2: Finalize the contract</p>	<ul style="list-style-type: none"> • Review the roles and responsibilities of parties in the contract as per project requirement • Coordinate with relevant departments to review legal, OHS, environmental and other requirements, applicable to the project 	<ul style="list-style-type: none"> • Explain typical parties in an energy efficiency consultancy contract and distribution of roles and responsibilities. • Explain the risks for each party that arises from responsibilities taken in the contract and ways to mitigate the risk (Example: A certain date for conclusion of the project is set, with penalties for the consultant in case of delays. Risk for the consultant is that he is penalized

	<ul style="list-style-type: none"> • Negotiate the terms and conditions of the contract as per project requirement • Compile the contract document as per legal and other requirements 	<p>despite not being responsible for the delay. Risk can be mitigated when delays caused by company or vis major lead to a respective extension of the project conclusion date.)</p> <ul style="list-style-type: none"> • Name and enlist deliverables and explain performance criteria that can be included in a contract to verify if the parties have fulfilled their responsibilities (specify outputs, like reports, presentations, conducted trainings and/ or outcome like certain measures implemented or savings achieved). • Name and explain all elements of a contract (header with contract number, date, title; parties with registration number or ID number, and contact; purpose; scope; timelines; fees, expenditures and payment terms etc.)
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Module/ Learning Unit	Practical	Theory
Module 2	Conduct Energy Review of the Company	
LU-1: Collect available data and information of company	Trainee will be able to: <ul style="list-style-type: none"> • Determine the data requirement to initiate energy review, after understanding process flow • Identify data sources for data collection, as per available resources • Communicate data requirement in 	Trainee will be asked to: <ul style="list-style-type: none"> • Explain methods of process analysis (mass balancing, flow charts, Sankey diagram etc.) • Describe forms of energy, fuel types, prices and tariffs • Describe energy parameters (e.g. calorific value of fuel, heat content, power frequency)

	<p>understandable way to relevant department</p> <ul style="list-style-type: none"> • Collect and consolidate the required data from identified sources 	<ul style="list-style-type: none"> • Perform and explain conversion of energy units (mainly British system into SI units and vice versa) • Describe sources for data (e.g. bills, metering data, log-books, machine ratings and operation hours) • Consolidate sample data in an editable, electronic form considering different quality of data (e.g. measured or estimated), standardization of units, different types of energy (e.g. electricity, compressed air, steam and hot water)
<p>LU-2: Measure the required data of company</p>	<ul style="list-style-type: none"> • Determine the data measurement requirement for energy review • Identify measurement points for required data • Identify Occupation Health and Safety (OHS) requirements for data measurement • Select measurement equipment as per requirement (accuracy, reliability, complexity, time, cost) • Take required measurement using selected equipment (if necessary), with safety precautions • Guide energy team to take measurement using selected equipment • Perform measurement system analysis as per MSA methodology • Compile the measured data for further analysis 	<ul style="list-style-type: none"> • Explain steps of a data gap analysis • Explain ways to identify major energy flows in an industry (e.g. bills, available metering data, rated power of machines) • Explain criteria for identification of measurement points (e.g. technical aspects of machine and measurement equipment, accessibility of measurement point, information required, significance of energy flow at identified point) • Describe the energy parameters for measurement • Enlist OHS requirements for using measurement equipment • Explain working principles and usage of different measuring equipment • Describe Measurement System Analysis (MSA)
<p>LU-3: Analyze energy use</p>	<ul style="list-style-type: none"> • Conduct process flow analysis using collected and measured data 	<ul style="list-style-type: none"> • Explain data analysis techniques

