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WORKSHOP ON DESIGNING SUSTAINABLE ENERGY SYSTEMS
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INPUT DATA FOR FORM FOR MESSAGE (xls)

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***These are preli*minary lecture notes, intended only for distribution to participants.**

Notes to the Input Data Forms for MESSAGE

This note provides additional explanation to the information given in the Excel file "Input_data_form_for_MESSAGE.xls"

1. Notes on General Data: (see worksheet "General data")

General data includes *study period* and a *discount rate* (in %). The study period is divided in to several *time steps.*
In the example the study period is from 2000 to 2050. This period can be split into time steps as follows: 2000, 2001, 2002, 2003, 2004, 2005, 2010, 2015, 2020, 2030, 2040, 2050. In this example, the first 5 intervals have 1-year length; the next 3 intervals have 5-year length and the last 3 intervals have 10-year length.
In the example, a discount rate is 8 %. It is the rate used for discounting monetary values into a common year, normally the first modelling year (2001 in the example). One value is used for the whole system.

2. Notes on Demand Data (see worksheet "Demand data"):

The direct input to the optimisation of the supply system (using MESSAGE) is future energy demand. Depending on the intended scope of the study, data on projected energy demand should be made available for each fuel to be included in the model. For example: demand for electricity, demand for gasoline, demand for heat demand for biomass etc. For each fuel, a time series data is needed, expressed in energy unit. At the present, all energy units are available and can be used however default unit of all energy forms in MESSAGE is MWyear (pronounced "Megawatts year" 1 MWyr = 8,760 MWh = 8,760,000 KWh).

In the example, demand for gasoline, coal, etc already converted into this default unit (MWyear). Demand for biomass is assumed to be constant.

If the consideration of the variation of a demand over time (seasonal, diurnal) is important, e.g., electricity load, then the data about such a variation is needed. This can be prepared based on typical hourly load data available at the dispatching agencies. Necessary data about load includes two subsets:
- data on load region length
- data on load curve

2.1. Load region length (fraction of time):

A year is divided into seasons (e.g., S Winter). Each season is represented by a typical day(s) (for example: working day, holiday, Sunday). Typical days then can be split into parts: peak load part, medium load part, off-peak load part. The load region length of a given part of a typical day of a given season is defined as a ration between the total number of hours of that given part, of the corresponding day and the total number of hours of all parts of that day.

2.2 Load curve (fraction of energy):

To represent load curve the energy portion of each part (defined above) is needed. This is defined as a ration between the total amount of energy demanded within the given part and the total amount of energy demanded within the corresponding typical day. Sum of all portions of all part of a day should be 1. Sum of portion of typical days within a season should be 1. Similarly, sum of all portions of all seasons should give 1.

3. Notes on Technology data: (see worksheet "Technology data")

Any real-life technology or process (or an aggregation of them) is termed "technology" in MESSAGE. A "technology" requires two subsets of data: technical and economic data (related to

technology capacity and operation) and other data or miscellaneous data. The meaning of data entries is given in the spreadsheet. The followings apply to all technology data:

- There are two most commonly used modes of data entries for a technology: constant (c) or time series (ts). Other modes can be specified such as constant growth (cg), periodic growth (pg). The user can choose the mode of data using the toggle "Switch".
- When the user does not specify investment cost, the model does not generate capacity equation. For existing capacity investment costs are zero (sunk costs)
- Cost data e.g., investment, fixed and variable O&M are based on the main output. For example, a cogeneration power plant producing electricity and heat. Suppose the user chooses electricity as main output then all costs of this plant should be recalculated based on electricity output.

4. Data about energy resources and import/export of energy:

4.1. Energy Resources:

All energy resources that are indigenously available can be classified into different categories in accordance with their availability, geological location (e.g., open-pit vs. underground) and quality of resources (e.g., different grade of coal). For each of the category the following data is required:
- Total Volume/Amount (energy unit, MWyear);
- Remaining Recoverable (energy unit, MWyear): the amount that should be left over at the end of the study period;
- Per unit cost (currency unit per unit of energy, $/MWyear): cost of resource itself a kind of scarcity rent)
- Limits on annual extraction, if any (energy unit, MWyear);

4.2 Energy Import/Export:

- Volume of imported/exported energy (energy unit, MWyear);
- Tendency of future energy trade;
- Import/export energy prices (currency unit per unit of energy, $/MWyear);

Apart from the above data users are advised to have at hand information about present and anticipated energy policies, policies related to environmental protection etc.