

## 1.2.2 Project Idea for boiler economizer

### 1.2.2.1 Summary sheet for boiler economizer

ENERGY INDUSTRIES PROJECT SHEET: Boiler Economizer		
<p><b>Brief Project description</b></p> <p>The undertaking of three complementary actions are proposed (1) offering a free energy audit of Rs 10,000 per unit and (2) providing 20% of the capital investment rebate scheme of Rs328,000 per unit, and (3) a measure to provide training to selected staff (1 per company) on energy management and energy auditing at the estimated cost of Rs5,402 per person. Implementation will be between 2013 and 2020.</p>		
Results Oriented Framework		
<p><b>Overall Goal</b></p> <p>Mitigate climate change through the use of energy efficient boilers in industry and commercial operations</p>		<p><b>Development Objectives</b></p> <p>Removal of barriers for the uptake of boiler economisers using financial incentives and capacity building throughout the industry</p>
<p><b>Inputs</b></p> <p>i. Capacity building and support mechanisms ii. Establishing rebate scheme on capital investment iii. Business and extension services</p>	<p><b>Outputs</b></p> <p>i. Opportunity is created for investment in economisers ii. Awareness of the benefit to the industry is raised</p>	<p><b>Impacts</b></p> <p>Long term impacts include reduction of industry energy and carbon intensity</p>
<p><b>Estimated costs</b></p> <p>The total cost of measures is MUR 22,114,482 over 8 years (NPV). The breakdown (NPV) is as follows:</p> <ul style="list-style-type: none"> <li>• Rebate scheme – MUR 21,122,615</li> <li>• Energy audits – MUR 643,982</li> <li>• Cost of training – 347,885</li> </ul>		
<p><b>Proposed timeframe</b></p> <p>2013 - 2020</p>	<p><b>Executive bodies</b></p> <p>Ministry of Industry, Commerce and Consumer Protection</p>	
<p><b>Cost-benefit analysis</b></p> <p>The NPV of benefits over 13 years equals MUR 42,355,220 – hence the benefit/cost ration is 3.05. Sensitivity analysis for efficiency gain and cost of economizer unit places the benefit/cost ratio in the 2.41 – 10.12 range. The analysis also includes the cost of operation &amp; maintenance of economizers.</p>	<p><b>Risks</b></p> <p>Lack of visibility and trust in the measure, low efficiency gains, undesirable modifications</p>	
Expertise required		
<p><b>Profile</b></p> <ul style="list-style-type: none"> <li>• Professional Energy Auditor</li> <li>• Trainers for energy managers</li> <li>• Engineers</li> </ul>	<p><b>Key tasks</b></p> <ul style="list-style-type: none"> <li>• Carrying out Energy audit</li> <li>• Training of enterprise staff in energy management</li> <li>• Establishing rebate scheme on capital investment</li> </ul>	
<p><b>Identification of key stakeholders</b></p> <p>Ministry of Energy and Public Utilities (MoEPU), EEMO, Ministry of Industry, Commerce and Consumer Protection, Financial Institutions, Enterprise Mauritius, Ministry of Finance and Economic Empowerment (MoFEM), Mr Sharma Buctowar (Chemical &amp; Environmental Engineer), Mr Bernard Domingue (Vivo Energy), Mr Fargy Romaly and Research Institutions such as MITD, UoM, MRC, UTM.</p>		

### 1.2.2.2 Project overview

#### Project scope

The undertaking of three complementary actions are proposed (1) offering a free energy audit of Rs 10,000 per unit and (2) providing 20% of the capital investment rebate scheme of Rs327,987 per unit, and (3) a measure to provide training to selected staff (1 per company) on energy management and energy auditing at the estimated cost of Rs5,402 per person.

The enabling framework that is conducive for technology transfer and diffusion needs to be in place: There are about 4 suppliers of the technology in Mauritius and they liaise directly with the end-users without the need of intermediaries. Government is currently putting in place mechanisms to increase the number of local suppliers of economizers to support the up-scaling of the technology in commercial applications, The main business and extension services are: (1) provision of financial and banking services (commercial banks); (2) EE promotion services (EEMO, Enterprise Mauritius, Ministry of Industry, etc.); and (3) consulting firms. There are also engineering companies that provide ancillary services during installation and maintenance of the equipment. Training and capacity building for energy managers and industrial auditors will be carried out under the GEF-UNDP-EEMO project for the removal of barriers to promote EE in industry.

