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ESMAP

AN ASSESSMENT OF

THE ENERGY TOOLBOX PLANNING MODEL

A Report to the World Bank Industry and Energy Department

Energy Strategy and Management Assistance Program

of the Results of a Summer Research Internship

Ernesto Cordova
September 1991

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This study evaluates the performance of Energy Toolbox (ETB), a wide-energy model, in the context of two levels of use:

1- Quick energy assessments for individual countries: these would require a basic level of analysis including the construction of the energy system flows both in tables and graphics as well as the generation of simple demand scenarios.

2- In-depth assessments of the energy sector or subsectors: these would require a more sophisticated level of analysis. This level includes the Disaggregated Demand Analysis System (DDAS) and the Econometric modules for analyzing the demand side and the linear programming package (LP-ESPS) for the supply side.

For purposes of this assessment two case studies were developed: a case for Haiti that assesses ETB's performance at the most basic level of analysis, and a case for Colombia that assesses the more sophisticated and time-consuming level of analysis.

conclusions

Overall, ETB is very flexible with respect to both levels of analysis. The user has options as to the type of energy and cost units to be used, energy sources, conversion processes and economic sectors to be considered, level of aggregation, time periods, reports and form in which demand is projected and scenarios are created. The model is rigid only in the type of printouts generated under the Graphics Network, DDAS and LP-ESPS modules.

As far as applicability is concerned, ETB performs both levels of analysis very efficiently; the most basic level allows the user to replicate fairly quickly a country's energy system and generate a variety of reports on costs and energy requirements in energy balance formats. At the more sophisticated level, ETB allows the user to perform more detailed analyses at both demand and supply. In the demand side linear regression and/or disaggregated demand analysis can be performed in order to generate demand forecasts. In the supply side linear programming can be used to optimize the flows of the energy system.

At the most basic level of analysis, the only important limitation of the model is that it does not permit the imposition of basic restrictions on the energy system. Parameters such as refinery yields and other conversion processes' conditions are not taken into consideration at this level by ETB. They are only incorporated in the evaluation at the more sophisticated level of analysis by the linear programming module. Basic energy assessments performed by ETB should offer the possibility to impose a greater variety of restrictions on the energy system. The difficulties created on the programming side by such changes would probably be outweighed by the benefits derived from the performance of "quick" and "realistic" energy assessments.

I. INTRODUCTION

The assessment of Energy Tool Box (ETB) is intended as a follow-up activity to the project "Assessment of Personal Computer Models for Energy Planning in Developing Countries". ETB received a good review in relationship to the other models assessed in the project and as a result it was decided to further evaluate ETB using two case studies: Haiti and Colombia.

The assessment of ETB is carried out taking into consideration that there are at least two types of potential users of the model: bank staff, who would be interested in quick energy assessments for specific countries; and, energy planners from client countries who would be more interested in a more in-depth analysis of the energy sector or specific sub-sectors.

ETB's structure is such that it is possible to assess the model according to its performance with respect to the two different types of uses. The model's structure recognizes three different levels of analysis:

1- Level A: This is the most basic level of analysis and includes the replication of the Energy Reference System both in tables and graphics as well as the generation of simple demand scenarios in absolute terms and/or using growth rates.

2- Level B: This is a more sophisticated level of analysis which includes the Disaggregated Demand Analysis module which allows the use of simultaneous equations in order to generate more complex demand scenarios, a module for regression analysis and a module for linear programming.

3- Level C: This is not included in the current release of the model used for the assessment, but it is designed to perform detailed sub-sectoral analysis such as power, oil refining and rural energy.

In this assessment the case of Haiti is used in the context of level A of the model and the case of Colombia is used in the context of level B. Therefore, each of the cases is developed taking into consideration the purpose of the application of ETB.

This paper is organized in six parts; part one is devoted to the introduction. In part two the model is described using the "Assessment of Personal Computer Models for Energy Planning in Developing Countries" report and ETB's manual as references.

Part three presents the criteria used to carry out the evaluation. These criteria are the same as were presented in the "Assessment of Personal Computer Models for Energy Planning in Developing Countries" report.

In part four the cases of Haiti and Colombia are developed and evaluated. In the case of the former basic data on consumption, technical characteristics of power plants, short-run capacity expansion plans and costs of fuel imports and power generation are used to produce a series of reports useful for the performance of an energy assessment.

In the case of the Colombia, data is extended in order to perform a more elaborate analysis of demand (Disaggregated Demand Analysis module) and to optimize the energy system (Linear Programming module). Both of these cases are described and assessed in the context of the two different applications of ETB (levels A and B discussed above).

Finally, part five are the appendices which include the tables and graphs used and/or produced in the case studies.

II. MODEL DESCRIPTION

Energy Toolbox is a set of software tools for aggregate planning studies at the national, regional or sectoral level. ETB is a commercial package developed by the Energy Policy Group at the Imperial College and marketed by ERL Energy Ltd., both based in London, U.K.

ETB comprises a number of different analyses systems arranged in a hierarchical fashion in three levels (A, B and C). While all the modeling tools are accessible from the menus and may be used for any type of study, the different levels conceptually relate to varying degrees of difficulty required to implement them. The major building blocks of ETB are:

1- Reference Energy System network flow model (RES): This is a tool used to describe a reference system defined by the user. It is a network representation of the energy flows, from supply, through conversion and distribution to final demand. The inputs required by this module include costs, conversion efficiencies and capacity data. The driving inputs of the model are the final demands, which are provided either as external inputs or by another ETB module. Other features of RES include its ability to define the basis for the linear programming module and its ability to employ user-defined process models. These process models convert energy inputs into energy outputs according to rules defined by the user in external programs. They are used where the normal linear definition of energy conversion activities are insufficient. The output of this module is a quantitative description of all energy flows between primary energy supply and final demand.

2- Network graphics: This module can display a graphic representation of RES on the computer screen. Hard copies can be generated by using the print screen function. This module can also display subwindows and RES data in pop-up windows.

3- Report generator: This module can generate a number of reports automatically, including cost reports, energy balance tables, and reference reports that compare two different scenarios. All these are created in spreadsheet format.

4- Disaggregated Demand Analysis System (DDAS): This module is used to derive energy demand for up to forty time periods. It allows input, modeling and projection of demand data disaggregated in any fashion to the user's requirements such as by region, income groups, sectors, activities, technologies, processes or appliance types.

5- Econometric Analysis Program: This module uses regression analysis techniques to estimate multivariate and single-equation econometric models, and applies them to produce forecasts. Tools available include Ordinary, Weighted and Generalized Least Squares estimations, Residuals analysis and Ridge regressions.

6- Linear Programming Energy Supply Planning System (LP-ESPS): This module extends RES by introducing changes in capacity as a result of investments, by changing the static (single-period) solution of RES into a dynamic (multi-period) solution, and by introducing the optimization of fuel mixes (and flows) of the system. LP-ESPS automatically converts RES into an LP problem (whose structure can be modified manually by the user) and solves it to find the least cost set of energy flows and investments. The results are fed back to RES and the report generator.

Level A of ETB includes RES, the network graphics and report generator. These are the most basic modules which allow quick and easy manipulation of data as well as generating results and reports.

Level B includes DDAS, the Econometric Analysis Program and LP-ESPS in addition to the modules from level A. The use of these modules is more complex and time consuming and, may require knowledge of specific analytical tools such as linear programming and/or regression analysis.

Level C modules are designed to cope with more detailed sectoral planning than can be carried out in the more aggregate RES and LP-ESPS modules. The first two recently-developed modules include power sector planning and rural energy planning.

"Alternative Electricity Sector Opportunities Program" (AESOP) is designed to carry out detailed multi-period electricity system capacity expansion planning of mixed hydro-thermal systems. It interfaces with RES for initial data. An LP model is used to screen power station investment alternatives. Detailed examination is carried out using probabilistic simulation around an interactively developed investment plan generator.

The "Framework for Rural Energy Decision Analysis" (FREDA) is designed to carry out the balancing of supply and demand of biomass and commercial fuels in rural areas. The country or region is disaggregated into a number of local energy systems within which fuel balances are calculated by disaggregating fuel use by activities, processes, technologies, etc. Surpluses and deficits are transported between local systems to balance fuels within the region.

III. EVALUATION CRITERIA

The evaluation criteria include the following categories:

1- **User friendliness** includes aspects such as the amount of on-line help provided during the formulation phase, the completeness and readability of the model documentation and the resilience of the computer code against user errors.

2- **Comprehensiveness of output** evaluates the relationship between the questions a model is supposed to answer and the completeness of its output.

3- **Data intensiveness** evaluates the amount and type of data required for the model to run. Lack of particular data or time series may render the model inapplicable for a given purpose.

4- **Sophistication** evaluates the type of knowledge required by the user in order to use the model.

5- **Transparency** evaluates how well the model outputs can be understood in terms of the inputs.

6- **Robustness of results** evaluates the degree of mathematical continuity of the model results, i.e., whether insignificant or small changes of the model inputs can yield major changes in the model output.

7- **Treatment of uncertainty** evaluates how the model takes into account the intrinsic uncertainty of its parameters.

8- **Flexibility** evaluates the adaptability of the model to the actual data situation.

9- **Applicability and limitations** evaluates how well the model performs the tasks for which it was constructed.

IV. CASE STUDIES

1. HAITI

1.1 CASE DESCRIPTION

Haiti is a country of few natural resources where most of the energy needs must be satisfied through fuel imports. The country has a population of approximately six million people, a population density of about 215 per square kilometer and is by far the poorest in the region.

In this assessment the case of Haiti had the following objectives:

1- To represent the flows of Haiti's energy system in "energy balance table" and "network flow" formats, and to compute the costs of the diffêrent flows in the system for the base year (1989). The data used includes final demands, technical characteristics of conversion processes and costs of supply and generation.

2- To use simple growth of demand to generate two different scenarios for 1995. One includes a business-as-usual type of situation where capacities are left unaltered and the other involves the addition of capacity in the power sector in 1994 (year in which new thermal plants are supposed to be in operation). Even though energy demand is the same under both scenarios, the total cost in the system would not be the same.

The energy subsectors considered in the assessment are:

1- Petroleum: This involves the imports of oil products only because Haiti does not have a refinery.

2- Power: This involves the generation of electricity from hydro, diesel and residual fuel oil sources. For this assessment the country was divided into eight generating blocks (chosen by a combination of factors such as geography, type of source and capacities).

3- Fuelwood and charcoal: This involves the utilization of fuelwood for both direct consumption and production of charcoal.

4- Coal: This involves the imports of coal for use by industry.

5- Sugar cane bagasse: This involves the use of bagasse by sugar cane related industries.

The demand sectors considered in the assessment are residential, transportation, industry and all other consumption grouped under "commercial".

The costs used in the assessment include the import costs of oil products (based on estimation of CIF prices), cost of fuelwood, cost of charcoal production and the fixed and variable cost of power generation (other than fuel). The costs for other sources such as bagasse and coal were not available and no attempt was made to estimate them.

The technical characteristics considered in the model were the conversion efficiencies in the power plants and in charcoal production.

It is important to note that the assumptions made in the model are not rigorous since the prime objective of running ETB was to assess its performance and not the accuracy of the assumptions and results. Appendix A contains the input data and output results for the base year (1989).

REFERENCE ENERGY SYSTEM

In order to produce the RES the user must define a set of "activity groups" (conversion processes and supply and demand sectors) and the set of "activities" (fuels) that are part of each group. The user must also define the "activity shares" which link the different activities between the groups thus, linking the whole network from supply to demand. The links represent the shares of supply activities going to each demand activity, eg. if electricity is generated from hydro and diesel, the user must define the percentage of each hydro and diesel that make up electricity.

ETB requires that activity links be established only between two groups at a time. As an example assume that a system has the sectors "supply", "elec. generation" and "demand", the group "supply" has the activities "gasoline", "hydro" and "diesel", the group "elec. generation" has the activities "gasoline" and "electricity" and group "demand" has the activities "gasoline in transportation" and "electricity in residential". In this case note that gasoline was included in the group "elec. generation" even though gasoline is not used to generate electricity. This is necessary because ETB is demand driven and in order for the model to trace gasoline from "demand" to "supply", it should have a bridge to get to supply. In this case the activity share for gasoline between "supply" and "elec. generation" is 1 because 100% of the gasoline from the "supply" goes to the group "elec. generation". The activity groups should contain all the activities necessary to make all the links within the system, considering that such links are made only between adjacent groups.

The characteristic in the group "elec. generation" that is particular to electricity generation is that the user must define the conversion efficiencies for electricity generation in that group. There are different parameters that must be defined for each group but they are explained very clearly in the manual.

Once the system has been defined in terms of the groups, activities, and shares, the user proceeds to enter the values for final demand for the base year. The user then has the option to enter values for up to ten time periods or, to use growth rates to generate the demand values.

Once the demand values are entered for the base case (period for which the model is built), the system is ready to be calculated. The user selects the time period for which the model is to be run. For this, there are up to ten time periods that can be projected (either using growth rates or absolute values). The output of the process is a set of reports for each of the groups. These include: energy requirements, losses, net energy produced, total variable and fixed cost of production (generation).

Finally, the energy units, currency units and energy names used in the model must all be defined in advance. ETB has specific databases for each of them where they are defined. In the case of energy and currency units, the user can choose to enter the values in whatever units he/she prefers as long as they have been defined in their respective databases (conversion tables). ETB makes the necessary internal conversions, thus maintaining consistency in the system.

NETWORK GRAPHICS

The generation of the graphic representation of RES is practically automatic. The user can control printing and displaying functions but generating network graphics is automatic and its structure cannot be changed within the module.

REPORT GENERATOR

This module can generate three types of reports: energy balance tables, cost reports in the same format as energy balance tables and summary reports, including energy and cost outputs. The set of cost reports, include reports for variable, fixed, incremental and total costs.

In addition to the various types of reports, the user has the option to customize his/her own table or make use of ETB's automatic balance table. One possibility is to generate the automatic balance table and then perform the necessary changes on it. Once a format has been customized, it can used again for other cases.

The manipulation of data and format in the balance tables is similar to a lotus spreadsheet. There are specific rules for the functions and expressions that can be easily followed from the manual or the on-screen help function.

1.2 EVALUATION

USER FRIENDLINESS

ETB provides good on-line help at all times for the modules discussed above. At any point the user can access the help screen with the F1 function key. In addition to this, there is a system of codes against user errors throughout the modeling process (data entry and network calculation).

Considering the modules in level A, for the most part the manual is clear and complete. However, there are two areas that deserve more information and explanation; the use and construction of "process" models and the mechanics of building the RES. With respect to the former, the users (even those with some modeling experience) need to know more about the use and applications of process models. With respect to the latter, the manual should expand on the mechanics of the links for **each activity** between each pair of adjacent groups. This is important because calling the groups names that identify a conversion process and based on the examples used in the manual, the user may be induced to infer that the only links that matter are those of the conversion processes.

The energy units, energy price, energy forms and energy categories databases along with the pop-up windows display database simplify and speed-up the modeling process, both in terms of building the model and generating different scenarios.

COMPREHENSIVENESS OF OUTPUT

The model is supposed to trace the flows in the energy system from final demand to total supply in order to evaluate energy requirements, conversion processes and alternative supply and/or demand scenarios. The model output reports for Haiti were comprehensive. They include energy and cost balance tables (which can be customized to produce the reports in a variety of ways), summary reports (which include summaries of both the physical and cost figures), a graphic representation of the flows of the energy system, and the activity groups summaries which include the efficiencies, the flows and the costs of the power and charcoal plants.

Costs are disaggregated in the reports into capital, variable and, incremental costs. Incremental costs represent any additional costs derived from producing above capacity.

Note that in the reports in appendix A, the costs for charcoal production were reported in the "fuel distribution" activity group. This was purposely done because the production costs for charcoal were available on a per unit of charcoal produced basis (after losses). Therefore, if the cost had been applied to the "charcoal production" activity group, they would have been multiplied by the units required which would have overestimated the cost.

Finally, it should also be noted that the reports in appendix A show costs for the "sectoral demand" activity group. These costs reflect only the margins, markups, profits, etc. that are charged to the consumers. In this way, the costs attached to each activity group represent the incremental costs in the system. This is important because otherwise the costs would be counted twice.

DATA INTENSIVENESS

The modules in level A require basic data on final consumption, efficiencies of conversion processes, knowledge of the mix of primary energy going to produce electricity, knowledge of refinery yields and other mixes of primary energy that may be required in other conversion processes. In addition to this, the different capital, variable and incremental costs for the different flows and processes are used to calculate the total costs in the system if desired by the user.

In Haiti's case study, RES was used to analyze the flows of the energy system for 1989 and 1995. As a result, data was collected only for that year. Since RES is demand driven, the flows in 1995 (up to ten periods are allowed) were calculated by making demand projections based on different annual growth rates for the different sectors and fuels (absolute values are also allowed within RES).

The detail and amount of data required is flexible. As a starting point, the user can build the RES using very aggregate data with a minimum amount of cost items. As data becomes available, the model can be expanded to include more disaggregated data and more cost items.

SOPHISTICATION

If the model is intended to be used only to solve the RES, to present graphic representation of the flows and to produce energy balance tables (level A), the user does not need any familiarity with or knowledge of any software package or analytical tool. The user is only required to understand the theoretical framework of the Reference Energy System, and it is helpful (but not required) to have some familiarity with LOTUS 123 (or other type of spreadsheets) in order to easily customize the table reports.

TRANSPARENCY

The model is transparent. The RES module produces output reports that include the inputs to the model. In this way, the user can make sure that the inputs entered in the model are correct and can also see and assess the output results in terms of the inputs. Both the network graphics as well as the report generator use the output results from RES to generate their own outputs. In these cases, these modules can be said to be transparent with respect to RES.

ROBUSTNESS OF RESULTS

The results of the model are robust. This is because the computations performed in level A of the model involve only the four basic mathematical operations and basic data base and logic manipulations of data. Therefore, any changes in the output derived from changes in the inputs are proportional to the changes of the inputs.

TREATMENT OF UNCERTAINTY

The input data is taken to be definite in the model. As a result, uncertainty can only be taken into account through the definition of scenarios which can be easily generated. In the case of Haiti, uncertainty was considered only via alternative growth rates for demand, but in theory, the user could consider alternative capacities or other technical characteristics to account for uncertainty.