<p>and consumption of company</p>	<ul style="list-style-type: none"> • Develop energy and mass balance within project boundaries • Identify patterns of energy consumption of organization • Identify areas with significant energy consumption of organization • Identify inter-relations between energy consumption and operating parameters of systems • Calculate the costs of energy flows for significant energy users 	<ul style="list-style-type: none"> • Read and interpret energy distribution network diagrams and drawings • Explain procedure of energy and mass balancing and demonstrate for small case studies • Explain the effect of operational parameters on energy consumption (e.g. torque when motors are started) • Explain energy cost calculations
<p>LU-4: Develop Energy Performance Indicators and their baseline values for the company</p>	<ul style="list-style-type: none"> • Establish energy performance indicators (EnPIs) for significant energy users • Develop baseline values for established EnPIs 	<ul style="list-style-type: none"> • Explain Performance Indicators including leading and lagging indicators • Explain criteria to identify organization's appropriate EnPIs (SMART) • Explain variables effecting energy performance (e.g. primary energy used, workload, weather) • Explain establishment of baseline considering controllable and uncontrollable variables
<p>LU-5: Identify areas of improvement potential of the company</p>	<ul style="list-style-type: none"> • Calculate the efficiency of significant energy users • Identify internal and external energy performance benchmarks • Analyze the gap between baseline and identified benchmarks 	<ul style="list-style-type: none"> • Explain the basic working principles and efficiency parameters of the following equipment and installations and optimization measures and techniques: Compressors, furnaces, boilers and heaters, HVACR (heating, ventilation, air-conditioning and refrigeration), expanders/ turbines, water treatment system, electric motors, drives and pumps, lighting systems, ICT system

	<ul style="list-style-type: none">• Set targets for energy performance for significant energy users	<ul style="list-style-type: none">• Explain the basic layout and components of energy distribution systems for steam and hot water, electricity and compressed air and the main parameters for energy efficiency of these systems• Explain the generation techniques of generators and boilers and efficiency parameters and optimization options (alternate fuels, renewable energies, heat recovery from exhaust and blow-down, co- and tri-generation, combined cycle generation)• Explain basic benchmarking techniques• Explain how to set realistic targets for specific industry (depending on sector, products, processes, size etc.)
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Module/ Learning Unit	Practical	Theory
Module 3	Advise on developing company energy policy and strategies	
LU-1: Develop energy policy and objectives	Trainee is able to: <ul style="list-style-type: none"> • Develop an outline for energy policy for the company based on international standard(ISO 50001) • Develop an outline for energy objectives for the company consistent with energy policy • Review the draft of the energy policy prepared by company, according to international standard (ISO 50001) • Review the draft of the energy objectives prepared by company, consistent with energy policy • Develop a methodology for periodically reviewing and updating energy policy and objectives, based on energy performance 	Trainee is asked to: <ul style="list-style-type: none"> • Explain the structure and contents of an energy management system according to ISO 50001 • Explain basic concepts and important elements of an energy policy and energy objectives • Explain ways of adaptation and formulation of an energy policy and objectives for a specific company. • Describe concepts and give examples of constructive feedback (e.g.: sandwich methodology, distinguish between person and work)
LU-2: Identify options for improvement of energy performance	<ul style="list-style-type: none"> • Determine options for improvement of energy performance. • Calculate energy performance improvement potential for each identified option (e.g. savings in electricity) 	<ul style="list-style-type: none"> • Name typical options and measures for improvement of energy performance in industries and explain how they can be realized and range of saving potential • Explain different energy efficiency labels and their signification(e.g. energy star label)

