

Table 3.5: Specific Measures for Technology 3: Biomass Residue Based Cogeneration Combined Heat and Power (CHP)

No.	Recommended Measures
1.	Review and reform government tax policy aimed at reducing capital costs of energy efficient and environment friendly technologies.
2.	Set up a Development Bank to provide credit on concessionary terms to promote biomass CHP.
3.	Establish an appropriate regulatory mechanism to streamline sustainable supply of biomass.
4.	Establish appropriate regulatory mechanisms to promote mitigation technologies.
5.	Measures to build confidence of industrialists on new technologies and publish local success stories and role models.
6.	Promote next generation biomass over for the traditional biomass resources.
7.	Technology promotion through Energy Associations, Industry Associations and stakeholders

3.2 Action Plan for Technology 1: Energy Efficient Motors

3.2.1 Description of the technology

According to global energy surveys, two thirds of electrical energy in the industry is consumed by motors and hence ensuring high efficiency is imperative for overall energy efficiency of the industry. If each installation could contribute even by a fractional improvement of efficiency, the gross saving would be enormous. Energy Policy Act 1992 (Epack 92) has directives for minimum efficiency levels for general purpose motors up to 200HP in USA. Based on such directives NEMA (National Electric Manufacturer’s Association) has listed different efficiency bands for motors. The motors that have higher efficiency by 2% – 8% than the standard motors are categorized as “Premium Efficiency Motors”. The efficiency classes in three groups viz; EFF1, EFF2 and EFF3 where EFF1 has the highest efficiency. For a 1.1kW motor, efficiency of EFF1 type is equal or more than 82.8%, EFF2 type is equal or more than 76.2% and any type with lower efficiency than EFF2 falls into EFF3 type. The efficiency values for 75kW motor are EFF1 \geq 94.6% and, EFF2 \geq 93.6%.

In addition to energy savings, the energy efficient motors have other benefits such as longer life time due to high quality insulation, magnetic circuits and bearings. These properties together with high quality manufacturing processes results in very low vibration and become more susceptible to voltage unbalances and overloading.

Efficient Energy Motor technology has been prioritized in view of its high potential for green house gas emission reduction in electricity power generation. This technology also helps in improving electrical energy efficiency particularly in industries and generally in the service sector.

3.2.2 Targets for Technology Transfer and Diffusion

It is proposed to replace 75% of existing motors with EEM by 2030. All the existing motors which ranges from small to large consume about 40% of total electrical energy used by the industries. The current level of employment for the technology is less than 50 and the estimated employment opportunities through technology implementation is 250 @ 10 per district. The estimated GHG emission reduction potential is about 130,192 tCO₂e and the electrical energy saving is 380,679 MWh over ten years which is valued at US\$ 35,688,656. The life time of the motor is minimum ten years and the investment cost of EEM technology would be about 71,000 US\$ per ton of CO₂ reduction.

3.2.3 Barriers to technology diffusion

The barriers likely to impact upon successful technology implementation and hierarchical classification is given in Table 3.6.

Table 3.6: List of Key Barriers and hierarchy classification for Energy Efficient Motors

Technology Name: Energy Efficient Motors			
No.	Key Barriers Identified	Priority Rank	Category of Barriers
1.	High capital costs	1	Economic and Financial
2.	Lack of financial resources and incentives	2	Economic and Financial
3.	Inadequate regulatory framework and insufficient enforcement	3	Policy, Legal and Regulatory
4.	Lack of professional institutions and limited capacity in existing institutions	4	Institutional and Organizational Capacity
5.	Lack of skilled personnel for technology implementation and inadequate training for maintenance	5	Human Skills
6.	Poor operations and maintenance facilities	6	Technical
7.	Absence of standards, codes and certification	7	Technical
8.	Inadequate information, awareness, feedback and difficulties in comprehending technical content	8	Information and Awareness

3.2.4 Proposed action plans

The Proposed Action Plan for Energy Efficient Motors is provided in table 3.7.