FLEXIBILITY

The model is very flexible with respect to the RES and report generator modules. The user can adapt the model to any level of aggregation and data situation. Once a basic model has been built, it can easily be expanded as data becomes available. In the case of Haiti, the model for the base case (1989) was built using final consumption of energy, cost of electricity generation, cost of charcoal production, the cost of fuelwood and imported oil products, and the efficiencies of power and charcoal plants.

In building RES the user has options as to the type of energy and cost units to be used, energy sources, conversion processes and economic sectors, the level of aggregation, time periods (up to ten), and form in which demand is to be projected.

As far as the network graphics module is concerned, it is only intended to present a graphic representation of the flows modeled in RES and, therefore it has a very rigid structure with few options for generating printouts.

The task of building scenarios is also very flexible. In the case of Haiti, one scenario was developed considering the commissioning of a gas turbine and three diesel plants in 1994. The idea was only to compare total energy costs (including both capital and variable costs) between the base case and the scenario in 1995.

To build a scenario the user can take the base case, change the file name of the base case, perform any desired changes to the parameters and/or variables and then save the scenario results under the new file name. This process is facilitated by the pop-up windows that show different listings of the files created at the different stages (from building the model to the report generator) of the modeling process. This is particularly helpful in the report generator module where the user may have to work with a large number of files. At this stage the user will have the names of all the scenarios created in RES plus the different report options (energy balance, variable cost, capital cost, incremental cost, total cost and summary report), each of which could be generated for each scenario.

APPLICABILITY & LIMITATIONS

Level A of ETB was designed to represent the energy flows from supply through conversion and distribution to final demand, to perform simple demand projections, and then to represent the energy flows for the projected periods. Ultimately, reports in balance and summary formats can be produced for both energy and costs.

In Haiti's case, ETB performed the above stated tasks very well. The RES was built without major difficulties; the demand projections were easily generated; the links between activity groups and among activities were also easily established; and the conversion processes were easily simulated using the efficiencies and the activity shares (discussed in the description of the case study).

As far as output reports for Haiti, ETB generated the following:

- network graphics showing the links among the flows and nodes in the energy system

- the RES summary tables with energy requirements, efficiencies and costs for each activity group

- energy balance tables for 1989 and 1995 for the base case and an energy balance for 1995 for the alternative scenario

- a summary table with total energy flows and costs for the activity groups and the system as a whole for each of the periods and scenarios.

Although ETB's performance in the modeling process was in general very good, some minor problems were encountered:

1- Under costs in RES the user is expected to enter the annualized capital costs on a per unit of capacity basis. This is confusing because users may be inclined to enter the costs on a per unit of capacity basis (MH, GW, etc.) when in reality the model computes on a per unit of energy (capacity * 8760 hrs.) basis. The logic solution would be to leave the same heading but to change the formula to consider units of capacity.

2- Also under RES, the quality of the presentation of the report summaries for the activity groups is not very good. The introductory paragraphs and the format in general are not visually appealing to a reader who was not involved in the modeling process.

3- In the report generator, the automatic energy balance format contains misplaced cell formulas in some of the conversion rows thus, resulting in misplaced figures in the report. These can easily be corrected manually, but the automatic balance tables should be generated correctly.

In addition to this, the first column of the balance tables should be automatically printed in every page of the report tables. Otherwise, if the energy balance reports are long, it would be difficult to match the columns with the rows.

Finally, the summary reports include a column for total energy and total costs (after adding the flows and costs for each activity group), however, the figure for total flows is conceptually wrong. The flows going to the demand group are the same flows originated in the supply group minus the losses in the conversion processes, transmission and distribution. When they are added, double counting errors are committed.

2. COLOMBIA

2.1 CASE DESCRIPTION

Colombia's demand for energy is met almost entirely by its own natural resources, some of which are also exported. The country has a population of approximately thirty million people and considering its current socio-political crises and in relation to the rest of Latin America, the country has a stable economy.

In this assessment the case of Colombia had the following objectives:

1- To represent the flows of Colombia's energy system in "network flow" format and to compute the supply costs of the system for the base year (1988). The data used includes final demands, technical characteristics of conversion processes and costs of energy supply and generation/production. The main source of data was a study carried out by Mr. Carlos Ferreira while attending the Imperial College in London. However, the data on cost and technical characteristics of conversion processes presented in this study were very limited and as a result very simplistic assumptions and estimations had to be made in order to carry out this assessment.

2- To use the "Disaggregated Demand Module" of ETB to make projections of demand from 1988 to 1997 and then to plug these results in the "Reference Energy System Module" (discussed under Haiti). This allows a comparison of energy requirements between different time periods.

3- To use the LP-ESPS (linear programming) module in order to optimize the flows of the system and to add constraints to the model (since RES has limitations in the type of restrictions that can incorporate).

The energy subsectors considered in the assessment are:

1- Petroleum: This involves the production and refining of crude, gasoline imports (since refinery output can not meet the demand) and crude, diesel, kerosene and fuel oil exports.

2- Power: This involves the generation of electricity from hydro, oil derivatives, coal and natural gas.

3- Coal: This involves the production, consumption and exports of coal. No distinction is made between thermal and metalurgic coal.

4- Natural Gas: This involves the production, processing and consumption of natural gas.

5- Fuelwood and charcoal: This involves the utilization of wood for both direct consumption and production of charcoal.

6- Bagasse: This involves all the agriculture residues used by the industrial and agriculture sectors.

The demand sectors considered in the assessment are residential, transportation, industry, agriculture, commercial, exports (defined in the assessment as another demand sector) and "other" (used to include all other consumption).

The costs in the assessment include the import costs of gasoline (based on an estimation of CIF prices), costs of crude, gas and coal production, costs of crude oil refining and gas processing, and an estimation of electricity generation costs. Costs for fuelwood, charcoal, and bagasse were not available and no attempt was made to estimate them.

The technical characteristics considered in the model were the conversion efficiencies of all the processes and the refinery yields.

In the disaggregated demand analysis module, GDP was used to compute the energy intensities which were used as the bases for making the demand projections. GDP was assumed to grow at an annual rate of 5% from 1988 to 1997.

Finally, as in the case of Haiti, it is important to note that the assumptions made in the model are not rigorous since the prime objective of running ETB was to assess its performance and not the accuracy of the assumptions and results. Appendix B contains the input data and output results for Colombia.

REFERENCE ENERGY SYSTEM

RES has already been described in the previous section, however, the case of Colombia introduces the oil refining process which demands special treatment by ETB.

RES is a demand driven module in which the user must define the "activity shares" according to the proportions of the supply activities feeding a demand activity. In cases like the power sector there is no problem in defining the shares because the demand activity (electricity) is produced from a series of supply activities (diesel, fuel oil, hydro, etc.). In this case it is a simple matter to define the proportion of each supply activity that make up the total output of electricity.

In the case of oil refineries there is one supply activity (crude) producing several demand activities (oil products) but the user must still define the demand activities in terms of the supply activities. For example, in the case of Colombia, gasoline is produced by oil refineries, gas plants and from direct imports. Therefore, the user must define the gasoline shares (and requirements) according to the proportions of these three supply activities.

However, the final supplies of the model may not be compatible with the technical restrictions of the refineries (yields). In the case of Colombia, the model's output for gasoline from the refineries was much higher than the highest possible yield (based on type of crude and existing technological conditions of the refineries).

In discussing the issue with Mr. Ray Tomkins of the Energy Policy Group at the Imperial College in London and main writer of ETB's models, he suggested that the easiest solution to this problem was to manipulate the shares until the refinery outputs were more in line with the yields. He also suggested that one could run the linear programming module in order to include the yield restrictions in the model. Finally, he mentioned that an intermediate module is under consideration that would allow the user to include basic restrictions to RES such as oil refinery yields.

DISAGGREGATED DEMAND ANALYSIS SYSTEM (DDAS)

This module was used to perform the demand projections from 1988 to 1997. The results were then fed to RES in order to compute the energy requirements of the energy system.

DDAS allows the user to establish several levels of disaggregation which are constructed in a tree-like manner. For each node of the tree the user is then required to define all the variables that interact directly and indirectly with the node.

DDAS performs basic data base operations across and within nodes, and allows the user to define up to three systems of equations (including simultaneous equations) for each node and make estimations for up to forty periods.

Because of the limitations discussed above in relation to the data from Colombia, the formulation of the demand model was very simple. The model included three levels; total energy, sectoral consumption and sectoral consumption by fuel.

Two systems of equations were developed; one defining the energy intensity for each fuel in each sector and the other, defining the demand for each fuel in each sector as a function of the energy intensity and GDP. The latter was used to make the demand projections.

Once the projections were made for each fuel in each sector, data base operations of the module were used to aggregate the results by sectoral consumption in the second level and by total consumption in the first level.

Finally, for the results to be read by RES, the fuel names must correspond to the names and categories defined under RES. The user can select the fuels names in advance by using the RES menus for names and categories. If the code D (for demand) is attached to the names, DDAS will create a RES file for these fuels.

LP-ESPS (LINEAR PROGRAMMING)

This is a tool used to optimize the energy flows described under the Reference Energy System (RES). LP-ESPS uses the information developed under RES to set up the LP problem. First, the variables and constraints' dictionaries are generated by LP-ESPS. These dictionaries are created automatically but they can be modified either to change the parameters or the names of the variables. Once the dictionaries are defined, they are used to set up the LP problem for the base year in terms of an objective function, and the full set of constraints and bounds. At this point the user is also allowed to change the time tables for each of the constraints. The time tables allow the user to define different growth patterns for the time horizon of the problem.

Once the base year has been defined, LP-ESPS generates the matrix for the multiperiod formulation and subsequently generates the solution of the problem. Finally, the user is allowed to feedback the solution to RES.

In the case of Colombia, the LP formulation was used only to set up constraints in the refinery. Restrictions were utilized to reflect the yields in the production of LPG, gasoline, kerosene, diesel and fuel oil.

ECONOMETRIC ANALYSIS

This assessment does not cover the econometric module in detail. Partly, because there was no historic data available for either Haiti or Colombia, and also because it is not considered to be a key feature of ETB.

This module was evaluated broadly and the following comments are offered:

1- The module is the least developed of all ETB modules included in the assessment. It is very rigid and not nearly as user friendly as the other ETB modules.

2- Every time a model is run, the results are written in the ECNM.RES file. Therefore, if the user wants to save the results, he/she must save the file under a different name after the model (or variant of the model) is run.

3- The data TRANSFORMATION sub-module allows only a limited number of operations. As a result, the user must make use of more time consuming procedures in order to achieve certain operations such as divisions and copying variables.

2.2 EVALUATION

USER FRIENDLINESS

ETB provides good on-line help for the DDAS module where the user can access the help screen at all times with the F1 function. In the case of LP-ESPS, on-line help offered is more limited but the manual provides an entire volume for this module.

Considering the modules in level B, the manual is clear and complete for the most part. However, there are some areas such as growth functions in DDAS that deserve more detailed explanation. Also, the manual could be improved by specifying the mechanics to be followed in order to run the different modules or, by developing some type of tutorial.

As with the previous modules, in DDAS, the energy units, energy prices, energy forms and energy categories databases along with the pop-up windows display database simplify and speed-up the modeling process, both in terms of building the model and in terms of generating different scenarios.

COMPREHENSIVENESS OF OUTPUT

The output reports of DDAS are comprehensive. The module allows the user to produce a report for any (or all) nodes of the tree. Three types of reports can be produced:

1- The names of the variables defined under the node

2- The data of the variables within the node arranged by periods (in the columns)

3- The data of the variables within the node arranged by variable names (in the columns).

DDAS also allows the user to create graphs for the variables within a node. However, ETB does not provide graphics printing functions and as a result the user must save the graphs under separate filenames to be printed outside the model. Finally, the user is also allowed to generate a graph showing the nodes' "tree".

In the case of LP-ESPS, the output is also comprehensive. The model produces two types of reports: one for the base year solution and one for the multi-period solution. These include the objective function, the constraints and the solution of the problem.

DATA INTENSIVENESS

In order to utilize the DDAS module the user is required to have **at least** a basic level of disaggregation for sectoral demand of energy (the same level defined in the "demand" activity group of RES) and basic macroeconomic and demographic data such as income, prices and population characteristics. The user can establish up to three sets of equations (including simultaneous equations) representing the interdependence of the consumption variables with the macroeconomic variables and/or other consumption variables. The idea is to build the more aggregated variables from the most disaggregated data possible. The model can then be expanded by parts as data becomes available.

In the case of the LP-ESPS module, the user is required to utilize the same data used to create RES plus any additional restrictions (such as process yields) and costs that the he/she may want to impose on the energy system.

SOPHISTICATION

If the user is interested in the application of the DDAS module, it is not necessary to have knowledge of any particular software package or analytical tool. The user is only required to perform basic data base operations and data manipulation. In the case of LP-ESPS the user must have some theoretical background in linear programming.

This is specially true if modifications are made to the dictionaries, which is inevitable if realistic assumptions are to be made of the energy system.

TRANSPARENCY

The model is transparent; both DDAS and LP-ESPS modules produce output reports that include the inputs to the model. The user can check the inputs entered in the model and also see and assess the output results in terms of the inputs.

ROBUSTNESS OF RESULTS

The results of the model may or may not be robust, because the computations performed in the DDAS module at level B of the model involve linear and/or non-linear equations and because the nature of LP problems is such that depending on the structure and conditions of the problem small changes in the inputs may generate large changes in the optimal solution.

TREATMENT OF UNCERTAINTY

The input data is used as definite in the model. As a result, uncertainty can only be taken into account through the definition of scenarios which can be easily generated. In the case of Colombia, uncertainty can be considered via alternative growth patterns for demand and alternative capacities or different technical characteristics.

FLEXIBILITY

The model is very flexible with respect to the DDAS module. The user can adapt the module to any level of aggregation and data situation. Once a basic model has been built, it can be easily expanded as data becomes available. In the case of Colombia, the model for the base case (1988) was built using final consumption of energy, energy intensities, expected growth of GDP and population growth (in the case of projections for wood consumption).

In building DDAS the user has options as to the type of energy and cost units to be used, economic sectors to be considered, level of aggregation, time periods (up to forty), and form in which demand is to be projected.

However, two aspects of the time periods are not very flexible in DDAS:

1- The output printouts always include the listing for the forty years allowed in the report independently of how many periods the user is estimating.

2- Time series can not be automatically generated. The user must enter every period of the time horizon of the model.

As far as the LP-ESPS module is concerned, it uses information from RES to automatically set up the LP problem allowing the user to make modifications. Modifications are inevitable if the user is to make a realistic representation of the energy system. Next, LP-ESPS solves the problem for the base year first and then for the multiperiod horizon. Finally, it feeds the results back in RES. With the exception of the modification of the dictionaries, this process is entirely menu driven.

An inconvenience for the user is that he/she is only allowed to generate printouts once the model has been formulated in the LP set up. A more flexible option would be to allow printouts of the dictionaries in order to permit the user to analyze the model building process outside the computer environment.

The task of building scenarios is also very flexible under both DDAS and LP-ESPS. In the case of the former, scenarios can be created by changing the parameters and/or variables defined in the module. In the case of the latter, the user can either change parameters under RES or the bounds and/or constraints under LP-ESPS.

APPLICABILITY & LIMITATIONS

Level B of ETB was designed to perform a more in-depth analysis of the energy system, both at the demand as well as at the supply side.

In the demand side, ETB permits the user to use either econometric and/or disaggregated demand analysis in order to produce the demand projections used by RES.

In the supply side, ETB permits the user to optimize the energy flows of RES through the use linear programming.

In Colombias' case ETB performed the above stated tasks very well (with the exception of regression analysis which was not assessed in detail). The DDAS model was built without major difficulties and the demand projections were easily generated. As far as LP-ESPS was concerned, the LP problem was formulated and solved again without major difficulties.

Although ETB's performance in the modeling process at level B was in general very good, some minor problems were encountered:

1- Under DDAS, the AV.GAS name was offered as a possibility for a fuel name. However, the program does not allow dots to be declared as part of the names. Either the program should be changed to accept such names or the manual and help screen should warn the users.

2- Since ETB does not provide printing options for graphics under DDAS, it should provide very clear and detailed explanations as to how to proceed in order to print graphics outside the model.

3- A limitation worth noting for both DDAS and LP-ESPS is that they require 500 KB and 512 KB of resident memory respectively. This is important because the availability of personal computers with expanded resident memory is limited in developing countries. Even if a PC has a capacity of 640 KB, there are usually other RAM-using features that reduce total RAM in the computer to below 500 KB.

4- In the case of LP-ESPS, there are parts of the module where the help functions do not work properly. The program does not respond when they are activated.

5- Under LP-ESPS, the demand/supply balance constraints are split into demand and supply constraints. Instead of defining single equations where the user includes the demand/supply balance, the user is allowed to define restrictions separately for demand and supply. Since capacity constraints are not considered under these equations, it is difficult to see the meaning of these restrictions at this level.

6- Finally, one of the most important issues that are raised from this assessment is the overall usefulness of ETB in the context of energy assessment needs of developing countries.

This assessment has shown that even the most basic evaluations of the energy system (level A) may require incorporating basic limitations of the energy system that the modules at level A (specifically RES) do not currently include in the modeling process. Aspects such as refinery yields and other process conditions are not taken into consideration at this level by ETB. These restrictions are only incorporated in the evaluation at level B through the use of LP-ESPS. However, the user should not be forced to formulate (modifying the dictionaries) and solve an LP problem in order to incorporate high degrees of realism in the simulation of the energy system.

Basic energy assessments performed by ETB (level A) should offer the possibility to impose a greater variety of restrictions on the energy system. The difficulties created on the programming side by such changes would probably be outweighed by the benefits derived from the performance of "quick" and "realistic" energy assessments.