	consumption, financial savings)	<ul style="list-style-type: none"> • Name different source of information and methods to retrieve information on energy performance improvement options. • Explain suitability of an energy efficiency measure for a specific process • Calculate energy efficiency improvement potentials for sample problems
LU-3: Prioritize identified energy performance improvement options	<ul style="list-style-type: none"> • Define criteria for prioritization of identified energy performance improvement options • Calculate required resources (e.g. HR, time, financial) for the identified energy performance improvement options • Make a comparison of identified energy performance improvement options based on defined criteria. • Present priority list of energy performance improvement options to management of the company 	<ul style="list-style-type: none"> • Explain meaning and ways of calculation for following financial analysis terms: capital expenditures (CAPEX), operational expenditures (OPEX), life cycle analysis, payback period, IRR, NPV • Calculate financial feasibility of sample problems on energy saving measures (static and dynamic) • Name other factors that determine priority of implementation, like time, complexity, required expertise and give examples in which one of these factors has significant influence on the priority of a measure (e.g. installation of economizer on boiler that is operating 24/7 and cannot be switched off without interrupting the production) • Explain prioritizing techniques(e.g. Gravity, Urgency and Tendency (GUT), Complexity-Investment-Savings, according to payback, cost-benefit-analysis) • Give a small presentation using different presentation and visualization techniques
LU-4: Develop	<ul style="list-style-type: none"> • Define required resources (e.g. time, HR, financial) for 	<ul style="list-style-type: none"> • Explain basic project planning methodology

<p>action plan for selected energy improvement options</p>	<p>implementation of selected energy improvement options</p> <ul style="list-style-type: none"> • Acquire required resources from company management • Prepare action plan for implementation of selected energy improvement options • Present action plan to management for perusal and support staff for implementation 	<ul style="list-style-type: none"> • Name negotiation techniques to acquire resources from company management and demonstrate ability to use some of the techniques in small role plays • Give a small presentation using different presentation and visualization techniques
<p>LU-5: Review progress of implementation of action plan</p>	<ul style="list-style-type: none"> • Analyze project progress (milestones) in set timelines • Verify the implementation procedure, in accordance with action plan • Suggest adaptations in action plan if actual progress is not as per plan • Prepare project progress report of the implementation of action plan 	<ul style="list-style-type: none"> • Explain monitoring and evaluation techniques of a project • Explain ways to deal with obstacles and crises during implementation

Modules/ Learning Unit	Practical	Theory
Module 4	Monitor the energy performance of the company	
LU-1: Develop a measurement plan for monitoring the energy performance	Trainee will be able to: <ul style="list-style-type: none"> • Determine data requirements for periodic monitoring of energy performance indicators for significant energy users • Identify locations for data collection as per data requirements • Identify measurement equipment with specifications as per data requirements and identified locations • Devise selection criteria for measurement equipment (OHS, Reliability, Calibration, Accuracy, Frequency, Cost, Time) • Devise timelines and responsibilities for execution of measurement plan based on review requirements 	Trainee will be asked to: <ul style="list-style-type: none"> • Explain Performance Indicators including leading and lagging indicators and give examples of SMART indicators. • Explain criteria to identify organization’s appropriate EnPIs • Name relevant variables and their effect on the energy performance • Explain working principles and usage of different measurement equipment • Demonstrate ability to correctly use mobile measurement equipment (for the equipment available in the training institute) • Enlist OHS requirements for using measurement equipment • Explain the contents of a measurement plan
LU-2: Compare actual vs. target energy performance	<ul style="list-style-type: none"> • Perform measurement system analysis as per MSA methodology • Compile the measured data for further analysis • Analyze gap between actual vs. baseline and target 	<ul style="list-style-type: none"> • Describe Measurement System Analysis (MSA) • Explain statistical analysis techniques and show competence of most important techniques in sample problems • Describe key contents of effective report writing

	<p>energy performance</p> <ul style="list-style-type: none"> • Identify patterns of energy performance of significant energy users • Document energy performance based on gap analysis 	
<p>LU-3: Review effectiveness of the action plan</p>	<ul style="list-style-type: none"> • Calculate energy savings of implemented actions as per action plan • Analyze gap between proposed and actual energy saving of implemented actions • Assess impact of realized saving on Energy Performance Indicators • Recommend corrective and preventive measures to mitigate gaps identified in gap analysis 	<ul style="list-style-type: none"> • Explain root cause analysis techniques • Explain how to calculate energy efficiency improvement and demonstrate for sample problems

Module/ Learning Unit	Learning outcomes	Learning elements
Module 5	Develop workforce competencies of the company	
<p>LU-1: Design training based</p>	<ul style="list-style-type: none"> • Determine training needs to promote energy efficient operations of the organization for each level using one of the learned techniques 	<ul style="list-style-type: none"> • Explain training need assessment methodology • Describe the steps that need to be taken to develop an effective training.