#### Project timeline:

The timeframe used in the TNA project for the energy industries is aligned with the time period of the Long-Term Energy Strategy 2009-2025 (Ministry of Renewable Energy & Public Utilities, 2009). Hence, the timeframe for the implementation of the measures will cover the period 2013 to 2020 as per the schedule summarised in the following table.

In the barrier analysis, it has been assumed that 20% of commercial entities using boilers would opt for pre-heating of water using SWH as a means to reduce energy bill (Ministry of Environment & Sustainable Development, 2012).

Year	2013	2014	2015	2016	2017	2018	2019	2020
Economizer (diesel)	3	8	8	8	8	8	8	10
Economizer (LPG)	3	8	8	8	8	8	8	3
Total economizers	6	16	16	16	16	16	16	13

Implementation can be planned in the short to medium term in cost effective ways. For new projects, design, procurement and installation can utilize the new technology potential. For existing operations, implementation can be planned to coincide with major equipment replacements and/or retrofitting operations. This project has targeted boilers using LPG and diesel as primary energy sources – i.e. a total of 143 boilers representing 24.3% of all boilers used in industrial and commercial applications.

#### Budget:

The following table provides a summary of the cost of economic and financial measures for a typical economizer. The total cost to 2025 was calculated at MUR 99,798,428.

Measure	Cost (Rs)	Remarks
Energy audit	10,000 / unit	It is assumed that one energy audit will be carried out for each boiler for retrofitting an economizer. Each energy audit would require one day's work by a professional auditor. It is assumed that this would be carried out for free as an incentive for associated capital investment.
Rebate scheme on capital investment	327,986.7 / unit	20% of the capital investment will be provided as a rebate scheme (financial incentive). The capital cost is taken as Rs 1, 640, 000 for one unit.
Training of energy manager	5,402 / unit	Specialized agencies, such as EEMO and/or the Ministry of Industry, would provide training to energy managers at the level of 1 person per enterprise.
O&M	54,000 per unit per year	Once installed, it is assumed that O&M expenses would be negligible to 2025.

### 1.2.2.3 Project framework

It should be noted that Energy Efficiency (EE) target for the stationary combustion of fossil fuels (e.g. boilers in commercial and industrial settings) does not exist; however the National Energy Strategy does indicate that EE measures are to be taken (see section 1.2.2.4). This project can therefore advance the national agenda and provide an example as guidance for future EE programmes.

**Project Goal:** Mitigate climate change through the use of energy efficient boilers in industry and commercial operations

**Development objectives:** Removal of barriers for the uptake of boiler economisers using financial incentives and capacity building throughout the industry

Project Component	Expected Outcomes	Expected Inputs	Expected Outputs	Responsibility	Objectively Verifiable Indicators	Expected Impacts	Timeframe
EE Promotion services	Realising the benefits of installing and retrofitting boilers with economizers	Training and capacity building for energy managers and industrial auditors (under the GEF-UNDP-EEMO project for the removal of barriers to promote EE in industry)	Increased capacity of personnel.	- Ministry of Industry, Commerce and EEMO.	- Number of economizers installed by type and energy savings - Number of audits carried out (with full reporting) - Number of energy managers trained	Reduction in electricity and fuel consumption	Year 1-2
Mechanisms for increasing the number of local EE consultants and suppliers of economizers	Supports the up-scaling of the technology in commercial applications.	Consultations with industry stakeholders	Increased number of suppliers and consultants, creation of a competitive market	- Ministry of Finance and Economic Development, Ministry of Industry	- Number of suppliers & consultants - Number of enquiries made - Number of products and services provided	Customers have a wider range of choice to suit their needs and adopt the measure more easily	Year 1-3

Provide incentives for enterprises	Attracting investment in economisers and EE measures	Energy audits, rebate scheme on capital investment and covering O&M costs	Identified specific needs, Rebate scheme on capital investment, O&M costs covered	- Ministry of Finance and Economic Development; Ministry of Industry	- Number of purchases benefitting from the rebate scheme - Amount disbursed on rebate - Number of new jobs created	Higher number of economiser purchases	Year 1-8
Provision of financial and banking services (commercial banks)	Being able to cover their own capital investment and ongoing maintenance costs	Information on benefits and rebate scheme to facilitate financing	Awareness and cooperation of financial and banking services to help promote the measure	- Financial institutions and Ministry of Industry, Commerce	- Number of enquiries - Services provided by scale	Ease of access to finance and services	Year 1-8

#### 1.2.2.4 Project Justification

##### **Sustainable development priorities:**

EE targets for the stationary combustion of fossil fuels (e.g. boilers in commercial and industrial settings) do not exist. The updated Energy Strategy Action Plan 2011-2025 mentions that guidelines for energy management in industry would be developed in 2012, and for mandatory energy audits to be carried out in industry as from 2013. Further, the Action Plan states that EE programmes based on voluntary agreements would be created for industry between 2011 and 2014.