APPENDIX A

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : HAI
Date : 1989.0
Activity group : SUPPLY,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 1 SUPPLY

Page 1. (SUPPLY)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	LPG	IMPORTS	G	TOE	100	0
2	GASOLINE	IMPORTS	G	TOE	100	0
3	AV.GAS	IMPORTS	G	TOE	100	0
4	KEROSENE	IMPORTS	G	TOE	100	0
5	TURBO	IMPORTS	G	TOE	100	0
6	DIESEL	IMPORTS	G	TOE	100	0
7	FUELOIL	IMPORTS	G	TOE	100	0
8	RESIDUAL	IMPORTS	G	TOE	100	0
9	HYDRO	DOMESTIC	G	MWH	100	0
10	FUELWOO	DOMESTIC	G	TOE	100	0
11	BAGASSE	DOMESTIC	G	TOE	100	0
12	COAL	IMPORTS	G	TOE	100	0

Page 2. (SUPPLY)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity capacity Base Yr	energy % Growth	Activity energy losses
1	LPG	IMPORTS	7168	0	0	0
2	GASOLINE	IMPORTS	64853	0	0	0
3	AV.GAS	IMPORTS	2549	0	0	0
4	KEROSENE	IMPORTS	26137	0	0	0
5	TURBO	IMPORTS	24760	0	0	0
6	DIESEL	IMPORTS	127508	0	0	0
7	FUELOIL	IMPORTS	9856	0	0	0
8	RESIDUAL	IMPORTS	63173	0	0	0
9	HYDRO	DOMESTIC	323169	0	0	0
10	FUELWOO	DOMESTIC	1709442	0	0	0
11	BAGASSE	DOMESTIC	60053	0	0	0
12	COAL	IMPORTS	9004	0	0	0

Page 3. (SUPPLY)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	LPG	IMPORTS	1229	0	0	0
2	GASOLINE	IMPORTS	1324	0	0	0
3	AV.GAS	IMPORTS	1590	0	0	0
4	KEROSENE	IMPORTS	1282	0	0	0
5	TURBO	IMPORTS	1282	0	0	0
6	DIESEL	IMPORTS	1200	0	0	0
7	FUELOIL	IMPORTS	1100	0	0	0
8	RESIDUAL	IMPORTS	636	0	0	0
9	HYDRO	DOMESTIC	0	0	0	0
10	FUELWOO	DOMESTIC	90	0	0	0
11	BAGASSE	DOMESTIC	0	0	0	0
12	COAL	IMPORTS	0	0	0	0

Page 4. (SUPPLY)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	LPG	IMPORTS	0	0
2	GASOLINE	IMPORTS	0	0
3	AV.GAS	IMPORTS	0	0
4	KEROSENE	IMPORTS	0	0
5	TURBO	IMPORTS	0	0
6	DIESEL	IMPORTS	0	0
7	FUELOIL	IMPORTS	0	0
8	RESIDUAL	IMPORTS	0	0
9	HYDRO	DOMESTIC	0	0
10	FUELWOO	DOMESTIC	0	0
11	BAGASSE	DOMESTIC	0	0
12	COAL	IMPORTS	0	0

Page 5. (SUPPLY)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	LPG	IMPORTS	0	7168	0	0
2	GASOLINE	IMPORTS	0	64853	0	0
3	AV.GAS	IMPORTS	0	2549	0	0
4	KEROSENE	IMPORTS	0	26137	0	0
5	TURBO	IMPORTS	0	24760	0	0
6	DIESEL	IMPORTS	0	127508	0	0
7	FUELOIL	IMPORTS	0	9856	0	0
8	RESIDUAL	IMPORTS	0	63173	0	0
9	HYDRO	DOMESTIC	0	323169	0	0
10	FUELWOO	DOMESTIC	0	1709442	0	0
11	BAGASSE	DOMESTIC	0	60053	0	0
12	COAL	IMPORTS	0	9004	0	0

Page 6. (SUPPLY)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	LPG	IMPORTS	0	8809989	0
2	GASOLINE	IMPORTS	0	85864884	0
3	AV.GAS	IMPORTS	0	4053663	0
4	KEROSENE	IMPORTS	0	33507432	0
5	TURBO	IMPORTS	0	31742320	0
6	DIESEL	IMPORTS	0	153009430	0
7	FUELOIL	IMPORTS	0	10841368	0
8	RESIDUAL	IMPORTS	0	40177986	0
9	HYDRO	DOMESTIC	0	0	0
10	FUELWOO	DOMESTIC	0	153849789	0
11	BAGASSE	DOMESTIC	0	0	0
12	COAL	IMPORTS	0	0	0

Page 7. (SUPPLY)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	LPG	IMPORTS	0	No File	No File
2	GASOLINE	IMPORTS	0	No File	No File
3	AV.GAS	IMPORTS	0	No File	No File
4	KEROSENE	IMPORTS	0	No File	No File
5	TURBO	IMPORTS	0	No File	No File
6	DIESEL	IMPORTS	0	No File	No File
7	FUELOIL	IMPORTS	0	No File	No File
8	RESIDUAL	IMPORTS	0	No File	No File
9	HYDRO	DOMESTIC	0	No File	No File
10	FUELWOO	DOMESTIC	0	No File	No File

11	BAGASSE	DOMESTIC	0 No File	No File
12	COAL	IMPORTS	0 No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : HAI
Date : 1989.0
Activity group : ELECGEN,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 2 ELECGEN

Page 1. (ELECGEN)
Activity element names and efficiencies.

Activities			Price unit	Energy unit	Percentage thermal efficiencies	
No	Name	Category	[P]	[E]	Base Yr	% Growth
1	LPG		G	TOE	100	0
2	GASOLINE		G	TOE	100	0
3	AV.GAS		G	TOE	100	0
4	KEROSENE		G	TOE	100	0
5	TURBO		G	TOE	100	0
6	DIESEL		G	TOE	100	0
7	FUELOIL		G	TOE	100	0
8	RESIDUAL		G	TOE	100	0
9	ELECTRIC	CAPHAIT	G	MWH	35	0
10	ELECTRIC	DROUET	G	MWH	60	0
11	ELECTRIC	MATHURIN	G	MWH	50	0

12	ELECTRIC VARREUX	G	MWH	35	0
13	ELECTRIC CARREFOU	G	MWH	35	0
14	ELECTRIC PELIGRE	G	MWH	99	0
15	ELECTRIC DELMAS	G	MWH	35	0
16	ELECTRIC OTHER	G	MWH	25	0
17	FUELWOO	G	TOE	100	0
18	BAGASSE	G	TOE	100	0
19	COAL	G	TOE	100	0

Page 2. (ELECGEN)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	LPG		7168	0	0	0
2	GASOLINE		64853	0	0	0
3	AV.GAS		2549	0	0	0
4	KEROSENE		26137	0	0	0
5	TURBO		24760	0	0	0
6	DIESEL		95428	0	0	0
7	FUELOIL		9856	0	0	0
8	RESIDUAL		26888	0	0	0
9	ELECTRIC	CAPHAIT	88847	50808	0	57751
10	ELECTRIC	DROUET	27765	27419	0	11106
11	ELECTRIC	MATHURIN	39981	48180	0	19991
12	ELECTRIC	VARREUX	122165	70080	0	79407
13	ELECTRIC	CARREFOU	428371	245280	0	278441
14	ELECTRIC	PELIGRE	255211	411720	0	2552
15	ELECTRIC	DELMAS	31731	18396	0	20625
16	ELECTRIC	OTHER	124386	51334	0	93290
17	FUELWOO		1709442	0	0	0
18	BAGASSE		60053	0	0	0
19	COAL		9004	0	0	0

Page 3. (ELECGEN)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	LPG		0	0	0	C
2	GASOLINE		0	0	0	0
3	AV.GAS		0	0	0	0
4	KEROSENE		0	0	0	0
5	TURBO		0	0	0	0
6	DIESEL		0	0	0	0
7	FUELOIL		0	0	0	0
8	RESIDUAL		0	0	0	0
9	ELECTRIC	CAPHAIT	630	0	0	0
10	ELECTRIC	DROUET	490	0	0	0
11	ELECTRIC	MATHURIN	1470	0	0	0
12	ELECTRIC	VARREUX	140	0	0	0
13	ELECTRIC	CARREFOU	45	0	0	0
14	ELECTRIC	PELIGRE	90	0	0	0
15	ELECTRIC	DELMAS	1120	0	0	0
16	ELECTRIC	OTHER	1000	0	0	0

17	FUELWOO	0	0	0	0
18	BAGASSE	0	0	0	0
19	COAL	0	0	0	0

Page 4. (ELECGEN)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	LPG		0	0
2	GASOLINE		0	0
3	AV.GAS		0	0
4	KEROSENE		0	0
5	TURBO		0	0
6	DIESEL		0	0
7	FUELOIL		0	0
8	RESIDUAL		0	0
9	ELECTRIC	CAPHAIT	0	0
10	ELECTRIC	DROUET	0	0
11	ELECTRIC	MATHURIN	0	0
12	ELECTRIC	VARREUX	0	0
13	ELECTRIC	CARREFOU	0	0
14	ELECTRIC	PELIGRE	0	0
15	ELECTRIC	DELMAS	0	0
16	ELECTRIC	OTHER	0	0
17	FUELWOO		0	0
18	BAGASSE		0	0
19	COAL		0	0

Page 5. (ELECGEN)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	LPG		0	7168	0	0
2	GASOLINE		0	64853	0	0
3	AV.GAS		0	2549	0	0
4	KEROSENE		0	26137	0	0
5	TURBO		0	24760	0	0
6	DIESEL		0	95428	0	0
7	FUELOIL		0	9856	0	0
8	RESIDUAL		0	26888	0	0
9	ELECTRIC	CAPHAIT	175	38039	0	0
10	ELECTRIC	DROUET	101	346	0	0
11	ELECTRIC	MATHURIN	83	0	0	0
12	ELECTRIC	VARREUX	174	52085	0	0
13	ELECTRIC	CARREFOU	175	183091	0	0
14	ELECTRIC	PELIGRE	62	0	0	0
15	ELECTRIC	DELMAS	172	13335	0	0
16	ELECTRIC	OTHER	242	73052	0	0
17	FUELWOO		0	1709442	0	0
18	BAGASSE		0	60053	0	0
19	COAL		0	9004	0	0

Page 6. (ELECGEN)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	LPG		0	0	0
2	GASOLINE		0	0	0
3	AV.GAS		0	0	0
4	KEROSENE		0	0	0
5	TURBO		0	0	0
6	DIESEL		0	0	0
7	FUELOIL		0	0	0
8	RESIDUAL		0	0	0
9	ELECTRIC	CAPHAIT	0	55973766	55973766
10	ELECTRIC	DROUET	0	13604735	13604735
11	ELECTRIC	MATHURIN	0	58772454	58772454
12	ELECTRIC	VARREUX	0	17103095	17103095
13	ELECTRIC	CARREFOU	0	19276679	19276679
14	ELECTRIC	PELIGRE	0	22969033	22969033
15	ELECTRIC	DELMAS	0	35538899	35538899
16	ELECTRIC	OTHER	0	124386146	124386146
17	FUELWOO		0	0	0
18	BAGASSE		0	0	0
19	COAL		0	0	0

Page 7. (ELECGEN)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	LPG		0	No File	No File
2	GASOLINE		0	No File	No File
3	AV.GAS		0	No File	No File
4	KEROSENE		0	No File	No File
5	TURBO		0	No File	No File
6	DIESEL		0	No File	No File
7	FUELOIL		0	No File	No File
8	RESIDUAL		0	No File	No File
9	ELECTRIC	CAPHAIT	0	No File	No File
10	ELECTRIC	DROUET	0	No File	No File
11	ELECTRIC	MATHURIN	0	No File	No File
12	ELECTRIC	VARREUX	0	No File	No File
13	ELECTRIC	CARREFOU	0	No File	No File
14	ELECTRIC	PELIGRE	0	No File	No File
15	ELECTRIC	DELMAS	0	No File	No File
16	ELECTRIC	OTHER	0	No File	No File
17	FUELWOO		0	No File	No File
18	BAGASSE		0	No File	No File
19	COAL		0	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : HAI
Date : 1989.0
Activity group : CHARPROD,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 3 CHARPROD

Page 1. (CHARPROD)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	LPG		G	TOE	100	0
2	GASOLINE		G	TOE	100	0
3	AV.GAS		G	TOE	100	0
4	KEROSENE		G	TOE	100	0
5	TURBO		G	TOE	100	0
6	DIESEL		G	TOE	100	0
7	FUELOIL		G	TOE	100	0
8	RESIDUAL		G	TOE	100	0
9	FUELWOO		G	TOE	100	0
10	CHARCOAL		G	TOE	20	0
11	BAGASSE		G	TOE	100	0
12	COAL		G	TOE	100	0
13	ELECTRIC		G	MWH	100	0

Page 2. (CHARPROD)
Activity element energy flows and capacities (in energy units).

Activity Activity energy Activity

No	Name	Category	Energy flow	capacity Base Yr	% Growth	energy losses
1	LPG		7168	0	0	0
2	GASOLINE		64853	0	0	0
3	AV.GAS		2549	0	0	0
4	KEROSENE		26137	0	0	0
5	TURBO		24760	0	0	0
6	DIESEL		95428	0	0	0
7	FUELOIL		9856	0	0	0
8	RESIDUAL		26888	0	0	0
9	FUELWOO		877305	0	0	0
10	CHARCOAL		832137	0	0	665709
11	BAGASSE		60053	0	0	0
12	COAL		9004	0	0	0
13	ELECTRIC		555295	0	0	0

Page 3. (CHARPROD)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	LPG		0	0	0	0
2	GASOLINE		0	0	0	0
3	AV.GAS		0	0	0	0
4	KEROSENE		0	0	0	0
5	TURBO		0	0	0	0
6	DIESEL		0	0	0	0
7	FUELOIL		0	0	0	0
8	RESIDUAL		0	0	0	0
9	FUELWOO		0	0	0	0
10	CHARCOAL		0	0	0	0
11	BAGASSE		0	0	0	0
12	COAL		0	0	0	0
13	ELECTRIC		0	0	0	0

Page 4. (CHARPROD)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	LPG		0	0
2	GASOLINE		0	0
3	AV.GAS		0	0
4	KEROSENE		0	0
5	TURBO		0	0
6	DIESEL		0	0
7	FUELOIL		0	0
8	RESIDUAL		0	0
9	FUELWOO		0	0
10	CHARCOAL		0	0
11	BAGASSE		0	0
12	COAL		0	0
13	ELECTRIC		0	0

Page 5. (CHARPROD)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	LPG		0	7168	0	0
2	GASOLINE		0	64853	0	0
3	AV.GAS		0	2549	0	0
4	KEROSENE		0	26137	0	0
5	TURBO		0	24760	0	0
6	DIESEL		0	95428	0	0
7	FUELOIL		0	9856	0	0
8	RESIDUAL		0	26888	0	0
9	FUELWOO		0	877305	0	0
10	CHARCOAL		0	832137	0	0
11	BAGASSE		0	60053	0	0
12	COAL		0	9004	0	0
13	ELECTRIC		0	555295	0	0

Page 6. (CHARPROD)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	LPG		0	0	0
2	GASOLINE		0	0	0
3	AV.GAS		0	0	0
4	KEROSENE		0	0	0
5	TURBO		0	0	0
6	DIESEL		0	0	0
7	FUELOIL		0	0	0
8	RESIDUAL		0	0	0
9	FUELWOO		0	0	0
10	CHARCOAL		0	0	0
11	BAGASSE		0	0	0
12	COAL		0	0	0
13	ELECTRIC		0	0	0

Page 7. (CHARPROD)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	LPG		0	No File	No File
2	GASOLINE		0	No File	No File
3	AV.GAS		0	No File	No File
4	KEROSENE		0	No File	No File
5	TURBO		0	No File	No File
6	DIESEL		0	No File	No File
7	FUELOIL		0	No File	No File

8	RESIDUAL	0 No File	No File
9	FUELWOO	0 No File	No File
10	CHARCOAL	0 No File	No File
11	BAGASSE	0 No File	No File
12	COAL	0 No File	No File
13	ELECTRIC	0 No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : HAI
Date : 1989.0
Activity group : FUELDIST,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 4 FUELDIST

Page 1. (FUELDIST)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	LPG		G	TOE	95	0
2	GASOLINE		G	TOE	95	0
3	AV.GAS		G	TOE	95	0
4	KEROSENE		G	TOE	95	0
5	TURBO		G	TOE	95	0
6	DIESEL		G	TOE	95	0
7	FUELOIL		G	TOE	95	0

8	RESIDUAL	G	TOE	95	0
9	FUELWOO	G	TOE	95	0
10	BAGASSE	G	TOE	95	0
11	COAL	G	TOE	95	0
12	ELECTRIC	G	MWH	85	0
13	CHARCOAL	G	TOE	95	0

Page 2. (FUELDIST)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	LPG		7168	0	0	358
2	GASOLINE		64853	0	0	3243
3	AV.GAS		2549	0	0	127
4	KEROSENE		26137	0	0	1307
5	TURBO		24760	0	0	1238
6	DIESEL		95428	0	0	4771
7	FUELOIL		9856	0	0	493
8	RESIDUAL		26888	0	0	1344
9	FUELWOO		877305	0	0	43865
10	BAGASSE		60053	0	0	3003
11	COAL		9004	0	0	450
12	ELECTRIC		555295	0	0	83294
13	CHARCOAL		166427	0	0	8321

Page 3. (FUELDIST)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	LPG		0	0	0	0
2	GASOLINE		0	0	0	0
3	AV.GAS		0	0	0	0
4	KEROSENE		0	0	0	0
5	TURBO		0	0	0	0
6	DIESEL		0	0	0	0
7	FUELOIL		0	0	0	0
8	RESIDUAL		0	0	0	0
9	FUELWOO		0	0	0	0
10	BAGASSE		0	0	0	0
11	COAL		0	0	0	0
12	ELECTRIC		0	0	0	0
13	CHARCOAL		960	0	0	0

Page 4. (FUELDIST)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	LPG		0	0
2	GASOLINE		0	0

3	AV.GAS	0	0
4	KEROSENE	0	0
5	TURBO	0	0
6	DIESEL	0	0
7	FUELOIL	0	0
8	RESIDUAL	0	0
9	FUELWOO	0	0
10	BAGASSE	0	0
11	COAL	0	0
12	ELECTRIC	0	0
13	CHARCOAL	0	0

