Technology Fact Sheet for Mitigation

VII. Construction of energy efficient infrastructure [i]

Introduction

Construction of energy efficient infrastructure means constructing buildings that are energy efficient and lead to energy savings in the construction sector. Many green or energy efficient building rating tools are currently followed to rate and certify the environmental performance of buildings across the globe. For example, The British Research Establishment launched the first commercial green building rating tool in 1990, known as BREEAM (British Research Establishment Environmental Assessment Method). This was followed by LEED (Leadership in Energy and Environmental Design) in the United States, CASBEE (Comprehensive Assessment System for Building Environmental Efficiency) in Japan and Green Star in Australia.

In India, The Energy Conservation Building Code (ECBC) has been developed. This code defines norms and standards for the energy performance of the building and its components, depending on the climate zones in which they are located. The code is applicable to buildings or building complexes having a minimum connected load of 100kW.

Technology characteristics

Energy conservation in buildings can be achieved through a variety of technologies, some of which have been explained below**.**

Building Envelope: The Building Envelope is defined as a separator between the interior and the exterior environments of the building such as roof, windows and doors. Proper insulation of the building envelop can lead to energy savings.

Double Glazed windows: A double glazed window consists of two layers of glasses, which are separated by a spacer bar. The cavity between the two panes is filled with inert gas or air and sealed around the perimeter. As inert gas or air is poor conductor of heat, it reduces heat conduction between the two panes. This reduces the peak heating and cooling load of the building, resulting in reduced size of air- conditioner/heating unit.

Energy Efficient HVAC Systems: HVAC (heating, ventilation, and air conditioning) provides conditioning of space with respect to temperature, humidity also using fresh air from outdoors. Since heating or cooling a space contributes to maximum energy consumption of the building, using energy efficient systems help to conserve energy, without compromising with the quality and comfort of living.

Further**,** intelligent HVAC systems provide variable fan speeds, results in energy saving when the room is empty or has less occupancy as designed for. Temperature control mechanism allows setting the desired temperature of the room, avoiding excess cooling or heating in the room. Additionally, room heating is performed by recovery of the waste heat from present HVAC systems or any other systems available at site.

Energy Efficient Lighting System: Energy Efficient Lighting System such as Light Emitting Diode and Compact Fluorescent Lamps give better light outputs, bringing in substantial energy savings. In case of LEDS, 80% of the electricity gets converted to light energy as compared to incandescent bulbs that convert only 20 % of electrical energy into light energy. CFLs also use at least two thirds less electricity than the standard incandescent lamps they replace and last up to 4 times longer

Country specific applicability and potential

Buildings in Bhutan use twice the energy for half the size compared to Nordic countries mainly due to poor insulation levels. The residential sector is the highest energy consumer, accounting for 48.7% of the total energy consumption[19].

TERI has also designed and set up an energy laboratory, which has been constructed according to energy efficient green building design principles.[20]

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[19] http://www.undp.org.bt/404.htm, accessed on 4 May 2012

[20] http://www.teriin.org/index.php?option=com_ongoing&task=about_project&sid=54, accessed on 4 May 2012

Status of technology in Bhutan

The government has recognized the need for energy efficiency in Bhutan's energy sector, and improvements in efficiency and energy conservation standards for the building sector are being promoted by the government, particularly in terms of lighting and ventilation.[21]

Benefits to economic / social and environmental development

Energy efficient construction can generate business opportunities for individuals and business dealing in this technology, thus generating employment for the people. In addition, energy efficient motors consume less energy, thereby reducing the monthly energy bill for the built up space.

Climate change mitigation benefits

Electricity savings will directly lead to CO_2 mitigation benefits.

Financial Requirements and Costs

In India, ECBC complaint buildings bring in energy savings of the order of 50% as compared to conventional buildings. Initial costs generally increase by 10-15%, and the payback period is 5-7 years[22].

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