INDUSRTY SECTOR

Action plans for Technology 1

Table 3.7: Proposed Action plans for Energy Efficient Motors

Measure/Action 1: Review and reform Government tax policy to enable reducing capital costs of high energy efficient and sustainable technologies					
Justification for the action: Energy efficient motors (EEM) are costlier than low efficient motors. As EEM are not manufactured locally, in view of high import taxes there is a tendency to import low efficient motors. Therefore, it is required to introduce tax reform policies so as to reduce capital cost of high efficient technologies such as EEM.					
Action/Sub Action No.	Priority Rank	Responsibility of Implementation	Time frame	Cost & Funding US \$	Indicators
i. Enabling policy to provide tariff concessions for investments in Carbon mitigation technologies for industries	V. High	Treasury/ MoFP	2014-2016	1500 Domestic	- Enabled tax policy by 2016.
ii. Include these technologies to government Strategic Investments plan	V. High	Treasury/ MoFP	2014-2016	1500 Domestic	- EEM included in priority technologies in the strategic investment plan by 2016.
Measure/Action 2: Ensure availability of financial instruments such as credit schemes,, subsidies and green credit lines					
Justification for the action: Financial resources available for investing in energy efficient technologies are limited and it takes long period to recover the investment in present financial market. Therefore, financial inducements in the form of access to credit on concessionary terms and green credit lines dedicated for clean technologies need to be made available to encourage energy efficient and mitigation technologies.					

Action/Sub Action No.	Priority Rank	Responsibility of Implementation	Time frame	Cost & Funding US \$	Indicators
i. Low interest credit schemes	V. High	Treasury/ MoFP	2014-2016	50,000 Donors	- Availability of low interest credit schemes by 2016
ii. Mandatory provisions to ensure investing at least 5% of loan the facility on mitigation related technology implementation and developments.	V. High	Treasury/CBSL/ MoFP	2014-2016	10,000 Domestic	- Percentage of loans given to mitigation technology implementation by 2016
iii. Capacity building for banking sector on mitigation technologies and its benefits	V. High	Treasury/SLSEA/ MoFP	2014-2016	100,000 Domestic	- No. of officers trained on project appraisal on mitigation technologies by 2016
iv. Reimbursement of part of the investment through a grant	V. High	Treasury /MoFP	2014-2016	20,000 Donors	- % of money reimbursed per year
v. Promote development banking to encourage investments on mitigation technologies (eg: EEM, VSD, biomass CHP)	V. High	Treasury/MoFP	2014-2016	5,000 Donors	- Amount of credit disbursed by 2016

Measure/Action 3: Develop enabling regulatory mechanisms to promote mitigation technologies, EEM, VSD and CHP

Justification for the action: There is no mandatory requirement for adopting climate change mitigation technologies. Therefore, appropriate legal provisions and regulatory framework will be imperative to promote application climate change mitigation technologies in industries.

Action/Sub Action No.	Priority Rank	Responsibility of Implementation	Time frame	Cost & Funding US \$	Indicators
i. Introduce legal reforms to enable developing an appropriate regulatory framework	High	CEA/ SLSEA/MoFP	2014-2016	25,000, Domestic	- Mitigation technologies promoting regulatory framework introduced by 2016
ii. Incorporate mandatory provisions for incorporating mitigation technologies whenever new investments	High	CEA/ SLSEA/MoFP	2014-2016	20,000, Domestic	- No. of institutions and no. of officers trained on regulatory mechanism by 2016

are made in designated industrial facilities.					
iii. Develop and Introduce market based instruments to promote selected mitigation technologies.	High	CEA/ SLSEA/MoFP	2014- 2016	100,000, Domestic	- Introduced voluntary recognition schemes such as award schemes by 2016
Measure/Action 4: Institutional strengthening including private sector organizations and capacity development					
Justification for the action: Institutional capacities of existing institutions are not geared to provide services related to promoting and implementation of climate change mitigation technologies.					
Action/Sub Action No.	Priority Rank	Responsibility of Implementation	Time frame	Cost & Funding US \$	Indicator
i. Strengthen, enforce and expand ESCOs & regulatory agencies.	High	SLSEA	2014- 2016	100,000, Domestic	- Increased no. of ESCOs by 2016
ii. Strengthen public private partnerships through joint ventures among ESCOs, Universities, government institutes and private organizations.	High	SLSEA	2014- 2016	100,000, Domestic	- No. of intellectual property rights recognized by 2016
iii. Register and assist Universities, institutions, suppliers and service providers to offer mitigation technologies.	High	SLSEA	2014- 2016	10,000, Domestic	- Registration process for supplier and service providers introduced within 3 years - No. of suppliers and service providers registered by 2016
iv. Technical and financial assistance for institutional capacity development.	High	SLSEA	2014- 2016	5,000 Donors	- No. of programmes conducted to develop in house capacity by 2016
Measures/Actions 5: Focus on technical education and awareness creation, training and skills development.					
Justification for the action: Lack of skilled personnel for installation and maintenance of mitigation technologies is identified as a major barrier for promoting					