Page 5. (FUELDIST)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	LPG		0	7168	0	0
2	GASOLINE		0	64853	0	0
3	AV.GAS		0	2549	0	0
4	KEROSENE		0	26137	0	0
5	TURBO		0	24760	0	0
6	DIESEL		0	95428	0	0
7	FUELOIL		0	9856	0	0
8	RESIDUAL		0	26888	0	0
9	FUELWOO		0	877305	0	0
10	BAGASSE		0	60053	0	0
11	COAL		0	9004	0	0
12	ELECTRIC		0	555295	0	0
13	CHARCOAL		0	166427	0	0

Page 6. (FUELDIST)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	LPG		0	0	0
2	GASOLINE		0	0	0
3	AV.GAS		0	0	0
4	KEROSENE		0	0	0
5	TURBO		0	0	0
6	DIESEL		0	0	0
7	FUELOIL		0	0	0
8	RESIDUAL		0	0	0
9	FUELWOO		0	0	0
10	BAGASSE		0	0	0
11	COAL		0	0	0
12	ELECTRIC		0	0	0
13	CHARCOAL		0	159770274	0

Page 7. (FUELDIST)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	LPG		0	No File	No File
2	GASOLINE		0	No File	No File
3	AV.GAS		0	No File	No File
4	KEROSENE		0	No File	No File
5	TURBO		0	No File	No File
6	DIESEL		0	No File	No File
7	FUELOIL		0	No File	No File
8	RESIDUAL		0	No File	No File
9	FUELWOO		0	No File	No File
10	BAGASSE		0	No File	No File
11	COAL		0	No File	No File
12	ELECTRIC		0	No File	No File
13	CHARCOAL		0	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : HAI
Date : 1989.0
Activity group : SECTDEM,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 5 SECTDEM

Page 1. (SECTDEM)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	LPG	HOUSEHOL	G	TOE	100	0
2	GASOLINE	TRANSPOR	G	TOE	100	0
3	AV.GAS	TRANSPOR	G	TOE	100	0
4	KEROSENE	INDUSTRY	G	TOE	100	0
5	KEROSENE	HOUSEHOL	G	TOE	100	0
6	TURBO	TRANSPOR	G	TOE	100	0
7	DIESEL	TRANSPOR	G	TOE	100	0
8	DIESEL	INDUSTRY	G	TOE	100	0
9	FUELOIL	INDUSTRY	G	TOE	100	0
10	RESIDUAL	INDUSTRY	G	TOE	100	0
11	FUELWOO	INDUSTRY	G	TOE	100	0
12	FUELWOO	HOUSEHOL	G	TOE	100	0
13	BAGASSE	INDUSTRY	G	TOE	100	0
14	COAL	INDUSTRY	G	TOE	100	0
15	ELECTRIC	INDUSTRY	G	MWH	100	0
16	ELECTRIC	COMMERCI	G	MWH	100	0
17	ELECTRIC	HOUSEHOL	G	MWH	100	0
18	CHARCOAL	COMMERCI	G	TOE	100	0
19	CHARCOAL	HOUSEHOL	G	TOE	100	0

Page 2. (SECTDEM)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	LPG	HOUSEHOL	6810	0	0	0
2	GASOLINE	TRANSPOR	61610	0	0	0
3	AV.GAS	TRANSPOR	2422	0	0	0
4	KEROSENE	INDUSTRY	5917	0	0	0
5	KEROSENE	HOUSEHOL	18913	0	0	0
6	TURBO	TRANSPOR	23522	0	0	0
7	DIESEL	TRANSPOR	72470	0	0	0
8	DIESEL	INDUSTRY	18187	0	0	0
9	FUELOIL	INDUSTRY	9363	0	0	0
10	RESIDUAL	INDUSTRY	25544	0	0	0
11	FUELWOO	INDUSTRY	58440	0	0	0
12	FUELWOO	HOUSEHOL	775000	0	0	0
13	BAGASSE	INDUSTRY	57050	0	0	0
14	COAL	INDUSTRY	8554	0	0	0
15	ELECTRIC	INDUSTRY	187036	0	0	0
16	ELECTRIC	COMMERCI	60353	0	0	0
17	ELECTRIC	HOUSEHOL	224612	0	0	0
18	CHARCOAL	COMMERCI	140606	0	0	0
19	CHARCOAL	HOUSEHOL	17500	0	0	0

Page 3. (SECTDEM)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	LPG	HOUSEHOL	2495	0	0	0

2	GASOLINE	TRANSPOR	2726	0	0	0
3	AV.GAS	TRANSPOR	3270	0	0	0
4	KEROSENE	INDUSTRY	1183	0	0	0
5	KEROSENE	HOUSEHOL	1183	0	0	0
6	TURBO	TRANSPOR	1183	0	0	0
7	DIESEL	TRANSPOR	1916	0	0	0
8	DIESEL	INDUSTRY	1916	0	0	0
9	FUELOIL	INDUSTRY	432	0	0	0
10	RESIDUAL	INDUSTRY	400	0	0	0
11	FUELWOO	INDUSTRY	0	0	0	0
12	FUELWOO	HOUSEHOL	0	0	0	0
13	BAGASSE	INDUSTRY	0	0	0	0
14	COAL	INDUSTRY	0	0	0	0
15	ELECTRIC	INDUSTRY	640	0	0	0
16	ELECTRIC	COMMERCI	640	0	0	0
17	ELECTRIC	HOUSEHOL	640	0	0	0
18	CHARCOAL	COMMERCI	0	0	0	0
19	CHARCOAL	HOUSEHOL	0	0	0	0

Page 4. (SECTDEM)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	LPG	HOUSEHOL	0	0
2	GASOLINE	TRANSPOR	0	0
3	AV.GAS	TRANSPOR	0	0
4	KEROSENE	INDUSTRY	0	0
5	KEROSENE	HOUSEHOL	0	0
6	TURBO	TRANSPOR	0	0
7	DIESEL	TRANSPOR	0	0
8	DIESEL	INDUSTRY	0	0
9	FUELOIL	INDUSTRY	0	0
10	RESIDUAL	INDUSTRY	0	0
11	FUELWOO	INDUSTRY	0	0
12	FUELWOO	HOUSEHOL	0	0
13	BAGASSE	INDUSTRY	0	0
14	COAL	INDUSTRY	0	0
15	ELECTRIC	INDUSTRY	0	0
16	ELECTRIC	COMMERCI	0	0
17	ELECTRIC	HOUSEHOL	0	0
18	CHARCOAL	COMMERCI	0	0
19	CHARCOAL	HOUSEHOL	0	0

Page 5. (SECTDEM)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	LPG	HOUSEHOL	0	6810	0	0
2	GASOLINE	TRANSPOR	0	61610	0	0
3	AV.GAS	TRANSPOR	0	2422	0	0
4	KEROSENE	INDUSTRY	0	5917	0	0
5	KEROSENE	HOUSEHOL	0	18913	0	0

6	TURBO	TRANSPOR	0	23522	0	0
7	DIESEL	TRANSPOR	0	72470	0	0
8	DIESEL	INDUSTRY	0	18187	0	0
9	FUELOIL	INDUSTRY	0	9363	0	0
10	RESIDUAL	INDUSTRY	0	25544	0	0
11	FUELWOO	INDUSTRY	0	58440	0	0
12	FUELWOO	HOUSEHOL	0	775000	0	0
13	BAGASSE	INDUSTRY	0	57050	0	0
14	COAL	INDUSTRY	0	8554	0	0
15	ELECTRIC	INDUSTRY	0	187036	0	0
16	ELECTRIC	COMMERCI	0	60353	0	0
17	ELECTRIC	HOUSEHOL	0	224612	0	0
18	CHARCOAL	COMMERCI	0	140606	0	0
19	CHARCOAL	HOUSEHOL	0	17500	0	0

Page 6. (SECTDEM)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	LPG	HOUSEHOL	0	16990950	0
2	GASOLINE	TRANSPOR	0	167948860	0
3	AV.GAS	TRANSPOR	0	7919940	0
4	KEROSENE	INDUSTRY	0	6999811	0
5	KEROSENE	HOUSEHOL	0	22374079	0
6	TURBO	TRANSPOR	0	27826526	0
7	DIESEL	TRANSPOR	0	138852520	0
8	DIESEL	INDUSTRY	0	34846292	0
9	FUELOIL	INDUSTRY	0	4044816	0
10	RESIDUAL	INDUSTRY	0	10217600	0
11	FUELWOO	INDUSTRY	0	0	0
12	FUELWOO	HOUSEHOL	0	0	0
13	BAGASSE	INDUSTRY	0	0	0
14	COAL	INDUSTRY	0	0	0
15	ELECTRIC	INDUSTRY	0	119703040	0
16	ELECTRIC	COMMERCI	0	38625920	0
17	ELECTRIC	HOUSEHOL	0	143751680	0
18	CHARCOAL	COMMERCI	0	0	0
19	CHARCOAL	HOUSEHOL	0	0	0

Page 7. (SECTDEM)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	LPG	HOUSEHOL	0	No File	No File
2	GASOLINE	TRANSPOR	0	No File	No File
3	AV.GAS	TRANSPOR	0	No File	No File
4	KEROSENE	INDUSTRY	0	No File	No File
5	KEROSENE	HOUSEHOL	0	No File	No File
6	TURBO	TRANSPOR	0	No File	No File
7	DIESEL	TRANSPOR	0	No File	No File
8	DIESEL	INDUSTRY	0	No File	No File
9	FUELOIL	INDUSTRY	0	No File	No File

10	RESIDUAL	INDUSTRY	0	No File	No File
11	FUELWOO	INDUSTRY	0	No File	No File
12	FUELWOO	HOUSEHOL	0	No File	No File
13	BAGASSE	INDUSTRY	0	No File	No File
14	COAL	INDUSTRY	0	No File	No File
15	ELECTRIC	INDUSTRY	0	No File	No File
16	ELECTRIC	COMMERCI	0	No File	No File
17	ELECTRIC	HOUSEHOL	0	No File	No File
18	CHARCOAL	COMMERCI	0	No File	No File
19	CHARCOAL	HOUSEHOL	0	No File	No File

Energy Demands for model: HAI

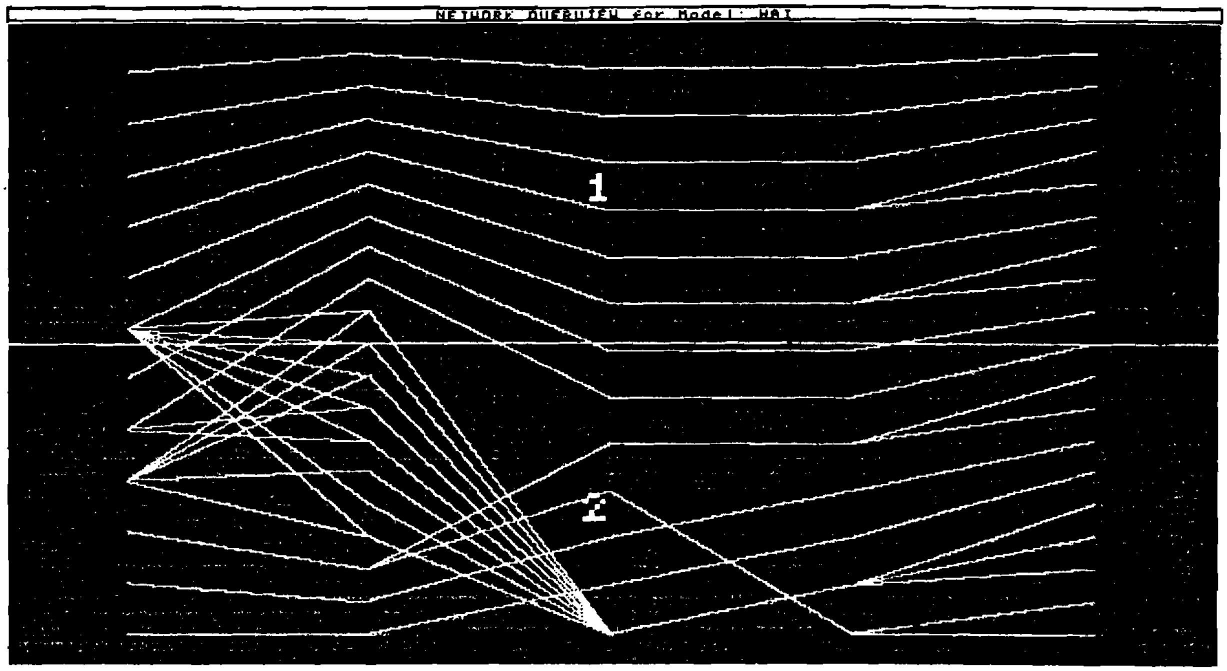
Activities No	Name	Category	Energy Unit	% Growths	Energy Time Values 1989.0	1990.0	1991.0
1	LPG	HOUSEHOL	TOE	5	6810	7151	7508
2	GASOLINE	TRANSPOR	TOE	5	61610	64691	67925
3	AV.GAS	TRANSPOR	TOE	5	2422	2543	2670
4	KEROSENE	INDUSTRY	TOE	5	5917	6213	6523
5	KEROSENE	HOUSEHOL	TOE	5	18913	19859	20852
6	TURBO	TRANSPOR	TOE	5	23522	24698	25933
7	DIESEL	TRANSPOR	TOE	5	72470	76094	79898
8	DIESEL	INDUSTRY	TOE	5	18187	19096	20051
9	FUELOIL	INDUSTRY	TOE	5	9363	9831	10323
10	RESIDUAL	INDUSTRY	TOE	1	25544	25799	26057
11	FUELWOO	INDUSTRY	TOE	1	58440	59024	59615
12	FUELWOO	HOUSEHOL	TOE	1	775000	782750	790578
13	BAGASSE	INDUSTRY	TOE	1	57050	57621	58197
14	COAL	INDUSTRY	TOE	0	8554	8554	8554
15	ELECTRIC	INDUSTRY	MWH	5	187036	196388	206207
16	ELECTRIC	COMMERCI	MWH	5	60353	63371	66539
17	ELECTRIC	HOUSEHOL	MWH	5	224612	235843	247635
18	CHARCOAL	COMMERCI	TOE	2	140606	143418	146286
19	CHARCOAL	HOUSEHOL	TOE	2	17500	17850	18207

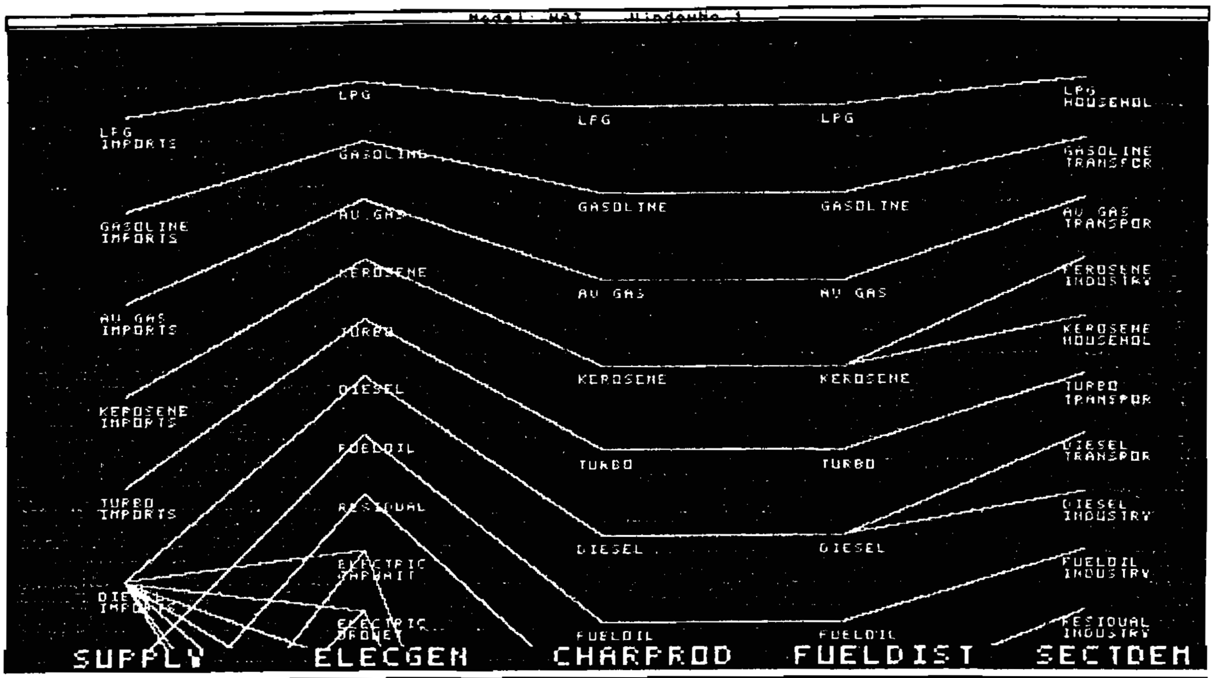
Activities No	Name	Category	Energy Unit	% Growths	Energy Time Values 1992.0	1993.0	1994.0
1	LPG	HOUSEHOL	TOE	5	7883	8278	8691
2	GASOLINE	TRANSPOR	TOE	5	71321	74887	78632
3	AV.GAS	TRANSPOR	TOE	5	2804	2944	3091
4	KEROSENE	INDUSTRY	TOE	5	6850	7192	7552
5	KEROSENE	HOUSEHOL	TOE	5	21894	22989	24138
6	TURBO	TRANSPOR	TOE	5	27230	28591	30021
7	DIESEL	TRANSPOR	TOE	5	83893	88088	92492
8	DIESEL	INDUSTRY	TOE	5	21054	22106	23212
9	FUELOIL	INDUSTRY	TOE	5	10839	11381	11950
10	RESIDUAL	INDUSTRY	TOE	1	26318	26581	26847
11	FUELWOO	INDUSTRY	TOE	1	60211	60813	61421
12	FUELWOO	HOUSEHOL	TOE	1	798483	806468	814533
13	BAGASSE	INDUSTRY	TOE	1	58779	59366	59960
14	COAL	INDUSTRY	TOE	0	8554	8554	8554
15	ELECTRIC	INDUSTRY	MWH	5	216518	227343	238711
16	ELECTRIC	COMMERCI	MWH	5	69866	73359	77027
17	ELECTRIC	HOUSEHOL	MWH	5	260016	273017	286668
18	CHARCOAL	COMMERCI	TOE	2	149212	152196	155240
19	CHARCOAL	HOUSEHOL	TOE	2	18571	18943	19321