<p>on need assessment</p>	<ul style="list-style-type: none"> • Develop the training plan (objectives, topics, resources, target audience and schedule), based on training needs • Communicate the training plan within the organization according to organizational guidelines 	<ul style="list-style-type: none"> • Identify ways to effectively and precisely communicate planned trainings within organization and how to motivate employees for the active participation.
<p>LU-2: Execute the training plan</p>	<ul style="list-style-type: none"> • Review progress of implementation of trainings against designed plan • Identify barriers in execution of the trainings as per plan • Modify training plan to tackle the identified barriers 	<ul style="list-style-type: none"> • Explain monitoring and evaluation techniques and apply for sample problems. • Explain ways to deal with obstacles and crises during implementation
<p>LU-3: Evaluate the effectiveness of training</p>	<ul style="list-style-type: none"> • Design criteria for evaluation of trainings as per training need assessment (TNA) • Perform evaluation of conducted training as per TNA • Analyze effectiveness of trainings based on results of evaluation • Recommend improvements in training plan based on effectiveness analysis 	<ul style="list-style-type: none"> • Explain training evaluation techniques

Learning Unit	Learning outcomes	Learning elements
Module 6	Develop Professionalism	
LU-1: Perform communication at each level	<ul style="list-style-type: none"> • Communicate within organization according to organizational guidelines (management, energy team, employees) • Communicate with business partners according to organizational guidelines • Communicate with relevant authorities according to organizational guidelines • Prepare reports appropriate for the audience • Present information to different audience • Negotiate with management and business partners 	<ul style="list-style-type: none"> • Explain how to communicate at different levels • Explain how to write reports for specific purpose and audience • Explain how to present specific information for a specific audience and demonstrate during group exercises • Explain how to negotiate effectively with relevant stakeholders
LU-2: Upgrade professional skill set	<ul style="list-style-type: none"> • Improve professional skills in current career path on continuous basis • Seek learning opportunities in new relevant areas to diversify skill set. • Adapt to changing business environment 	<ul style="list-style-type: none"> • Explain sources for professional development: (professional bodies, prevailing standards, certification courses, online libraries, webinars, technical journals, conferences or other events)

4.5 Structure of the assessment team

The composition of the assessment team (number of assessors and their field of expertise) must be appropriate to ensure that the assessment can be carried out according to the principles defined in chapter 4.3. The number of assessors depends on the selected assessment technique and instruments, their expertise in the contents of the different modules and the number of students.

4.6 Planning for assessments

Formative assessment: Assessors need to plan in advance frequency and techniques of the formative assessments for each module. It is suggested to plan several small and quick assessments for theoretical part of each module to get continuous feedback on the learning progress of the students. Thus it is possible to repeat topics within the module that have not been understood by majority of the students. For the practical part trainees must regularly submit evidence of their work output to the assessors (e.g. draft of energy policy, metering protocols, financial analysis of specific energy saving measures). If possible assessors should visit the trainees at least twice during their practical training phase to assess learning progress on-site.

Summative assessment: Summative assessment of theory could be either done at the end of theory block of each module or as a larger assessment at the end of the whole theory part of the training. If manageable the second option is preferred as it allows a more realistic assessment as trainees must be able to retrieve the learned knowledge all at same time. For summative assessment of practical it is recommended to assess a portfolio with all practical work performed by the trainee and to assess the presentation of the results for the company management.

