Building Energy Efficiency Project Software

The purpose of the BEEP (Building Energy Efficiency Project) software is to identify and address energy-efficiency problems in buildings for the end-user. The software, created by the Alliance Serbia team, is designed as user-friendly Windows application and is divided into two parts.

The Alliance has conducted BEEP training sessions in several countries and further training and implementation of this program is planned. As of early 2005, there have been a total of 10 municipal training courses with over 80 participants from over 50 municipalities. Download *Energy Efficiency in Buildings: the BEEP software*, a presentation on BEEP and energy efficiency in buildings at country and municipal level, advantages, energy management, energy consumption in buildings.

**PART I.**

The first part of BEEP is a large database. The user can utilize existing data in the program database for a number of countries, or add/change specific data. The kinds of data included are:

- country and city/site with climate data
- local currency
- energy sources (caloric value, price, pollution, etc.) and heating devices (efficiency, price, installed power, etc.)
- building materials and building construction (density, thermal resistance, etc.)
- light bulbs and tubes (power, light flux, price, etc.)
- different types of windows, doors, and other construction features affecting energy use in the building(s).
- The user enters information about the building to be evaluated. The following is a list of criteria:
  - heating system (heating device, energy source, regulation type)
  - building envelope (floors, walls, roof layers and dimension)
  - construction (type, size, and number of windows and doors)
  - indoor lighting (type, number and usage of indoor lighting)
- The user finds that the following features:
  - electricity bill calculator (enables tariff system definition and monthly bill calculation)
  - unit converter (deals with mass, volume, and energy)
  - currency calculator (enables conversion between two defined currencies).

The software then checks all entered data. Any irregularities, errors or warnings are messaged to the user.

**PART II.**

In the second part of the BEEP program, the user can create energy-efficiency packages. After defining basic financial input parameters (i.e. project lifetime, nominal discount rate, inflation, etc.), the user can simulate several energy-efficiency measures within one package:

- Heating device replacement or repair
- Energy source replacement
- Heating system regulation improvement
- External hot water pipeline insulation
- Building envelope insulation (walls, floors, ceilings)
- Replacement of doors and windows or weatherization
- Indoor lighting improvement
During the simulation, the user receives all important technical and financial parameters for a selected set of measures:

- Heating energy consumption before and after package implementation
- Lighting energy consumption before and after package implementation
- Green house gas emissions before and after package implementation
- Annual savings
- Package implementation investment
- Net present value and its coefficient
- Payback and pay-off periods
- Internal rate of return.

In addition, a tool for sensitivity analysis is provided. The user can define ranges of change, in percentages, for the most important input parameters (i.e. discount rate, energy price, energy-efficiency equipment price). Then the user immediately receives the respective changes of key output parameters (net present value and NPV coefficient, pay back period, internal rate of return).

Also, the user can create several reports in a MS Word format. Such reports can facilitate and improve the way that anticipated results of projects are presented.

**BEEP has the following custom features:**

Multi-language property: This feature enables the user to switch the whole program environment language at any time. In other words, the user can choose the language in which to display the titles of all graphical elements of the software and all the reports. Practically, the program limits the feature to a so-called two-language regime. Language Number 1 is an international language (English in this version) and Language Number 2 is the local language (the language of the country where the project is prepared). Currently, the following languages are in use: Armenian, Bosnian, English, Lithuanian, Russian, Serbian, and Ukrainian. (The efforts in translating the BEEP Manual were invested by the Armenian, Serbian and Ukrainian Alliance teams.)

Multi-currency property: This feature allows the user to enter financial data and access project reports (prices, costs, savings) in any defined currency. The program has already defined some of the world’s main currencies (Dollar, Euro) and local regional currencies (Serbian Dinar, Bosnian Convertible Mark, Ukrainian Hryvna, Russian Ruble, etc.). The user can add countries and currencies when needed.