The free energy audit and capital investment rebate scheme directly address the key economical, financial and other barriers to the widespread diffusion of boiler economizers as noted TNA BAEF report. All the key stakeholders have singled out the high upfront capital cost of the equipment as the main impediment for the widespread diffusion of boiler economizers. Other barriers include low awareness of the technology and lack of consultants who would conduct detailed engineering studies (with accurate measurements) to evaluate energy savings opportunities – an important factor necessary to convince Top Management of pursuing energy efficiency projects.

##### **Benefit-cost analysis:**

Calculations to estimate the quantity of fossil fuels used for heating in industry and commercial applications were made using a top-down approach (macro socio-economic and environmental level for country-level aggregate) , resulting in a benefit-cost ratio is found to be 3.05 (NPV cost: MUR 99,798,428 and NPV benefits: MUR 129,226,461), which shows the net benefit accruing from the measures identified. Other than savings from increased efficiency, benefits can be multiple:

- Reduced health and safety hazards due to heat losses
- Marketing potential
- Reduced operational expenses
- Profit increase potential
- Potential to attract investments

The annual CO<sub>2</sub> emission reduction in the Mauritian context has been calculated at 54.2 tCO<sub>2</sub> and 18.3 tCO<sub>2</sub> for retrofitted boilers running on diesel and LPG, respectively.

11 It wasn't possible to apply a bottom-up approach (namely operational level of industrial and commercial users of boilers) to estimate the quantity of fossil fuels used for heating in industry and commercial applications.

### 1.2.2.5 Monitoring and Evaluation (M&E)

The results-oriented framework will be used for M&E of project implementation. More specifically, the progress made against the Objectively Verifiable indicators (OVIs) will be monitored and reported under the governance structure of the project

### 1.2.2.6 Risks

Risk	Level (Low, Medium, High)	Response
Lack of visibility of the project	Low	The relevant authorities and stakeholders will be solicited and engaged in the project
Energy audits reveal that energy efficiency gains from economizers are small	Low	Higher energy efficiency gains may be identified with alternative techniques or technologies thanks to energy audits and capacity building.
Enterprises may not have resources for hiring an energy manager	Medium	The training and support provided by the project can support existing staff to take on the role of energy manager.
Electricity use associated with the boiler auxiliaries (e.g., fans, pumps, conveyors) may change as a result of the new boiler.	Low	Risk is limited with appropriate commissioning of the entire boiler system.
A change of boiler system requires modification of operation and maintenance schedules.	Low	Industry operation and maintenance schedules change regularly as a result of increased capacity, new equipment and optimization measures.
The technologies adopted are not operated and maintained adequately leading to premature failure and reduced confidence in the technology	Low-Medium	The training and support provided should ensure that management pays attention to the new technology to achieve its potential benefits.

### 1.2.2.7 Stakeholder mapping

Stakeholder	Roles and responsibilities
Ministry of Energy and Public Utilities (MoEPU)	Responsible for developing Energy Policy and Strategy of Mauritius and to put in place policy instruments to support EE and RETs
EEMO	Facilitates the promotion of EE in all sectors of the economy, including industry and commercial activities. It also carries out capacity building and training on energy auditing.
Financial Institutions	Provider of finance for investment in wind energy projects.
Ministry of Finance and Economic Empowerment (MoFEM)	The ministry responsible for budgeting and has the role to develop financial instruments to fund the incremental cost of electricity produced from RETs.
Enterprise Mauritius	Provides energy audit services through funding schemes for industry.
Ministry of Environment and Sustainable Development	Responsible for providing EIA license for wind farm development.
Research institutions	Active in the fields of research for the promotion of RETs. Activities include renewable energy resources mapping, development of energy futures, etc ...