Technology Fact Sheet for Mitigation

Technology Fact Sheet – Compact Fluorescent Lamps [i]

Sector	**Lighting**
Technology name	Compact fluorescent lamp
Subsector GHG emission (mn mt CO2 equivalent	CO_2 emission from power generation in 2005 was 11.9 mn mt. The ultimate supply of electricity is less than its output. How much the domestic sector is responsible for use of the supplied electricity seems to be not known with any precision. It is known however that the access by households to electricity supply is still limited, probably to 40% or so. And of the total supply, lighting probably accounts for somewhere within the range of 50-70 percent. The percent of households connected to the grid is around 40% or so and the highest percentage of household consumption for lighting in the capital city has been found to be 56. In villages it must be much higher. On the whole, we may thus think of the over-all residential activities in 2005 to give rise to CO_2 emission of 4.7 mn mt. As lighting may account for more or less 50% of total electricity use in households, this means that nearly 2.4 mn mt of CO_2 emission was due to electrical lighting purposes.
Background/short description of technology	In Fluorescent lamps, mercury vapor is excited inside a tube by alternating current, and ultraviolet light is emitted by the gas. The light strikes the inner coating of the tube which is some type of fluorescent material, producing visible light. Compact fluorescent is a new technology with a history of about 40 years and new developments for bettering its performance is continuing. It uses the same basic features as for the LFLs but introducing design and other changes. It has already generated legislations in many countries to phase out incandescent bulbs with CFLs or other similarly energy-saving lighting technology. A CFL of 23 W produce the same light as an incandescent bulb of 100 W i.e., a CFL uses 75% less power than an incandescent lamp to produce the same lumen.
Implementation assumption, how the technology will be implemented and diffused across the sub-sector	CFLs are less well-known than LFLs the latter being in the market far longer and also because it is much cheaper. Compact fluorescent lamps are far costlier compared to incandescent lamps and this is a major barrier to its widespread use. Already, the Government has introduced as a promotional case swapping an incandescent for a CFL and reportedly has replaced a million incandescent lamps that way. Obviously clear-cut and transparent procedures would be needed. One issue may be the tariff imposed on its import and the other is to lower tariffs on raw materials for producing CFLs in the country. A third process may be strictly enforcing quality control so that CFLs

	deliver the number of hours of service these are intended to provide. A fourth issue would be the measures for safe disposal of the unusable CFLs particularly the mercury it contains (about 5 mg/lamp) The nominal lumen capacity, relative efficiency compared to high pressure sodium (HPS) light and life lengths are 45-60 per watt, 65% and 10,000 hours.
Reduction in GHG emission	CFLs are much more efficient than incandescent lamps. Lumens per kw for incandescent lamps are about 15-25 while for LFLs it has a range from 45-60. The CFLs are at least 4 times as efficient as incandescent bulbs. Thus, for the same lighting service, roughly $3/4^{th}$ of the electricity is saved leading to a proportionate reduction in carbon di-oxide. On a life cycle analysis basis, use of a typical CFL results in an emission of 184 kg of CO2. The comparable emission from an incandescent lamp is 734 kg. Thais CFL use leads to 75% reduction in emission. Note that all these are actually indirect emission in the production, transportation and use of the CFL. **Based on:** Ramroth, Laurie, *Comparison of Life-Cycle Analyses of Compact Fluorescent and Incandescent Lamps Based on Rated Life of Compact Fluorescent Lamp*, Rocky Mountain Institute, February 2008.
Impact Statements – How this option impacts the country development priorities	
Country social development priorities	With better lighting quality, study habits may change for the better leading to better education prospects as well as security.
Country economic development priorities	*Productivity* may increase as with better quality of light, workers' incentive to work may improve. Also security in the work place may become better. Better lighting in commercial establishments may attract better more customers in the evening than previously spurring higher sales and incomes. Poverty may be reduced because people may have more time to engage in income-earning activities due to better lighting. Impact on BoP is not likely to be impacted much either negatively or positively. Part of the demand for CFLs can be met from domestic production while a certain percentage is always likely to be imported which will have a low negative impact on BoP.
Country environment development priorities	Direct impact on air pollution may result from the disposal of CFLs due to use of mercury in the lamp. There will be a 75% fall in use of electricity for lighting for the same number of hours implying positive outcome on resource use.
Other considerations and priorities	-
Costs	
Capital costs	The costs of an incandescent bulb may vary from US$ 1-3 while for an CFL it is at least US$ 10.
Operation and	A CFL needs ballast. These days it comes integrated with the

maintenance costs O&M	lamp and thus fixed costs are little or none. It does not generally need to be replaced for 10,000 hours although the actual life may get reduced if the on-off cycle is rather short (15 minutes to half hour). A CFL lasts far longer 10 thousand hours compared to an average of 1000 hours. Thus the latter needs to be replaced about 10 times while the CFL is replaced only once. But because CFL investment cost is far higher, the over-all O&M costs may not be much different.
Cost of GHG reduction	While many factors may impinge upon the actual emission reduction and the costs, it appears that the cost may not be high on a life cycle analysis basis. In fact it may be near zero if the investment costs and O&M costs for equivalent hours (10,000) for CFL and incandescent lamps are considered.

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment and Technology Action Plans For Climate Change Mitigation– Bangladesh. You can access the complete report from the TNA project website http://tech-action.org/**