**Output Reports: BEEP software produces several output reports:**

Energy Efficiency Project, which provides technical and financial information about the proposed project, without the financing/investment structure (the latter is part of the business plan).

- **Business Plan:** Includes all technical, economical and ecological impacts of the project, together with the planned investment structure and the planned return on capital for the trustees (in case of a loan).
- **Thermal Calculation:** Building regulations throughout the world require condominium owners to have plans for architectural and mechanical heating system designs. Unfortunately, in most Eastern European countries public and residential buildings are without a heating system design. This report provides much of relevant information about these buildings' heating systems and can be used in order to produce the missing design data.
- **Macro Project:** Allows users to analyze technical and financial results from several projects. Provides municipal energy officers with a summary of data needed to assess options related to improving energy efficiency, selecting
Training for the BEEP software

Part of MUNEE's mission is to enable and build self-sufficiency of the local organizations, municipalities, facility engineers, project developers and other stakeholders. Therefore, MUNEE has initiated, developed and implemented training programs that utilize practical software tools for developing projects or energy management systems. The training is useful for building practical skills of the trainees as well as for raising awareness about energy efficiency and its link to well-functioning businesses, cities, and a strong civil society.

MUNEE training aims to enable its trainees and the people they serve in communities and households to derive the most benefit from energy efficiency. Local trainees learn about methods to identify energy saving opportunities, prioritize the methods most suitable for a given project or community, and develop a project or plan to make energy saving a reality. MUNEE training introduces municipalities and other trainees to a range of energy-saving measures that lead to improved building comfort, lower energy bills, more rational use of available resources.

The MUNEE software tool and training program known as "BEEP" (Building Energy Efficiency Project), teaches energy accounting and business planning skills for projects in certain kinds of buildings. BEEP targets an audience of project developers that can capitalize on energy efficiency opportunities in public buildings. Recent interest in its application to multifamily residential buildings and for district heating clients in various building types has led to adaptations of BEEP for a range of buildings.

The following are the skills taught during BEEP training:

- selection, monitoring and preparation of technical data for energy efficiency projects in a range of different building types
- understanding the meaning of the most important financial parameters for developing a project business plan
- preparation of business plans utilizing a mixed investment structure.

The following are the BEEP training components:

1. Theoretical background about energy efficiency improvement on the national and municipal levels.
3. Ecological model: global pollution (related to greenhouse gases) and local pollution.
4. Financial model: key financial parameters of project profitability (net present value, pay back period, internal rate of return).
5. Preparation of real projects:
   - **Data input**
     - Data about country and cities
     - Climate data about potential project sites/regions within a country
     - Data about energy systems and energy sources in the particular country
     - Data about energy efficiency equipment
     - Heating system description
     - Building envelope and construction description
     - Indoor lighting description
   - **Calculation of status quo (baseline)**
     - Annual energy consumption for heating
• Annual energy consumption for lighting
• Annual greenhouse gas and local pollution emission

- **Simulation of energy efficiency measures**
  - Energy efficiency package creation (assumption of project life time, nominal discount rate, inflation, GHG price, etc.)
  - Heating system improvements (boiler, energy source, regulation)
  - Heating pipeline insulation
  - Building envelope additional insulation
  - Construction (renovations or reconstruction) or weatherization
  - Indoor lighting replacement

- **Preparation of reports and business plans**
  - Sensitivity analysis
  - Description of energy efficiency measures
  - Definition of investment structure
  - Other textual inputs
  - Creation of business plans

6. **Discussion**
   - Comments about training
   - Questions about solving some specific problems in municipalities
   - Advices for future preparation of independent project

7. **Awarding Certificates for Completion of BEEP Training**

The training produces both short-term and long-term results. The short-term results are demonstrated in the creation of new projects and business plans. Long-term results can be observed and tracked through the improved ability of the trainees to create a project pipeline, and through the increased overall energy efficiency over time.

Copies of BEEP software and multilingual training manuals are available upon request.