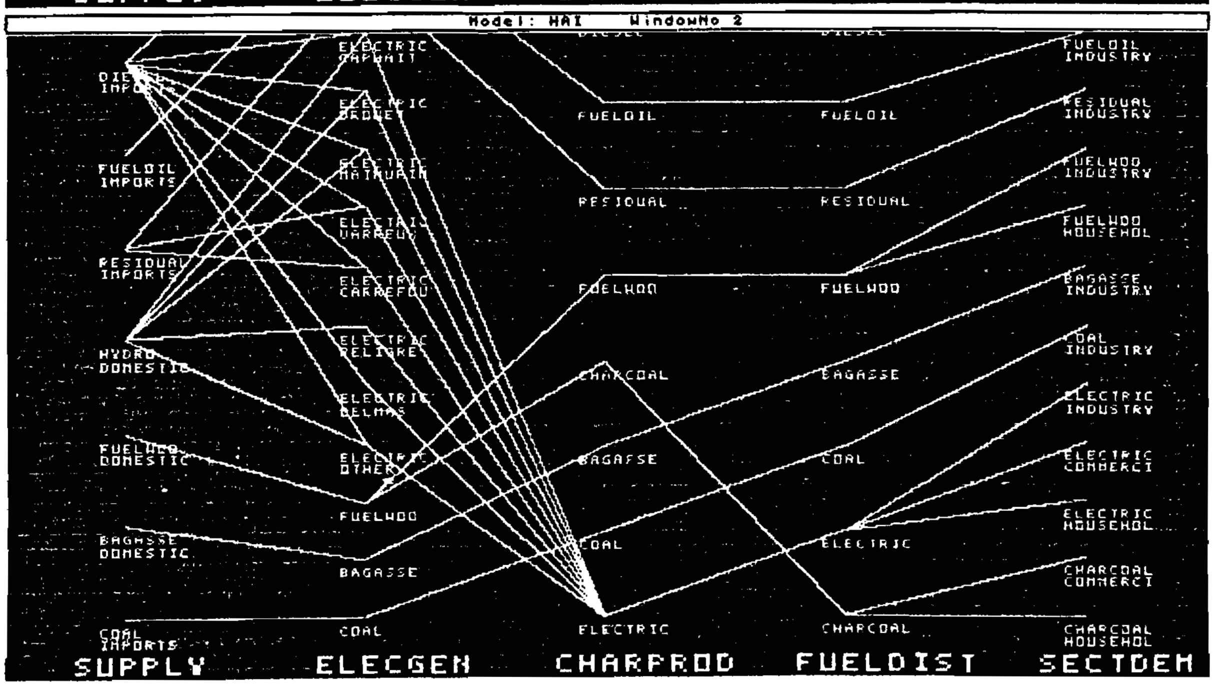
Activities No	Name	Category	Energy Unit	% Growths	Energy Time Values 1995.0	1996.0	1997.0
1	LPG	HOUSEHOL	TOE	5	9126	9582	10061
2	GASOLINE	TRANSPOR	TOE	5	82563	86691	91026
3	AV.GAS	TRANSPOR	TOE	5	3246	3408	3578
4	KEROSENE	INDUSTRY	TOE	5	7929	8326	8742
5	KEROSENE	HOUSEHOL	TOE	5	25345	26612	27943

6	TURBO	TRANSPOR	TOE	5	31522	33098	34753
7	DIESEL	TRANSPOR	TOE	5	97117	101973	107071
8	DIESEL	INDUSTRY	TOE	5	24372	25591	26870
9	FUELOIL	INDUSTRY	TOE	5	12547	13175	13833
10	RESIDUAL	INDUSTRY	TOE	1	27115	27387	27660
11	FUELWOO	INDUSTRY	TOE	1	62035	62656	63282
12	FUELWOO	HOUSEHOL	TOE	1	822678	830905	839214
13	BAGASSE	INDUSTRY	TOE	1	60560	61165	61777
14	COAL	INDUSTRY	TOE	0	8554	8554	8554
15	ELECTRIC	INDUSTRY	MWH	5	250646	263178	276337
16	ELECTRIC	COMMERCI	MWH	5	80879	84923	89169
17	ELECTRIC	HOUSEHOL	MWH	5	301002	316052	331854
18	CHARCOAL	COMMERCI	TOE	2	158345	161512	164742
19	CHARCOAL	HOUSEHOL	TOE	2	19708	20102	20504

Activities No	Name	Category	Energy Unit	% Growths	Energy Time Values 1998.0
1	LPG	HOUSEHOL	TOE	5	10565
2	GASOLINE	TRANSPOR	TOE	5	95577
3	AV.GAS	TRANSPOR	TOE	5	3757
4	KEROSENE	INDUSTRY	TOE	5	9179
5	KEROSENE	HOUSEHOL	TOE	5	29340
6	TURBO	TRANSPOR	TOE	5	36490
7	DIESEL	TRANSPOR	TOE	5	112425
8	DIESEL	INDUSTRY	TOE	5	28214
9	FUELOIL	INDUSTRY	TOE	5	14525
10	RESIDUAL	INDUSTRY	TOE	1	27937
11	FUELWOO	INDUSTRY	TOE	1	63915
12	FUELWOO	HOUSEHOL	TOE	1	847606
13	BAGASSE	INDUSTRY	TOE	1	62395
14	COAL	INDUSTRY	TOE	0	8554
15	ELECTRIC	INDUSTRY	MWH	5	290154
16	ELECTRIC	COMMERCI	MWH	5	93627
17	ELECTRIC	HOUSEHOL	MWH	5	348447
18	CHARCOAL	COMMERCI	TOE	2	168037
19	CHARCOAL	HOUSEHOL	TOE	2	20914


NETWORK OVERVIEW for Model: HAI
1
2


Model: HAI WindowNo 1
LPG IMPORTS
GASOLINE IMPORTS
AV GAS IMPORTS
KEROSENE IMPORTS
TURBO IMPORTS
DIESEL IMPORTS
LPG
GASOLINE
AV GAS
KEROSENE
TURBO
DIESEL
FUELOIL
RESIDUAL
LPG
GASOLINE
AV GAS
KEROSENE
TURBO
DIESEL
FUELOIL
LPG
GASOLINE
AV GAS
KEROSENE
TURBO
DIESEL
FUELOIL
LPG HOUSEHOL
GASOLINE TRANSPOR
AV GAS TRANSPOR
KEROSENE INDUSTRY
KEROSENE HOUSEHOL
TURBO TRANSPOR
DIESEL TRANSPOR
DIESEL INDUSTRY
FUELOIL INDUSTRY
RESIDUAL INDUSTRY
SUPPLY
ELECGEN
CHARPROD
FUELDIST
SECTDEM


Model: HAI WindowNo 2
DIESEL IMPORTS
FUELOIL IMPORTS
RESIDUAL IMPORTS
HYDRO DOMESTIC
FUELWOO DOMESTIC
BAGASSE DOMESTIC
COAL IMPORTS
FUELWOO
BAGASSE
COAL
FUELOIL
RESIDUAL
FUELWOO
CHARCOAL
BAGASSE
COAL
ELECTRIC
FUELOIL
RESIDUAL
FUELWOO
BAGASSE
COAL
ELECTRIC
CHARCOAL
FUELOIL INDUSTRY
RESIDUAL INDUSTRY
FUELWOO INDUSTRY
FUELWOO HOUSEHOL
BAGASSE INDUSTRY
COAL INDUSTRY
ELECTRIC INDUSTRY
ELECTRIC COMMERCI
ELECTRIC HOUSEHOL
CHARCOAL COMMERCI
CHARCOAL HOUSEHOL
SUPPLY
ELECGEN
CHARPROD
FUELDIST
SECTDEM

Energy balance table created from RES network

Model: HAI

Energy unit: TOE

Price unit: G

Primary balance

Date: 1989

	HYDRO	LPG	GASOLINE	AV.GAS	KEROSENE	TURBO
DOMESTIC	27780	0.00				
IMPORTS		7168	64853	2549	26137	24760
Supply	27780	7168	64853	2549	26137	24760
SUPPLY		0	0	0	0	0
ELECGEN	-27780	0	0	0	0	0
CHARPROD		0	0	0	0	0
FUELDIST		-358	-3243	-127	-1307	-1238
Conversion	-27780	-358	-3243	-127	-1307	-1238
Fin supply	0	6810	61610	2422	24830	23522
TRANSPOR			61610	2422		23522
INDUSTRY					5917	
COMMERCI						
HOUSEHOL		6810			18913	
Demands	0	6810	61610	2422	24830	23522
Error	0	0	0	0	0	0

	8	9	10	11	12	13	14
1							
2							
3							
4							
5							
6							
7							
8	DIESEL	FUELOIL	RESIDUAL	FUELWOO	BAGASSE	COAL	ELECTRIC
9							
10				1709442	60053	0.00	
11	127508	9856	63173			9004	0.00
12							
13	127508	9856	63173	1709442	60053	9004	0
14							
15	0	0	0	0	0	0	0
16	-32079	0	-36285	0	0	0	47734
17	0	0	0	-832137	0	0	0
18	-4771	-493	-1344	-43865	-3003	-450	-7160
19							
20	-36851	-493	-37629	-876002	-3003	-450	40574
21							
22	90657	9363	25544	833440	57050	8554	40574
23							
24	72470						
25	18187	9363	25544	58440	57050	8554	16078
26							5188
27				775000			19308
28							
29	90657	9363	25544	833440	57050	8554	40574
30							
31	0	0	0	0	0	0	0
32							

	15	16
1		
2		
3		
4		
5		
6		
7		
8	CHARCOAL	Total
9	==========	==========
10		1797275
11		335008
12	----------	----------
13	0	2132283
14	==========	==========
15	0	0
16	0	-48410
17	166427	-665709
18	-8321	-75682
19	----------	----------
20	158106	-789801
21	==========	==========
22	158106	1342482
23	==========	==========
24		160024
25		199133
26	140606	145794
27	17500	837531
28	----------	----------
29	158106	1342482
30	==========	==========
31	0	0
32	==========	==========

RES network summary for 1 result file(s)

Model: HAI (units in 1000s)

Energy units: TOE

Price units: G

1989.00	SUPPLY	ELECGEN	CHARPROD	FUELDIST	SECTDEM	Total
Energy flow	2132	2132	2084	1418	1342	9109
Capacity	0	79	0	0	0	79
Variable cost	521857	347625	0	159770	740102	1769354
Exist cap cost	0	0	0	0	0	0
Incr cap cost	0	0	0	0	0	0
Total cost	521857	347625	0	159770	740102	1769354

APPENDIX B

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1988.0
Activity group : DEMAND,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 6 DEMAND

Page 1. (DEMAND)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE	RESID	$	TCAL	100	0
2	GASOLINE	TRANSP	$	TCAL	100	0
3	CRUDE	EXPORTS	$	TCAL	100	0
4	CRUDE	INDUSTRY	$	TCAL	100	0
5	KEROSENE	RESID	$	TCAL	100	0
6	KEROSENE	TRANSP	$	TCAL	100	0
7	KEROSENE	EXPORTS	$	TCAL	100	0
8	KEROSENE	INDUSTRY	$	TCAL	100	0
9	DIESEL	TRANSP	$	TCAL	100	0
10	DIESEL	EXPORTS	$	TCAL	100	0
11	DIESEL	INDUSTRY	$	TCAL	100	0
12	DIESEL	COMERC	$	TCAL	100	0
13	DIESEL	AGRIC	$	TCAL	100	0
14	DIESEL	OTHER	$	TCAL	100	0
15	FUELOIL	EXPORTS	$	TCAL	100	0

16	FUELOIL	INDUSTRY	$	TCAL	100	0
17	FUELOIL	COMERC	$	TCAL	100	0
18	LPG	RESID	$	TCAL	100	0
19	LPG	INDUSTRY	$	TCAL	100	0
20	LPG	COMERC	$	TCAL	100	0
21	NATGAS	RESID	$	TCAL	100	0
22	NATGAS	INDUSTRY	$	TCAL	100	0
23	ELECTRIC	RESID	$	TCAL	100	0
24	ELECTRIC	EXPORTS	$	TCAL	100	0
25	ELECTRIC	INDUSTRY	$	TCAL	100	0
26	ELECTRIC	COMERC	$	TCAL	100	0
27	COAL	RESID	$	TCAL	100	0
28	COAL	EXPORTS	$	TCAL	100	0
29	COAL	INDUSTRY	$	TCAL	100	0
30	BAGASSE	INDUSTRY	$	TCAL	100	0
31	BAGASSE	AGRIC	$	TCAL	100	0
32	WOOD	RESID	$	TCAL	100	0
33	WOOD	AGRIC	$	TCAL	100	0
34	CHARCOAL	RESID	$	TCAL	100	0

Page 2. (DEMAND)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	GASOLINE	RESID	2624	0	0	0
2	GASOLINE	TRANSP	45063	0	0	0
3	CRUDE	EXPORTS	78386	0	0	0
4	CRUDE	INDUSTRY	6445	0	0	0
5	KEROSENE	RESID	1383	0	0	0
6	KEROSENE	TRANSP	4528	0	0	0
7	KEROSENE	EXPORTS	1214	0	0	0
8	KEROSENE	INDUSTRY	796	0	0	0
9	DIESEL	TRANSP	7850	0	0	0
10	DIESEL	EXPORTS	2361	0	0	0
11	DIESEL	INDUSTRY	1827	0	0	0
12	DIESEL	COMERC	1375	0	0	0
13	DIESEL	AGRIC	2522	0	0	0
14	DIESEL	OTHER	3022	0	0	0
15	FUELOIL	EXPORTS	31530	0	0	0
16	FUELOIL	INDUSTRY	1063	0	0	0
17	FUELOIL	COMERC	268	0	0	0
18	LPG	RESID	3823	0	0	0
19	LPG	INDUSTRY	69	0	0	0
20	LPG	COMERC	288	0	0	0
21	NATGAS	RESID	878	0	0	0
22	NATGAS	INDUSTRY	8934	0	0	0
23	ELECTRIC	RESID	9745	0	0	0
24	ELECTRIC	EXPORTS	0	0	0	0
25	ELECTRIC	INDUSTRY	7277	0	0	0
26	ELECTRIC	COMERC	3831	0	0	0
27	COAL	RESID	1792	0	0	0
28	COAL	EXPORTS	67984	0	0	0
29	COAL	INDUSTRY	18095	0	0	0
30	BAGASSE	INDUSTRY	7550	0	0	0
31	BAGASSE	AGRIC	5460	0	0	0
32	WOOD	RESID	33134	0	0	0
33	WOOD	AGRIC	5536	0	0	0

34	CHARCOAL	RESID	648	0	0	0

Page 3. (DEMAND)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE	RESID	0	0	0	0
2	GASOLINE	TRANSP	0	0	0	0
3	CRUDE	EXPORTS	0	0	0	0
4	CRUDE	INDUSTRY	0	0	0	0
5	KEROSENE	RESID	0	0	0	0
6	KEROSENE	TRANSP	0	0	0	0
7	KEROSENE	EXPORTS	0	0	0	0
8	KEROSENE	INDUSTRY	0	0	0	0
9	DIESEL	TRANSP	0	0	0	0
10	DIESEL	EXPORTS	0	0	0	0
11	DIESEL	INDUSTRY	0	0	0	0
12	DIESEL	COMERC	0	0	0	0
13	DIESEL	AGRIC	0	0	0	0
14	DIESEL	OTHER	0	0	0	0
15	FUELOIL	EXPORTS	0	0	0	0
16	FUELOIL	INDUSTRY	0	0	0	0
17	FUELOIL	COMERC	0	0	0	0
18	LPG	RESID	0	0	0	0
19	LPG	INDUSTRY	0	0	0	0
20	LPG	COMERC	0	0	0	0
21	NATGAS	RESID	0	0	0	0
22	NATGAS	INDUSTRY	0	0	0	0
23	ELECTRIC	RESID	0	0	0	0
24	ELECTRIC	EXPORTS	0	0	0	0
25	ELECTRIC	INDUSTRY	0	0	0	0
26	ELECTRIC	COMERC	0	0	0	0
27	COAL	RESID	0	0	0	0
28	COAL	EXPORTS	0	0	0	0
29	COAL	INDUSTRY	0	0	0	0
30	BAGASSE	INDUSTRY	0	0	0	0
31	BAGASSE	AGRIC	0	0	0	0
32	WOOD	RESID	0	0	0	0
33	WOOD	AGRIC	0	0	0	0
34	CHARCOAL	RESID	0	0	0	0

Page 4. (DEMAND)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE	RESID	0	0
2	GASOLINE	TRANSP	0	0
3	CRUDE	EXPORTS	0	0
4	CRUDE	INDUSTRY	0	0
5	KEROSENE	RESID	0	0
6	KEROSENE	TRANSP	0	0
7	KEROSENE	EXPORTS	0	0

8	KEROSENE	INDUSTRY	0	0
9	DIESEL	TRANSP	0	0
10	DIESEL	EXPORTS	0	0
11	DIESEL	INDUSTRY	0	0
12	DIESEL	COMERC	0	0
13	DIESEL	AGRIC	0	0
14	DIESEL	OTHER	0	0
15	FUELOIL	EXPORTS	0	0
16	FUELOIL	INDUSTRY	0	0
17	FUELOIL	COMERC	0	0
18	LPG	RESID	0	0
19	LPG	INDUSTRY	0	0
20	LPG	COMERC	0	0
21	NATGAS	RESID	0	0
22	NATGAS	INDUSTRY	0	0
23	ELECTRIC	RESID	0	0
24	ELECTRIC	EXPORTS	0	0
25	ELECTRIC	INDUSTRY	0	0
26	ELECTRIC	COMERC	0	0
27	COAL	RESID	0	0
28	COAL	EXPORTS	0	0
29	COAL	INDUSTRY	0	0
30	BAGASSE	INDUSTRY	0	0
31	BAGASSE	AGRIC	0	0
32	WOOD	RESID	0	0
33	WOOD	AGRIC	0	0
34	CHARCOAL	RESID	0	0

