

3.1.2 General barriers and proposed measures for the industry sector

Most of the industries in Sudan are of small and medium size with obsolete technologies. They are facing different types of problems which can be summarized as follows:

- Fuel scarcity: fuel availability is not sustainable due to fluctuating national and international political circumstances which govern fossil fuel exploration and import. Additionally, fluctuation of hard currency policies is a crucial factor in fuel pricing.
- Relative absence of long term appropriate storage facilities for all fossil fuel as general and LPG specifically
- Low rehabilitation budgets; most of the industries are of small to medium size with relatively limited scope of work. The assigned budget for maintenance and rehabilitation is low thus explaining reluctance of factory owners to purchase new technologies including efficient boilers.
- Absences of local industry protections and policies that can restrict imports of similar products, thus resulting in low profit for produced commodities

Therefore general proposed activities include:

- Setting an effective policy to insure the availability of fuels to the industrial sector at suitable prices
- Improving storage facilities and distribution system to accommodate for fuel crises
- Enforcing local production policies to allow better profits for produced commodities

3.2 Action plans for the Technology of Efficient boiler (EB) for the Industry Sector

3.2.1 About the technology

Efficient boilers with dual fuel (Furnace –diesel/ LPG) are industrial boilers that are characterized by

- Improved combustion processes through different technical measures such air/fuel ratios, reducing heat losses to surrounding through better insulation. This leads to lower fuel consumption hence lower GHG emissions.
- Allowing the use of two fuels at same technical efficiency. This criterion

accommodates for more fuel flexibility that can result in higher profit for produced commodities.

3.2.2 Targets for diffusion and deployment of EB

The action targeted is the erection of 100 efficient boilers within a period of 10 years, at a rate of 10 boilers per year. The target sector covers medium and small scale factories of food, beverage and textile by introducing new boilers of capacity ranging between 1 -6 tonn/hour with working pressures of 5-12 bar and 90 percent efficiency, specifically fire-tube boiler with dual burner. A special criterion for the food sector is its relative high need for steam and hot water which calls for a reformation on the energy side. Hence the expected impact will be:

- Reduction of 3740.5 kg CO₂/mmbtu in ten factories a year
- Reducing the production costs by 30 percent due to fuel savings
- Lowering GHG emissions
- Increasing the degree of the energy security in the industrial plants
- Improving the occupational health and the environmental measures
- Reducing the quantity of fuel imported and hence save hard currency

3.2.3 Barriers to the diffusion of Efficient Boilers

Economic financial barriers

- Absence of investment incentives for importing EBs as banks and credit institutions do not support such projects

Small and medium industries have limited budget for rehabilitating or maintaining old systems and spare parts. Also LPG need additional infrastructure, storage facilities, connections and safety requirement, therefore the owners will not be able to buy new boilers/ dual burner system

Non-financial barriers

- Lack of training programs for skilled operators and engineers for the total steam generation and distribution: new efficient steam generation system need well trained workers to control the whole system starting from using the dual burner system to steam distribution
- Unstable governmental regulations in fuel distribution to different sector
- Lack of clear policies towards industrial development, especially in issues such as finance and employment, initiating smart partnerships between the

industrial sector and related research institution

- Lack of awareness and ignorance about the benefits of EBs

3.2.4 Proposed action plan for the Efficient Boilers

The action plan target is to replace the old inefficient boilers in the medium and small scale factories of food, beverage and textile by new efficient boilers with dual burner of capacity ranging between 1 -6 tonnes/hour with working pressure 5-12 bar and 90 percent efficiency.

The plan is to start by the erection of 100 efficient boilers with dual fuel (furnace, diesel/ LPG) over a period of 10 years at a rate of 10 boilers per year.

The implementation of the proposed action plan for Efficient Boilers (EBs) in the industry sector need a close coordination and cooperation between the different actors in the industry field those actors are the government ministries and relevant institutions, private companies as well as the NGOs, civil societies in Sudan

The main governmental authorities that should be involved in the implementation of the action plan are the following:-

1. Ministry of Petroleum is to facilitate the importation of LPG/NG and develop the regulation and standards as well as the needed infrastructure for the NG importation.
2. Ministry of Industry in association with the -Industrial Chamber Association is to formulate standards of Efficient Boilers (EBs) and facilitate their importation in coordination with the Ministry of Finance and the administration of the customs
3. Ministry of industry in association with the Industrial Chamber Association and the national banks is to facilitate loans that encourage the small and medium food industries to install EB
4. Close liaison and coordination for the implantation of this action plan should be maintained between Industrial Chamber Association and the Ministries of Environment, Information and other concerned bodies including NGOs, international donors and agencies that sponsor CDM projects.

More details about the action plan activities, the responsible body for each activity as well as with the estimated cost are presented in Table (3.1) below.

Table 5: Proposed 10 Years Action Plan for Implementation of Efficient Boilers Technology in Sudan

The measure	Why is needed	Action needed	Responsible Institution	Time frame (years)	Cost of action	Indicators
Establish financial mechanism and provision of soft loans to investors	To encourage the dissemination of biogas	Support producers village committees	Governmental Banks	20	1000,000	Number of people financed Size of annual finance received Percent of loan re-payment of loans
Qualify engineers technicians & skilled workers	Technology transfer ,operation & maintenance of the biogas	Establish educational programs for university and vocational training centres	Universities/ Research centres/ vocational training centres	5	50,000	Number of curriculums designed and applied Number of instructors trained Locally/ Abroad Number of students graduated
Country wide awareness campaigns	Raise the awareness of the population about the economical & environmental benefits of biogas	Workshops seminars brochures	Energy institutions	10	100,000	Number and types of campaign designed Number of materials prepared Number of campaigns performed Geographical coverage of campaigns
Capacity building and training programs	Training of trainees (engineer technicians)	Training programs	Energy institution/ private training centres/ local media	5	100,000	Number and types of training needs assessment performed Number of training packages prepared Number of training sessions held Number of trained beneficiaries (persons/ institutions)
Develop market chain	Distribution of biogas construction material at reasonable price	Establish link between material suppliers manufacturer The biogas user/users	Private sector	5	500,000	Number of businesses initiated Number of built biogas plants per year Number of prefabricated units sold
Put in place energy and waste policy mechanism & institutional arrangement	Coordination between different stakeholder especially government institutions	Institutional arrangements	Energy Institutions	3	15,000	Institutions establishment Approved biogas standards and specifications Laws and regulations formulated and approved by the government.
Total budget					1,765,000	

Budget:

Total Budget needed for the implementation of the action plan = 1,765,000 USD

To be financed by industry owners, governmental banks and international donors