5 LIST OF MACHINERY/ EQUIPMENT/ TOOLS

#	Equipment or tool	Number of equipment(for about 20 trainees)	
		Theory (in institute)	Practical (in company)
	Office Equipment		
1.	Computer System with internet connection	1 per trainee	1 per trainee
2.	Printer	Total 1 (and 1 back-up if possible)	1 per company
3.	Phone	-	1 per trainee
4.	Office desk and chair	-	1 per trainee
	Software		
5.	Office (MS office or comparable) with text processing, spread-sheets, and presentation software	1 per trainee	1 per trainee
6.	Project management software (MS project, Open project or comparable)	1 per trainee	1 per trainee
7.	E-sankey software	1 per trainee	1 per trainee
8.	Antivirus software	1 per trainee	1 per trainee
	Measurement Equipment		
9.	Measuring tape	-	1 per trainee***
10.	Stop watch	-	1 per trainee***
11.	Portable energy analyzer with data logger (3-clamp power-analyzer)	Total 2-3*	Total 2-3*

1.	Emission analyzer (flue gas analyzer)	Total 2-3*	Total 2-3*
2.	Thermal imager	Total 0-1****	-
3.	Infrared temperature gun	1 per trainee***	1 per trainee***
4.	Portable gas flow meter	Total 5**	Total 5**
5.	Lux meter	1 per trainee***	1 per trainee***
6.	Tachometer	1 per trainee***	1 per trainee***
7.	Noise meter	1 per trainee***	1 per trainee***
8.	Ultrasonic air leakage detector	Total 5**	Total 5**
9.	Total dissolved solids (TDS) meter	1 per trainee***	1 per trainee***
10.	Water hardness kit	1 per trainee***	1 per trainee***
11.	Earth resistance tester	Total 5**	Total 5**
12.	Portable air flow meter	Total 5**	Total 5
13.	Portable water flow meter	Total 5**	Total 5**
14.	pH meter	1 per trainee***	1 per trainee***
	Personal Protective Equipment		
15.	Ear plugs or earmuffs	One of each type for demonstration of differences	(depends on noise level in company)
16.	Respiratory mask simple or with adequate cartridge (e.g. against organic vapor) as per requirements of SDS for chemicals and substances in areas that have to be entered for observations or measurements	1 for demonstration purpose	(depends on chemicals used in the company)

17.	Helmet, safety boots and other protective gear as per requirement of working areas that have to be entered for observations or measurements	Pictures should be sufficient for theory	(depends on operations in company)
	Standards		
18.	ISO 50001	1 per trainee	1 per trainee

* Equipment is very important but expensive and requires good maintenance and calibration. 2-3 sets should be available in the training institute for demonstration and practicing. Same equipment should be available for trainees to use in their companies during practical training part. Logistics need to be planned to avoid delays in the practical projects, furthermore controls need to be implemented to avoid damage or loss of the equipment. Recommendation should be given to companies to purchase a 3-clamp power analyzer. Analysis of flue gas is often out-sourced to third parties. Thus purchase of the equipment might not be useful for most of the companies and trainees must only understand how equipment is properly used and how to interpret results to be able to supervise contractors.

**Equipment is important but prices are in medium to high range. Number of equipment needed in the training institute and for use in the companies depends on the processes in the companies (e.g. do they have large systems for compressed air or steam for which the respective measurement equipment is required?) and on the question if respective equipment is already available in the companies of the trainees.

*** Equipment is not very expensive and having one set per trainee will allow for everyone to practice the use during the theory training and to use on-site during practical training part without extensive administrative arrangements for handing over equipment from one participant to another. If is not possible to provide the equipment through the institute it should be part of the agreement with the companies that they provide the equipment for their trainees.

**** Equipment is very expensive and requires extensive training to be able to get a real advantage out of it. Only few consultants in the Pakistani market are working with thermal imagers. For the training it is suggested to only explain the working principle and benefits. Demonstration of use may be included if a thermal imager is available for rent for a reasonable fee.