Page 5. (DEMAND)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE	RESID	0	2624	0	0
2	GASOLINE	TRANSP	0	45063	0	0
3	CRUDE	EXPORTS	0	78386	0	0
4	CRUDE	INDUSTRY	0	6445	0	0
5	KEROSENE	RESID	0	1383	0	0
6	KEROSENE	TRANSP	0	4528	0	0
7	KEROSENE	EXPORTS	0	1214	0	0
8	KEROSENE	INDUSTRY	0	796	0	0
9	DIESEL	TRANSP	0	7850	0	0
10	DIESEL	EXPORTS	0	2361	0	0
11	DIESEL	INDUSTRY	0	1827	0	0
12	DIESEL	COMERC	0	1375	0	0
13	DIESEL	AGRIC	0	2522	0	0
14	DIESEL	OTHER	0	3022	0	0
15	FUELOIL	EXPORTS	0	31530	0	0
16	FUELOIL	INDUSTRY	0	1063	0	0
17	FUELOIL	COMERC	0	268	0	0
18	LPG	RESID	0	3823	0	0
19	LPG	INDUSTRY	0	69	0	0
20	LPG	COMERC	0	288	0	0
21	NATGAS	RESID	0	878	0	0
22	NATGAS	INDUSTRY	0	8934	0	0
23	ELECTRIC	RESID	0	9745	0	0
24	ELECTRIC	EXPORTS	0	0	0	0

25	ELECTRIC	INDUSTRY	0	7277	0	0
26	ELECTRIC	COMERC	0	3831	0	0
27	COAL	RESID	0	1792	0	0
28	COAL	EXPORTS	0	67984	0	0
29	COAL	INDUSTRY	0	18095	0	0
30	BAGASSE	INDUSTRY	0	7550	0	0
31	BAGASSE	AGRIC	0	5460	0	0
32	WOOD	RESID	0	33134	0	0
33	WOOD	AGRIC	0	5536	0	0
34	CHARCOAL	RESID	0	648	0	0

Page 6. (DEMAND)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE	RESID	0	0	0
2	GASOLINE	TRANSP	0	0	0
3	CRUDE	EXPORTS	0	0	0
4	CRUDE	INDUSTRY	0	0	0
5	KEROSENE	RESID	0	0	0
6	KEROSENE	TRANSP	0	0	0
7	KEROSENE	EXPORTS	0	0	0
8	KEROSENE	INDUSTRY	0	0	0
9	DIESEL	TRANSP	0	0	0
10	DIESEL	EXPORTS	0	0	0
11	DIESEL	INDUSTRY	0	0	0
12	DIESEL	COMERC	0	0	0
13	DIESEL	AGRIC	0	0	0
14	DIESEL	OTHER	0	0	0
15	FUELOIL	EXPORTS	0	0	0
16	FUELOIL	INDUSTRY	0	0	0
17	FUELOIL	COMERC	0	0	0
18	LPG	RESID	0	0	0
19	LPG	INDUSTRY	0	0	0
20	LPG	COMERC	0	0	0
21	NATGAS	RESID	0	0	0
22	NATGAS	INDUSTRY	0	0	0
23	ELECTRIC	RESID	0	0	0
24	ELECTRIC	EXPORTS	0	0	0
25	ELECTRIC	INDUSTRY	0	0	0
26	ELECTRIC	COMERC	0	0	0
27	COAL	RESID	0	0	0
28	COAL	EXPORTS	0	0	0
29	COAL	INDUSTRY	0	0	0
30	BAGASSE	INDUSTRY	0	0	0
31	BAGASSE	AGRIC	0	0	0
32	WOOD	RESID	0	0	0
33	WOOD	AGRIC	0	0	0
34	CHARCOAL	RESID	0	0	0

Page 7. (DEMAND)
External file energy flows.

% Flow adjust	Energy flows	Energy flows

No	Name	Category	(+/-)	out ?	in ?
1	GASOLINE	RESID	0	No File	No File
2	GASOLINE	TRANSP	0	No File	No File
3	CRUDE	EXPORTS	0	No File	No File
4	CRUDE	INDUSTRY	0	No File	No File
5	KEROSENE	RESID	0	No File	No File
6	KEROSENE	TRANSP	0	No File	No File
7	KEROSENE	EXPORTS	0	No File	No File
8	KEROSENE	INDUSTRY	0	No File	No File
9	DIESEL	TRANSP	0	No File	No File
10	DIESEL	EXPORTS	0	No File	No File
11	DIESEL	INDUSTRY	0	No File	No File
12	DIESEL	COMERC	0	No File	No File
13	DIESEL	AGRIC	0	No File	No File
14	DIESEL	OTHER	0	No File	No File
15	FUELOIL	EXPORTS	0	No File	No File
16	FUELOIL	INDUSTRY	0	No File	No File
17	FUELOIL	COMERC	0	No File	No File
18	LPG	RESID	0	No File	No File
19	LPG	INDUSTRY	0	No File	No File
20	LPG	COMERC	0	No File	No File
21	NATGAS	RESID	0	No File	No File
22	NATGAS	INDUSTRY	0	No File	No File
23	ELECTRIC	RESID	0	No File	No File
24	ELECTRIC	EXPORTS	0	No File	No File
25	ELECTRIC	INDUSTRY	0	No File	No File
26	ELECTRIC	COMERC	0	No File	No File
27	COAL	RESID	0	No File	No File
28	COAL	EXPORTS	0	No File	No File
29	COAL	INDUSTRY	0	No File	No File
30	BAGASSE	INDUSTRY	0	No File	No File
31	BAGASSE	AGRIC	0	No File	No File
32	WOOD	RESID	0	No File	No File
33	WOOD	AGRIC	0	No File	No File
34	CHARCOAL	RESID	0	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1988.0
Activity group : TRA/DIST,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 5 TRA/DIST

Page 1. (TRA/DIST)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE		$	TCAL	95	0
2	CRUDE		$	TCAL	95	0
3	KEROSENE		$	TCAL	95	0
4	DIESEL		$	TCAL	95	0
5	FUELOIL		$	TCAL	95	0
6	LPG		$	TCAL	95	0
7	NATGAS		$	TCAL	95	0
8	ELECTRIC	GENER	$	TCAL	75	0
9	COAL		$	TCAL	95	0
10	BAGASSE		$	TCAL	95	0
11	WOOD		$	TCAL	95	0
12	CHARCOAL		$	TCAL	95	0

Page 2. (TRA/DIST)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity capacity Base Yr	energy % Growth	Activity energy losses
1	GASOLINE		50197	0	0	2510
2	CRUDE		89296	0	0	4465
3	KEROSENE		8338	0	0	417
4	DIESEL		19955	0	0	998
5	FUELOIL		34591	0	0	1730
6	LPG		4400	0	0	220
7	NATGAS		10328	0	0	516
8	ELECTRIC	GENER	27804	0	0	6951
9	COAL		92496	0	0	4625
10	BAGASSE		13695	0	0	685
11	WOOD		40705	0	0	2035
12	CHARCOAL		682	0	0	34

Page 3. (TRA/DIST)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE		0	0	0	0
2	CRUDE		0	0	0	0
3	KEROSENE		0	0	0	0
4	DIESEL		0	0	0	0
5	FUELOIL		0	0	0	0
6	LPG		0	0	0	0
7	NATGAS		0	0	0	0
8	ELECTRIC	GENER	0	0	0	0
9	COAL		0	0	0	0
10	BAGASSE		0	0	0	0
11	WOOD		0	0	0	0
12	CHARCOAL		0	0	0	0

Page 4. (TRA/DIST)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE		0	0
2	CRUDE		0	0
3	KEROSENE		0	0
4	DIESEL		0	0
5	FUELOIL		0	0
6	LPG		0	0
7	NATGAS		0	0
8	ELECTRIC	GENER	0	0
9	COAL		0	0
10	BAGASSE		0	0
11	WOOD		0	0
12	CHARCOAL		0	0

Page 5. (TRA/DIST)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE		0	50197	0	0
2	CRUDE		0	89296	0	0
3	KEROSENE		0	8338	0	0
4	DIESEL		0	19955	0	0
5	FUELOIL		0	34591	0	0
6	LPG		0	4400	0	0
7	NATGAS		0	10328	0	0
8	ELECTRIC	GENER	0	27804	0	0
9	COAL		0	92496	0	0
10	BAGASSE		0	13695	0	0
11	WOOD		0	40705	0	0
12	CHARCOAL		0	682	0	0

Page 6. (TRA/DIST)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE		0	0	0
2	CRUDE		0	0	0
3	KEROSENE		0	0	0
4	DIESEL		0	0	0
5	FUELOIL		0	0	0
6	LPG		0	0	0
7	NATGAS		0	0	0
8	ELECTRIC	GENER	0	0	0
9	COAL		0	0	0
10	BAGASSE		0	0	0
11	WOOD		0	0	0
12	CHARCOAL		0	0	0

Page 7. (TRA/DIST)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE		0	No File	No File
2	CRUDE		0	No File	No File
3	KEROSENE		0	No File	No File
4	DIESEL		0	No File	No File
5	FUELOIL		0	No File	No File
6	LPG		0	No File	No File
7	NATGAS		0	No File	No File
8	ELECTRIC	GENER	0	No File	No File
9	COAL		0	No File	No File
10	BAGASSE		0	No File	No File

11 WOOD	0	No File	No File
12 CHARCOAL	0	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1988.0
Activity group : ELECGEN,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 4 ELECGEN

Page 1. (ELECGEN)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE		$	TCAL	100	0
2	CRUDE		$	TCAL	100	0
3	KEROSENE		$	TCAL	100	0
4	DIESEL		$	TCAL	100	0
5	FUELOIL		$	TCAL	100	0
6	LPG		$	TCAL	100	0
7	NATGAS		$	TCAL	100	0
8	ELELIQ		$	TCAL	24	0
9	ELEGAS		$	TCAL	26	0
10	ELEHYDRO		$	TCAL	80	0
11	ELECOAL		$	TCAL	22	0
12	COAL		$	TCAL	100	0
13	BAGASSE		$	TCAL	100	0
14	WOOD		$	TCAL	100	0
15	CHARCOAL		$	TCAL	100	0

Page 2. (ELECGEN)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	GASOLINE		50197	0	0	0
2	CRUDE		89296	0	0	0
3	KEROSENE		8338	0	0	0
4	DIESEL		19955	0	0	0
5	FUELOIL		34591	0	0	0
6	LPG		4400	0	0	0
7	NATGAS		10328	0	0	0
8	ELELIQ		2317	1280	0	1761
9	ELEGAS		2139	1280	0	1583
10	ELEHYDRO		26066	46700	0	5213
11	ELECOAL		26540	13445	0	20701
12	COAL		92496	0	0	0
13	BAGASSE		13695	0	0	0
14	WOOD		40705	0	0	0
15	CHARCOAL		682	0	0	0

Page 3. (ELECGEN)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE		0	0	0	0
2	CRUDE		0	0	0	0
3	KEROSENE		0	0	0	0
4	DIESEL		0	0	0	0
5	FUELOIL		0	0	0	0
6	LPG		0	0	0	0
7	NATGAS		0	0	0	0
8	ELELIQ		14400	0	0	0
9	ELEGAS		14400	0	0	0
10	ELEHYDRO		14400	0	0	0
11	ELECOAL		14400	0	0	0
12	COAL		0	0	0	0
13	BAGASSE		0	0	0	0
14	WOOD		0	0	0	0
15	CHARCOAL		0	0	0	0

Page 4. (ELECGEN)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE		0	0
2	CRUDE		0	0
3	KEROSENE		0	0
4	DIESEL		0	0

5	FUELOIL	0	0
6	LPG	0	0
7	NATGAS	0	0
8	ELELIQ	0	0
9	ELEGAS	0	0
10	ELEHYDRO	0	0
11	ELECOAL	0	0
12	COAL	0	0
13	BAGASSE	0	0
14	WOOD	0	0
15	CHARCOAL	0	0

Page 5. (ELECGEN)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE		0	50197	0	0
2	CRUDE		0	89296	0	0
3	KEROSENE		0	8338	0	0
4	DIESEL		0	19955	0	0
5	FUELOIL		0	34591	0	0
6	LPG		0	4400	0	0
7	NATGAS		0	10328	0	0
8	ELELIQ		181	1037	0	0
9	ELEGAS		167	859	0	0
10	ELEHYDRO		56	0	0	0
11	ELECOAL		197	13095	0	0
12	COAL		0	92496	0	0
13	BAGASSE		0	13695	0	0
14	WOOD		0	40705	0	0
15	CHARCOAL		0	682	0	0

Page 6. (ELECGEN)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE		0	0	0
2	CRUDE		0	0	0
3	KEROSENE		0	0	0
4	DIESEL		0	0	0
5	FUELOIL		0	0	0
6	LPG		0	0	0
7	NATGAS		0	0	0
8	ELELIQ		0	33364800	33364800
9	ELEGAS		0	30798277	30798277
10	ELEHYDRO		0	375354000	375354000
11	ELECOAL		0	382178618	382178618
12	COAL		0	0	0
13	BAGASSE		0	0	0
14	WOOD		0	0	0
15	CHARCOAL		0	0	0

Page 7. (ELECGEN)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE		0	No File	No File
2	CRUDE		0	No File	No File
3	KEROSENE		0	No File	No File
4	DIESEL		0	No File	No File
5	FUELOIL		0	No File	No File
6	LPG		0	No File	No File
7	NATGAS		0	No File	No File
8	ELELIQ		0	No File	No File
9	ELEGAS		0	No File	No File
10	ELEHYDRO		0	No File	No File
11	ELECOAL		0	No File	No File
12	COAL		0	No File	No File
13	BAGASSE		0	No File	No File
14	WOOD		0	No File	No File
15	CHARCOAL		0	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1988.0
Activity group : ENGY PRD,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 3 ENGY PRD

Page 1. (ENGY PRD)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE		$	TCAL	100	0
2	CRUDE		$	TCAL	100	0
3	KEROSENE		$	TCAL	100	0
4	DIESEL		$	TCAL	100	0
5	FUELOIL		$	TCAL	100	0
6	LPG		$	TCAL	100	0
7	NATGAS		$	TCAL	100	0
8	HYDRO		$	TCAL	100	0
9	COAL		$	TCAL	100	0
10	BAGASSE		$	TCAL	100	0
11	WOOD		$	TCAL	100	0
12	CHARCOAL		$	TCAL	100	0

Page 2. (ENGY PRD)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	GASOLINE		50197	0	0	0
2	CRUDE		89852	0	0	0
3	KEROSENE		8338	0	0	0
4	DIESEL		21113	0	0	0
5	FUELOIL		35193	0	0	0
6	LPG		4400	0	0	0
7	NATGAS		12467	0	0	0
8	HYDRO		26066	0	0	0
9	COAL		119036	0	0	0
10	BAGASSE		13695	0	0	0
11	WOOD		40705	0	0	0
12	CHARCOAL		682	0	0	0

Page 3. (ENGY PRD)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE		0	0	0	0
2	CRUDE		0	0	0	0
3	KEROSENE		0	0	0	0
4	DIESEL		0	0	0	0
5	FUELOIL		0	0	0	0
6	LPG		0	0	0	0
7	NATGAS		0	0	0	0
8	HYDRO		0	0	0	0
9	COAL		0	0	0	0
10	BAGASSE		0	0	0	0
11	WOOD		0	0	0	0
12	CHARCOAL		0	0	0	0

Page 4. (ENGY PRD)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE		0	0
2	CRUDE		0	0
3	KEROSENE		0	0
4	DIESEL		0	0
5	FUELOIL		0	0
6	LPG		0	0
7	NATGAS		0	0
8	HYDRO		0	0
9	COAL		0	0
10	BAGASSE		0	0
11	WOOD		0	0
12	CHARCOAL		0	0

Page 5. (ENGY PRD)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE		0	50197	0	0
2	CRUDE		0	89852	0	0
3	KEROSENE		0	8338	0	0
4	DIESEL		0	21113	0	0
5	FUELOIL		0	35193	0	0
6	LPG		0	4400	0	0
7	NATGAS		0	12467	0	0
8	HYDRO		0	26066	0	0
9	COAL		0	119036	0	0
10	BAGASSE		0	13695	0	0
11	WOOD		0	40705	0	0
12	CHARCOAL		0	682	0	0

Page 6. (ENGY PRD)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE		0	0	0
2	CRUDE		0	0	0
3	KEROSENE		0	0	0
4	DIESEL		0	0	0
5	FUELOIL		0	0	0
6	LPG		0	0	0
7	NATGAS		0	0	0
8	HYDRO		0	0	0
9	COAL		0	0	0
10	BAGASSE		0	0	0
11	WOOD		0	0	0
12	CHARCOAL		0	0	0

Page 7. (ENGY PRD)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE		0	No File	No File
2	CRUDE		0	No File	No File
3	KEROSENE		0	No File	No File
4	DIESEL		0	No File	No File
5	FUELOIL		0	No File	No File
6	LPG		0	No File	No File
7	NATGAS		0	No File	No File
8	HYDRO		0	No File	No File
9	COAL		0	No File	No File
10	BAGASSE		0	No File	No File

11 WOOD	0	No File	No File
12 CHARCOAL	0	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1988.0
Activity group : PROCESS,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 2 PROCESS

Page 1. (PROCESS)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE		$	TCAL	100	0
2	CRUDE		$	TCAL	100	0
3	CRUDE	REFINERY	$	TCAL	95	0
4	NATGAS	PLANT	$	TCAL	90	0
5	HYDRO		$	TCAL	100	0
6	COAL		$	TCAL	100	0
7	BAGASSE		$	TCAL	100	0
8	WOOD		$	TCAL	100	0
9	CHARCOAL	PLANT	$	TCAL	20	0

Page 2. (PROCESS)
Activity element energy flows and capacities (in energy units).

Activity Energy   Activity energy capacity   Activity energy

No	Name	Category	flow	Base Yr	% Growth	losses
1	GASOLINE		13553	0	0	0
2	CRUDE		89852	0	0	0
3	CRUDE	REFINERY	105699	99000	0	5285
4	NATGAS	PLANT	19712	0	0	1971
5	HYDRO		26066	0	0	0
6	COAL		119036	0	0	0
7	BAGASSE		13695	0	0	0
8	WOOD		40705	0	0	0
9	CHARCOAL	PLANT	3411	0	0	2728

Page 3. (PROCESS)
Unit energy costs.