mitigation technologies. Regular maintenance and precious running conditions are main requirements of high efficient technologies. Therefore, availability of trained and skilled personnel to install and maintain the equipment and machinery is an essential prerequisite for successful application of mitigation technologies.

Action/Sub Action No.	Priority Rank	Responsibility of Implementation	Time frame	Cost & Funding US \$	Indicator
i. Include mitigation technologies in vocational and technical education curricula. Establish partnerships with industries to facilitate internship training opportunities for undergraduates and students of vocational training institutes.	Medium	MoVT, MoHE, NERD, SLEMA, NCPCC, SLITA	2014-2016	250,000 Domestic	- No. of teaching hours are allocated for mitigation technologies annually in each institute - No. of institutes teaching mitigation technologies
ii. Develop twining programs with other relevant institutions (foreign and local) to enable exchange of experience and acquire skills.	Medium	MoVT, MoHE, NERD, SLEMA, NCPCC, SLITA	2014-2018	5,000 per Participants Donors	- No. of training programs are conducted per year; No. of trained personnel - No. of international and local exchanges

Measures/Actions 6: Set up factory level operation and maintenance management system with registered after sale services providers and spare parts suppliers.

Justification for the action: Poor operation and maintenance systems at factory level will not be conducive for achieving desired results from the new technologies adopted. Therefore, establishment of factory level operations and maintenance system is essential to enable deriving the maximum benefits of mitigation technologies.

Action/Sub Action No.	Priority Rank	Responsibility of Implementation	Time frame	Cost & Funding US \$	Indicator
i. Facilitate training institutions to conduct training and re-training programs on operation and maintenance of the EEM, VSD, CHP technologies.	Medium	MoVT, MoHE, NERD, SLEMA, NCPCC, SLITA	2014-2018	250,000 Donors	- No. of training programmes conducted by 2016; No. of trained personnel trained by 2016
ii. Strengthen manufacturing and streamline supply of components and maintenance material for the	Medium	MoVT, MoHE, NERD, SLEMA,	2014-2018	100,000 Domestic	- No. of new suppliers, service providers and components manufacturers in

selected technologies.		NPCPC, SLITA			business by 2016.
Measures/Actions 7& 8: (7) Get the service from international certification agencies to set up local institutions. (8.1) Develop schemes for energy labeling and standards. Promote technologies through increased awareness using demonstration and pilot projects. (8.2) Promote technology through Energy Associations, Industry Associations and stakeholders.					
Justification for the action: National standards, codes and certification schemes for the proposed technologies are non existent. In addition, availability of information and awareness on the proposed technologies is inadequate due to lack of feedback from technology users and difficulties in comprehending technology related literature.					
Action/Sub Action No.	Priority Rank	Responsibility of Implementation	Time frame	Cost & Funding US \$	Indicator
i. Expand the existing labeling program to the selected technologies	Medium	SLSI, SLSEA	2014-2016	50,000 Domestic, Donor	- No. of energy labels introduced for mitigation technologies by 2016
ii. Awareness programs on labeling to Energy Association, Industry Associations and Chambers through demonstration projects	Medium	SLSI, SLSEA	2014-2016	25,000 Domestic, Donor	- No. of awareness programmes conducted during last three years - No. of relevant associations participated by 2016
iii. Develop a national certification system for new mitigation technologies through Sri Lanka Accreditation Board (SLAB)	Medium	SLSI, SLSEA, SLAB	2014-2016	50,000 Domestic, Donor	- National certification system developed by 2016
Total Cost Estimate for Technology 1				Approx: US \$ 1.28 million	