			Variable cost per unit energy		Annualised capital cost per unit existing capacity	
No	Name	Category	Base Yr	% Growth	Base Yr	% Growth
1	GASOLINE		0	0	0	0
2	CRUDE		0	0	0	0
3	CRUDE	REFINERY	2199	0	0	0
4	NATGAS	PLANT	629	0	0	0
5	HYDRO		0	0	0	0
6	COAL		0	0	0	0
7	BAGASSE		0	0	0	0
8	WOOD		0	0	0	0
9	CHARCOAL	PLANT	1000	0	0	0

Page 4. (PROCESS)
More unit energy costs.

			Incremental capital cost per unit existing annual capacity	
No	Name	Category	Base Yr	% Growth
1	GASOLINE		0	0
2	CRUDE		0	0
3	CRUDE	REFINERY	0	0
4	NATGAS	PLANT	0	0
5	HYDRO		0	0
6	COAL		0	0
7	BAGASSE		0	0
8	WOOD		0	0
9	CHARCOAL	PLANT	0	0

Page 5. (PROCESS)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE		0	13553	0	0
2	CRUDE		0	89852	0	0
3	CRUDE	REFINERY	107	6699	0	0
4	NATGAS	PLANT	0	19712	0	0

5	HYDRO		0	26066	0	0
6	COAL		0	119036	0	0
7	BAGASSE		0	13695	0	0
8	WOOD		0	40705	0	0
9	CHARCOAL	PLANT	0	3411	0	0

Page 6. (PROCESS)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE		0	0	0
2	CRUDE		0	0	0
3	CRUDE	REFINERY	0	232431971	232431971
4	NATGAS	PLANT	0	12398966	0
5	HYDRO		0	0	0
6	COAL		0	0	0
7	BAGASSE		0	0	0
8	WOOD		0	0	0
9	CHARCOAL	PLANT	0	3410526	0

Page 7. (PROCESS)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE		0	No File	No File
2	CRUDE		0	No File	No File
3	CRUDE	REFINERY	0	No File	No File
4	NATGAS	PLANT	0	No File	No File
5	HYDRO		0	No File	No File
6	COAL		0	No File	No File
7	BAGASSE		0	No File	No File
8	WOOD		0	No File	No File
9	CHARCOAL	PLANT	0	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1988.0
Activity group : SUPPLY,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 1 SUPPLY

Page 1. (SUPPLY)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE	IMPORT	$	TCAL	97	0
2	CRUDE	DOMESTIC	$	TCAL	97	0
3	NATGAS	DOMESTIC	$	TCAL	97	0
4	HYDRO	DOMESTIC	$	TCAL	100	0
5	COAL	DOMESTIC	$	TCAL	99	0
6	BAGASSE	DOMESTIC	$	TCAL	99	0
7	WOOD	DOMESTIC	$	TCAL	97	0

Page 2. (SUPPLY)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	GASOLINE	IMPORT	13972	0	0	419
2	CRUDE	DOMESTIC	201599	0	0	6048
3	NATGAS	DOMESTIC	20322	33647	0	610
4	HYDRO	DOMESTIC	26066	0	0	0

6	BAGASSE	DOMESTIC	13833	0	0	138
7	WOOD	DOMESTIC	45480	0	0	1364

Page 3. (SUPPLY)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE	IMPORT	19630	0	0	0
2	CRUDE	DOMESTIC	6597	0	0	0
3	NATGAS	DOMESTIC	2421	0	0	0
4	HYDRO	DOMESTIC	0	0	0	0
5	COAL	DOMESTIC	4175	0	0	0
6	BAGASSE	DOMESTIC	0	0	0	0
7	WOOD	DOMESTIC	0	0	0	0

Page 4. (SUPPLY)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE	IMPORT	0	0
2	CRUDE	DOMESTIC	0	0
3	NATGAS	DOMESTIC	0	0
4	HYDRO	DOMESTIC	0	0
5	COAL	DOMESTIC	0	0
6	BAGASSE	DOMESTIC	0	0
7	WOOD	DOMESTIC	0	0

Page 5. (SUPPLY)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE	IMPORT	0	13972	0	0
2	CRUDE	DOMESTIC	0	201599	0	0
3	NATGAS	DOMESTIC	60	0	0	0
4	HYDRO	DOMESTIC	0	26066	0	0
5	COAL	DOMESTIC	0	120238	0	0
6	BAGASSE	DOMESTIC	0	13833	0	0
7	WOOD	DOMESTIC	0	45480	0	0

Page 6. (SUPPLY)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE	IMPORT	0	274276580	0
2	CRUDE	DOMESTIC	0	1329947108	0
3	NATGAS	DOMESTIC	0	49199183	49199183
4	HYDRO	DOMESTIC	0	0	0
5	COAL	DOMESTIC	0	501995131	0
6	BAGASSE	DOMESTIC	0	0	0

Page 7. (SUPPLY)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE	IMPORT	0	No File	No File
2	CRUDE	DOMESTIC	0	No File	No File
3	NATGAS	DOMESTIC	0	No File	No File
4	HYDRO	DOMESTIC	0	No File	No File
5	COAL	DOMESTIC	0	No File	No File
6	BAGASSE	DOMESTIC	0	No File	No File
7	WOOD	DOMESTIC	0	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1996.0
Activity group : DEMAND,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation	=	Energy flow / capacity
Energy flow over capacity	=	Energy flow - capacity
Total capital cost	=	Existing + Incremental capital cost
Total Energy cost	=	Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 6 DEMAND

Page 1. (DEMAND)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE	RESID	$	TCAL	100.00	0.00
2	GASOLINE	TRANSP	$	TCAL	100.00	0.00
3	CRUDE	EXPORTS	$	TCAL	100.00	0.00
4	CRUDE	INDUSTRY	$	TCAL	100.00	0.00
5	KEROSENE	RESID	$	TCAL	100.00	0.00
6	KEROSENE	TRANSP	$	TCAL	100.00	0.00
7	KEROSENE	EXPORTS	$	TCAL	100.00	0.00
8	KEROSENE	INDUSTRY	$	TCAL	100.00	0.00
9	DIESEL	TRANSP	$	TCAL	100.00	0.00
10	DIESEL	EXPORTS	$	TCAL	100.00	0.00
11	DIESEL	INDUSTRY	$	TCAL	100.00	0.00
12	DIESEL	COMERC	$	TCAL	100.00	0.00
13	DIESEL	AGRIC	$	TCAL	100.00	0.00
14	DIESEL	OTHER	$	TCAL	100.00	0.00
15	FUELOIL	EXPORTS	$	TCAL	100.00	0.00
16	FUELOIL	INDUSTRY	$	TCAL	100.00	0.00
17	FUELOIL	COMERC	$	TCAL	100.00	0.00

19	LPG	INDUSTRY	$	TCAL	100.00	0.00
20	LPG	COMERC	$	TCAL	100.00	0.00
21	NATGAS	RESID	$	TCAL	100.00	0.00
22	NATGAS	INDUSTRY	$	TCAL	100.00	0.00
23	ELECTRIC	RESID	$	TCAL	100.00	0.00
24	ELECTRIC	EXPORTS	$	TCAL	100.00	0.00
25	ELECTRIC	INDUSTRY	$	TCAL	100.00	0.00
26	ELECTRIC	COMERC	$	TCAL	100.00	0.00
27	COAL	RESID	$	TCAL	100.00	0.00
28	COAL	EXPORTS	$	TCAL	100.00	0.00
29	COAL	INDUSTRY	$	TCAL	100.00	0.00
30	BAGASSE	INDUSTRY	$	TCAL	100.00	0.00
31	BAGASSE	AGRIC	$	TCAL	100.00	0.00
32	WOOD	RESID	$	TCAL	100.00	0.00
33	WOOD	AGRIC	$	TCAL	100.00	0.00
34	CHARCOAL	RESID	$	TCAL	100.00	0.00

Page 2. (DEMAND)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	GASOLINE	RESID	3876.84	0.00	0.00	0.00
2	GASOLINE	TRANSP	66578.57	0.00	0.00	0.00
3	CRUDE	EXPORTS	115811.82	0.00	0.00	0.00
4	CRUDE	INDUSTRY	9522.20	0.00	0.00	0.00
5	KEROSENE	RESID	2043.32	0.00	0.00	0.00
6	KEROSENE	TRANSP	6689.92	0.00	0.00	0.00
7	KEROSENE	EXPORTS	1793.63	0.00	0.00	0.00
8	KEROSENE	INDUSTRY	1176.05	0.00	0.00	0.00
9	DIESEL	TRANSP	11598.03	0.00	0.00	0.00
10	DIESEL	EXPORTS	3488.27	0.00	0.00	0.00
11	DIESEL	INDUSTRY	2699.31	0.00	0.00	0.00
12	DIESEL	COMERC	2031.50	0.00	0.00	0.00
13	DIESEL	AGRIC	3726.14	0.00	0.00	0.00
14	DIESEL	OTHER	4464.87	0.00	0.00	0.00
15	FUELOIL	EXPORTS	46584.17	0.00	0.00	0.00
16	FUELOIL	INDUSTRY	1570.54	0.00	0.00	0.00
17	FUELOIL	COMERC	395.96	0.00	0.00	0.00
18	LPG	RESID	5648.31	0.00	0.00	0.00
19	LPG	INDUSTRY	101.94	0.00	0.00	0.00
20	LPG	COMERC	425.51	0.00	0.00	0.00
21	NATGAS	RESID	1297.21	0.00	0.00	0.00
22	NATGAS	INDUSTRY	13199.59	0.00	0.00	0.00
23	ELECTRIC	RESID	14397.80	0.00	0.00	0.00
24	ELECTRIC	EXPORTS	0.00	0.00	0.00	0.00
25	ELECTRIC	INDUSTRY	10751.44	0.00	0.00	0.00
26	ELECTRIC	COMERC	5660.13	0.00	0.00	0.00
27	COAL	RESID	2647.60	0.00	0.00	0.00
28	COAL	EXPORTS	100443.33	0.00	0.00	0.00
29	COAL	INDUSTRY	26734.56	0.00	0.00	0.00
30	BAGASSE	INDUSTRY	11154.79	0.00	0.00	0.00
31	BAGASSE	AGRIC	8066.91	0.00	0.00	0.00
32	WOOD	RESID	37965.86	0.00	0.00	0.00
33	WOOD	AGRIC	8179.19	0.00	0.00	0.00
34	CHARCOAL	RESID	742.50	0.00	0.00	0.00

Page 3. (DEMAND)
Unit energy costs.

Variable cost per unit energy	Annualised capital cost per unit existing capacity

1	GASOLINE	RESID	0.00	0.00	0.00	0.00
2	GASOLINE	TRANSP	0.00	0.00	0.00	0.00
3	CRUDE	EXPORTS	0.00	0.00	0.00	0.00
4	CRUDE	INDUSTRY	0.00	0.00	0.00	0.00
5	KEROSENE	RESID	0.00	0.00	0.00	0.00
6	KEROSENE	TRANSP	0.00	0.00	0.00	0.00
7	KEROSENE	EXPORTS	0.00	0.00	0.00	0.00
8	KEROSENE	INDUSTRY	0.00	0.00	0.00	0.00
9	DIESEL	TRANSP	0.00	0.00	0.00	0.00
10	DIESEL	EXPORTS	0.00	0.00	0.00	0.00
11	DIESEL	INDUSTRY	0.00	0.00	0.00	0.00
12	DIESEL	COMERC	0.00	0.00	0.00	0.00
13	DIESEL	AGRIC	0.00	0.00	0.00	0.00
14	DIESEL	OTHER	0.00	0.00	0.00	0.00
15	FUELOIL	EXPORTS	0.00	0.00	0.00	0.00
16	FUELOIL	INDUSTRY	0.00	0.00	0.00	0.00
17	FUELOIL	COMERC	0.00	0.00	0.00	0.00
18	LPG	RESID	0.00	0.00	0.00	0.00
19	LPG	INDUSTRY	0.00	0.00	0.00	0.00
20	LPG	COMERC	0.00	0.00	0.00	0.00
21	NATGAS	RESID	0.00	0.00	0.00	0.00
22	NATGAS	INDUSTRY	0.00	0.00	0.00	0.00
23	ELECTRIC	RESID	0.00	0.00	0.00	0.00
24	ELECTRIC	EXPORTS	0.00	0.00	0.00	0.00
25	ELECTRIC	INDUSTRY	0.00	0.00	0.00	0.00
26	ELECTRIC	COMERC	0.00	0.00	0.00	0.00
27	COAL	RESID	0.00	0.00	0.00	0.00
28	COAL	EXPORTS	0.00	0.00	0.00	0.00
29	COAL	INDUSTRY	0.00	0.00	0.00	0.00
30	BAGASSE	INDUSTRY	0.00	0.00	0.00	0.00
31	BAGASSE	AGRIC	0.00	0.00	0.00	0.00
32	WOOD	RESID	0.00	0.00	0.00	0.00
33	WOOD	AGRIC	0.00	0.00	0.00	0.00
34	CHARCOAL	RESID	0.00	0.00	0.00	0.00

Page 4. (DEMAND)
More unit energy costs.

			Incremental capital cost per unit existing annual capacity	
No	Name	Category	Base Yr	% Growth
1	GASOLINE	RESID	0.00	0.00
2	GASOLINE	TRANSP	0.00	0.00
3	CRUDE	EXPORTS	0.00	0.00
4	CRUDE	INDUSTRY	0.00	0.00
5	KEROSENE	RESID	0.00	0.00
6	KEROSENE	TRANSP	0.00	0.00
7	KEROSENE	EXPORTS	0.00	0.00
8	KEROSENE	INDUSTRY	0.00	0.00
9	DIESEL	TRANSP	0.00	0.00
10	DIESEL	EXPORTS	0.00	0.00
11	DIESEL	INDUSTRY	0.00	0.00
12	DIESEL	COMERC	0.00	0.00
13	DIESEL	AGRIC	0.00	0.00
14	DIESEL	OTHER	0.00	0.00
15	FUELOIL	EXPORTS	0.00	0.00
16	FUELOIL	INDUSTRY	0.00	0.00
17	FUELOIL	COMERC	0.00	0.00
18	LPG	RESID	0.00	0.00
19	LPG	INDUSTRY	0.00	0.00
20	LPG	COMERC	0.00	0.00
21	NATGAS	RESID	0.00	0.00

23	ELECTRIC	RESID	0.00	0.00
24	ELECTRIC	EXPORTS	0.00	0.00
25	ELECTRIC	INDUSTRY	0.00	0.00
26	ELECTRIC	COMERC	0.00	0.00
27	COAL	RESID	0.00	0.00
28	COAL	EXPORTS	0.00	0.00
29	COAL	INDUSTRY	0.00	0.00
30	BAGASSE	INDUSTRY	0.00	0.00
31	BAGASSE	AGRIC	0.00	0.00
32	WOOD	RESID	0.00	0.00
33	WOOD	AGRIC	0.00	0.00
34	CHARCOAL	RESID	0.00	0.00

Page 5. (DEMAND)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE	RESID	0.00	3876.84	0.00	0.00
2	GASOLINE	TRANSP	0.00	66578.57	0.00	0.00
3	CRUDE	EXPORTS	0.00	115811.82	0.00	0.00
4	CRUDE	INDUSTRY	0.00	9522.20	0.00	0.00
5	KEROSENE	RESID	0.00	2043.32	0.00	0.00
6	KEROSENE	TRANSP	0.00	6689.92	0.00	0.00
7	KEROSENE	EXPORTS	0.00	1793.63	0.00	0.00
8	KEROSENE	INDUSTRY	0.00	1176.05	0.00	0.00
9	DIESEL	TRANSP	0.00	11598.03	0.00	0.00
10	DIESEL	EXPORTS	0.00	3488.27	0.00	0.00
11	DIESEL	INDUSTRY	0.00	2699.31	0.00	0.00
12	DIESEL	COMERC	0.00	2031.50	0.00	0.00
13	DIESEL	AGRIC	0.00	3726.14	0.00	0.00
14	DIESEL	OTHER	0.00	4464.87	0.00	0.00
15	FUELOIL	EXPORTS	0.00	46584.17	0.00	0.00
16	FUELOIL	INDUSTRY	0.00	1570.54	0.00	0.00
17	FUELOIL	COMERC	0.00	395.96	0.00	0.00
18	LPG	RESID	0.00	5648.31	0.00	0.00
19	LPG	INDUSTRY	0.00	101.94	0.00	0.00
20	LPG	COMERC	0.00	425.51	0.00	0.00
21	NATGAS	RESID	0.00	1297.21	0.00	0.00
22	NATGAS	INDUSTRY	0.00	13199.59	0.00	0.00
23	ELECTRIC	RESID	0.00	14397.80	0.00	0.00
24	ELECTRIC	EXPORTS	0.00	0.00	0.00	0.00
25	ELECTRIC	INDUSTRY	0.00	10751.44	0.00	0.00
26	ELECTRIC	COMERC	0.00	5660.13	0.00	0.00
27	COAL	RESID	0.00	2647.60	0.00	0.00
28	COAL	EXPORTS	0.00	100443.33	0.00	0.00
29	COAL	INDUSTRY	0.00	26734.56	0.00	0.00
30	BAGASSE	INDUSTRY	0.00	11154.79	0.00	0.00
31	BAGASSE	AGRIC	0.00	8066.91	0.00	0.00
32	WOOD	RESID	0.00	37965.86	0.00	0.00
33	WOOD	AGRIC	0.00	8179.19	0.00	0.00
34	CHARCOAL	RESID	0.00	742.50	0.00	0.00

Page 6. (DEMAND)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE	RESID	0.00	0.00	0.00

3	CRUDE	EXPORTS	0.00	0.00	0.00
4	CRUDE	INDUSTRY	0.00	0.00	0.00
5	KEROSENE	RESID	0.00	0.00	0.00
6	KEROSENE	TRANSP	0.00	0.00	0.00
7	KEROSENE	EXPORTS	0.00	0.00	0.00
8	KEROSENE	INDUSTRY	0.00	0.00	0.00
9	DIESEL	TRANSP	0.00	0.00	0.00
10	DIESEL	EXPORTS	0.00	0.00	0.00
11	DIESEL	INDUSTRY	0.00	0.00	0.00
12	DIESEL	COMERC	0.00	0.00	0.00
13	DIESEL	AGRIC	0.00	0.00	0.00
14	DIESEL	OTHER	0.00	0.00	0.00
15	FUELOIL	EXPORTS	0.00	0.00	0.00
16	FUELOIL	INDUSTRY	0.00	0.00	0.00
17	FUELOIL	COMERC	0.00	0.00	0.00
18	LPG	RESID	0.00	0.00	0.00
19	LPG	INDUSTRY	0.00	0.00	0.00
20	LPG	COMERC	0.00	0.00	0.00
21	NATGAS	RESID	0.00	0.00	0.00
22	NATGAS	INDUSTRY	0.00	0.00	0.00
23	ELECTRIC	RESID	0.00	0.00	0.00
24	ELECTRIC	EXPORTS	0.00	0.00	0.00
25	ELECTRIC	INDUSTRY	0.00	0.00	0.00
26	ELECTRIC	COMERC	0.00	0.00	0.00
27	COAL	RESID	0.00	0.00	0.00
28	COAL	EXPORTS	0.00	0.00	0.00
29	COAL	INDUSTRY	0.00	0.00	0.00
30	BAGASSE	INDUSTRY	0.00	0.00	0.00
31	BAGASSE	AGRIC	0.00	0.00	0.00
32	WOOD	RESID	0.00	0.00	0.00
33	WOOD	AGRIC	0.00	0.00	0.00
34	CHARCOAL	RESID	0.00	0.00	0.00

Page 7. (DEMAND)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE	RESID	0.00	No File	No File
2	GASOLINE	TRANSP	0.00	No File	No File
3	CRUDE	EXPORTS	0.00	No File	No File
4	CRUDE	INDUSTRY	0.00	No File	No File
5	KEROSENE	RESID	0.00	No File	No File
6	KEROSENE	TRANSP	0.00	No File	No File
7	KEROSENE	EXPORTS	0.00	No File	No File
8	KEROSENE	INDUSTRY	0.00	No File	No File
9	DIESEL	TRANSP	0.00	No File	No File
10	DIESEL	EXPORTS	0.00	No File	No File
11	DIESEL	INDUSTRY	0.00	No File	No File
12	DIESEL	COMERC	0.00	No File	No File
13	DIESEL	AGRIC	0.00	No File	No File
14	DIESEL	OTHER	0.00	No File	No File
15	FUELOIL	EXPORTS	0.00	No File	No File
16	FUELOIL	INDUSTRY	0.00	No File	No File
17	FUELOIL	COMERC	0.00	No File	No File
18	LPG	RESID	0.00	No File	No File
19	LPG	INDUSTRY	0.00	No File	No File
20	LPG	COMERC	0.00	No File	No File
21	NATGAS	RESID	0.00	No File	No File
22	NATGAS	INDUSTRY	0.00	No File	No File
23	ELECTRIC	RESID	0.00	No File	No File
24	ELECTRIC	EXPORTS	0.00	No File	No File

26	ELECTRIC	COMERC	0.00	No	File	No	File
27	COAL	RESID	0.00	No	File	No	File
28	COAL	EXPORTS	0.00	No	File	No	File
29	COAL	INDUSTRY	0.00	No	File	No	File
30	BAGASSE	INDUSTRY	0.00	No	File	No	File
31	BAGASSE	AGRIC	0.00	No	File	No	File
32	WOOD	RESID	0.00	No	File	No	File
33	WOOD	AGRIC	0.00	No	File	No	File
34	CHARCOAL	RESID	0.00	No	File	No	File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1996.0
Activity group : TRA/DIST,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 5 TRA/DIST

Page 1. (TRA/DIST)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE		$	TCAL	95.00	0.00
2	CRUDE		$	TCAL	95.00	0.00
3	KEROSENE		$	TCAL	95.00	0.00
4	DIESEL		$	TCAL	95.00	0.00
5	FUELOIL		$	TCAL	95.00	0.00
6	LPG		$	TCAL	95.00	0.00
7	NATGAS		$	TCAL	95.00	0.00
8	ELECTRIC	GENER	$	TCAL	75.00	0.00
9	COAL		$	TCAL	95.00	0.00

11	WOOD	$	TCAL	95.00	0.00
12	CHARCOAL	$	TCAL	95.00	0.00

Page 2. (TRA/DIST)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	GASOLINE		74163.60	0.00	0.00	3708.18
2	CRUDE		131930.55	0.00	0.00	6596.53
3	KEROSENE		12318.87	0.00	0.00	615.94
4	DIESEL		29482.23	0.00	0.00	1474.11
5	FUELOIL		51105.96	0.00	0.00	2555.30
6	LPG		6500.80	0.00	0.00	325.04
7	NATGAS		15259.78	0.00	0.00	762.99
8	ELECTRIC	GENER	41079.17	0.00	0.00	10269.79
9	COAL		136658.41	0.00	0.00	6832.92
10	BAGASSE		20233.36	0.00	0.00	1011.67
11	WOOD		48573.74	0.00	0.00	2428.69
12	CHARCOAL		781.58	0.00	0.00	39.08

Page 3. (TRA/DIST)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE		0.00	0.00	0.00	0.00
2	CRUDE		0.00	0.00	0.00	0.00
3	KEROSENE		0.00	0.00	0.00	0.00
4	DIESEL		0.00	0.00	0.00	0.00
5	FUELOIL		0.00	0.00	0.00	0.00
6	LPG		0.00	0.00	0.00	0.00
7	NATGAS		0.00	0.00	0.00	0.00
8	ELECTRIC	GENER	0.00	0.00	0.00	0.00
9	COAL		0.00	0.00	0.00	0.00
10	BAGASSE		0.00	0.00	0.00	0.00
11	WOOD		0.00	0.00	0.00	0.00
12	CHARCOAL		0.00	0.00	0.00	0.00

Page 4. (TRA/DIST)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE		0.00	0.00
2	CRUDE		0.00	0.00
3	KEROSENE		0.00	0.00
4	DIESEL		0.00	0.00
5	FUELOIL		0.00	0.00
6	LPG		0.00	0.00
7	NATGAS		0.00	0.00
8	ELECTRIC	GENER	0.00	0.00
9	COAL		0.00	0.00
10	BAGASSE		0.00	0.00
11	WOOD		0.00	0.00
12	CHARCOAL		0.00	0.00

Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE		0.00	74163.60	0.00	0.00
2	CRUDE		0.00	131930.55	0.00	0.00
3	KEROSENE		0.00	12318.87	0.00	0.00
4	DIESEL		0.00	29482.23	0.00	0.00
5	FUELOIL		0.00	51105.96	0.00	0.00
6	LPG		0.00	6500.80	0.00	0.00
7	NATGAS		0.00	15259.78	0.00	0.00
8	ELECTRIC	GENER	0.00	41079.17	0.00	0.00
9	COAL		0.00	136658.41	0.00	0.00
10	BAGASSE		0.00	20233.36	0.00	0.00
11	WOOD		0.00	48573.74	0.00	0.00
12	CHARCOAL		0.00	781.58	0.00	0.00

Page 6. (TRA/DIST)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE		0.00	0.00	0.00
2	CRUDE		0.00	0.00	0.00
3	KEROSENE		0.00	0.00	0.00
4	DIESEL		0.00	0.00	0.00
5	FUELOIL		0.00	0.00	0.00
6	LPG		0.00	0.00	0.00
7	NATGAS		0.00	0.00	0.00
8	ELECTRIC	GENER	0.00	0.00	0.00
9	COAL		0.00	0.00	0.00
10	BAGASSE		0.00	0.00	0.00
11	WOOD		0.00	0.00	0.00
12	CHARCOAL		0.00	0.00	0.00

Page 7. (TRA/DIST)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE		0.00	No File	No File
2	CRUDE		0.00	No File	No File
3	KEROSENE		0.00	No File	No File
4	DIESEL		0.00	No File	No File
5	FUELOIL		0.00	No File	No File
6	LPG		0.00	No File	No File
7	NATGAS		0.00	No File	No File
8	ELECTRIC	GENER	0.00	No File	No File
9	COAL		0.00	No File	No File
10	BAGASSE		0.00	No File	No File
11	WOOD		0.00	No File	No File
12	CHARCOAL		0.00	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1996.0
Activity group : ELECGEN.

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 4 ELECGEN

Page 1. (ELECGEN)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE		$	TCAL	100.00	0.00
2	CRUDE		$	TCAL	100.00	0.00
3	KEROSENE		$	TCAL	100.00	0.00
4	DIESEL		$	TCAL	100.00	0.00
5	FUELOIL		$	TCAL	100.00	0.00
6	LPG		$	TCAL	100.00	0.00
7	NATGAS		$	TCAL	100.00	0.00
8	ELELIQ		$	TCAL	24.00	0.00
9	ELEGAS		$	TCAL	26.00	0.00
10	ELEHYDRO		$	TCAL	80.00	0.00
11	ELECOAL		$	TCAL	22.00	0.00
12	COAL		$	TCAL	100.00	0.00
13	BAGASSE		$	TCAL	100.00	0.00
14	WOOD		$	TCAL	100.00	0.00
15	CHARCOAL		$	TCAL	100.00	0.00

Page 2. (ELECGEN)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses

2	CRUDE	131930.55	0.00	0.00	0.00
3	KEROSENE	12318.87	0.00	0.00	0.00
4	DIESEL	29482.23	0.00	0.00	0.00
5	FUELOIL	51105.96	0.00	0.00	0.00
6	LPG	6500.80	0.00	0.00	0.00
7	NATGAS	15259.78	0.00	0.00	0.00
8	ELELIQ	3423.26	1280.00	0.00	2601.68
9	ELEGAS	3159.94	1280.00	0.00	2338.35
10	ELEHYDRO	38511.72	46700.00	0.00	7702.34
11	ELECOAL	39211.94	13445.00	0.00	30585.31
12	COAL	136658.41	0.00	0.00	0.00
13	BAGASSE	20233.36	0.00	0.00	0.00
14	WOOD	48573.74	0.00	0.00	0.00
15	CHARCOAL	781.58	0.00	0.00	0.00

Page 3. (ELECGEN)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE		0.00	0.00	0.00	0.00
2	CRUDE		0.00	0.00	0.00	0.00
3	KEROSENE		0.00	0.00	0.00	0.00
4	DIESEL		0.00	0.00	0.00	0.00
5	FUELOIL		0.00	0.00	0.00	0.00
6	LPG		0.00	0.00	0.00	0.00
7	NATGAS		0.00	0.00	0.00	0.00
8	ELELIQ		14400.00	0.00	0.00	0.00
9	ELEGAS		14400.00	0.00	0.00	0.00
10	ELEHYDRO		14400.00	0.00	0.00	0.00
11	ELECOAL		14400.00	0.00	0.00	0.00
12	COAL		0.00	0.00	0.00	0.00
13	BAGASSE		0.00	0.00	0.00	0.00
14	WOOD		0.00	0.00	0.00	0.00
15	CHARCOAL		0.00	0.00	0.00	0.00

Page 4. (ELECGEN)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE		0.00	0.00
2	CRUDE		0.00	0.00
3	KEROSENE		0.00	0.00
4	DIESEL		0.00	0.00
5	FUELOIL		0.00	0.00
6	LPG		0.00	0.00
7	NATGAS		0.00	0.00
8	ELELIQ		0.00	0.00
9	ELEGAS		0.00	0.00
10	ELEHYDRO		0.00	0.00
11	ELECOAL		0.00	0.00
12	COAL		0.00	0.00
13	BAGASSE		0.00	0.00
14	WOOD		0.00	0.00
15	CHARCOAL		0.00	0.00

Page 5. (ELECGEN)

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE		0.00	74163.60	0.00	0.00
2	CRUDE		0.00	131930.55	0.00	0.00
3	KEROSENE		0.00	12318.87	0.00	0.00
4	DIESEL		0.00	29482.23	0.00	0.00
5	FUELOIL		0.00	51105.96	0.00	0.00
6	LPG		0.00	6500.80	0.00	0.00
7	NATGAS		0.00	15259.78	0.00	0.00
8	ELELIQ		267.44	2143.26	0.00	0.00
9	ELEGAS		246.87	1879.94	0.00	0.00
10	ELEHYDRO		82.47	0.00	0.00	0.00
11	ELECOAL		291.65	25766.94	0.00	0.00
12	COAL		0.00	136658.41	0.00	0.00
13	BAGASSE		0.00	20233.36	0.00	0.00
14	WOOD		0.00	48573.74	0.00	0.00
15	CHARCOAL		0.00	781.58	0.00	0.00

Page 6. (ELECGEN)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE		0.00	0.00	0.00
2	CRUDE		0.00	0.00	0.00
3	KEROSENE		0.00	0.00	0.00
4	DIESEL		0.00	0.00	0.00
5	FUELOIL		0.00	0.00	0.00
6	LPG		0.00	0.00	0.00
7	NATGAS		0.00	0.00	0.00
8	ELELIQ		0.00	49295005.39	49295005.39
9	ELEGAS		0.00	45503081.90	45503081.90
10	ELEHYDRO		0.00	554568810.65	554568810.65
11	ELECOAL		0.00	564651879.94	564651879.94
12	COAL		0.00	0.00	0.00
13	BAGASSE		0.00	0.00	0.00
14	WOOD		0.00	0.00	0.00
15	CHARCOAL		0.00	0.00	0.00

Page 7. (ELECGEN)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE		0.00	No File	No File
2	CRUDE		0.00	No File	No File
3	KEROSENE		0.00	No File	No File
4	DIESEL		0.00	No File	No File
5	FUELOIL		0.00	No File	No File
6	LPG		0.00	No File	No File
7	NATGAS		0.00	No File	No File
8	ELELIQ		0.00	No File	No File
9	ELEGAS		0.00	No File	No File
10	ELEHYDRO		0.00	No File	No File
11	ELECOAL		0.00	No File	No File
12	COAL		0.00	No File	No File

14 WOOD	0.00	No File	No File
15 CHARCOAL	0.00	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1996.0
Activity group : ENGY PRD,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 3 ENGY PRD

Page 1. (ENGY PRD)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE		$	TCAL	100.00	0.00
2	CRUDE		$	TCAL	100.00	0.00
3	KEROSENE		$	TCAL	100.00	0.00
4	DIESEL		$	TCAL	100.00	0.00
5	FUELOIL		$	TCAL	100.00	0.00
6	LPG		$	TCAL	100.00	0.00
7	NATGAS		$	TCAL	100.00	0.00
8	HYDRO		$	TCAL	100.00	0.00
9	COAL		$	TCAL	100.00	0.00
10	BAGASSE		$	TCAL	100.00	0.00
11	WOOD		$	TCAL	100.00	0.00
12	CHARCOAL		$	TCAL	100.00	0.00

Page 2. (ENGY PRD)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Energy flow	capacity Base Yr	% Growth	energy losses
1	GASOLINE		74163.60	0.00	0.00	0.00
2	CRUDE		132752.13	0.00	0.00	0.00
3	KEROSENE		12318.87	0.00	0.00	0.00
4	DIESEL		31193.87	0.00	0.00	0.00
5	FUELOIL		51996.01	0.00	0.00	0.00
6	LPG		6500.80	0.00	0.00	0.00
7	NATGAS		18419.72	0.00	0.00	0.00
8	HYDRO		38511.72	0.00	0.00	0.00
9	COAL		175870.34	0.00	0.00	0.00
10	BAGASSE		20233.36	0.00	0.00	0.00
11	WOOD		48573.74	0.00	0.00	0.00
12	CHARCOAL		781.58	0.00	0.00	0.00

Page 3. (ENGY PRD)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE		0.00	0.00	0.00	0.00
2	CRUDE		0.00	0.00	0.00	0.00
3	KEROSENE		0.00	0.00	0.00	0.00
4	DIESEL		0.00	0.00	0.00	0.00
5	FUELOIL		0.00	0.00	0.00	0.00
6	LPG		0.00	0.00	0.00	0.00
7	NATGAS		0.00	0.00	0.00	0.00
8	HYDRO		0.00	0.00	0.00	0.00
9	COAL		0.00	0.00	0.00	0.00
10	BAGASSE		0.00	0.00	0.00	0.00
11	WOOD		0.00	0.00	0.00	0.00
12	CHARCOAL		0.00	0.00	0.00	0.00

Page 4. (ENGY PRD)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE		0.00	0.00
2	CRUDE		0.00	0.00
3	KEROSENE		0.00	0.00
4	DIESEL		0.00	0.00
5	FUELOIL		0.00	0.00
6	LPG		0.00	0.00
7	NATGAS		0.00	0.00
8	HYDRO		0.00	0.00
9	COAL		0.00	0.00
10	BAGASSE		0.00	0.00
11	WOOD		0.00	0.00
12	CHARCOAL		0.00	0.00

Page 5. (ENGY PRD)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost

1	GASOLINE	0.00	74163.60	0.00	0.00
2	CRUDE	0.00	132752.13	0.00	0.00
3	KEROSENE	0.00	12318.87	0.00	0.00
4	DIESEL	0.00	31193.87	0.00	0.00
5	FUELOIL	0.00	51996.01	0.00	0.00
6	LPG	0.00	6500.80	0.00	0.00
7	NATGAS	0.00	18419.72	0.00	0.00
8	HYDRO	0.00	38511.72	0.00	0.00
9	COAL	0.00	175870.34	0.00	0.00
10	BAGASSE	0.00	20233.36	0.00	0.00
11	WOOD	0.00	48573.74	0.00	0.00
12	CHARCOAL	0.00	781.58	0.00	0.00

Page 6. (ENGY PRD)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE		0.00	0.00	0.00
2	CRUDE		0.00	0.00	0.00
3	KEROSENE		0.00	0.00	0.00
4	DIESEL		0.00	0.00	0.00
5	FUELOIL		0.00	0.00	0.00
6	LPG		0.00	0.00	0.00
7	NATGAS		0.00	0.00	0.00
8	HYDRO		0.00	0.00	0.00
9	COAL		0.00	0.00	0.00
10	BAGASSE		0.00	0.00	0.00
11	WOOD		0.00	0.00	0.00
12	CHARCOAL		0.00	0.00	0.00

Page 7. (ENGY PRD)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE		0.00	No File	No File
2	CRUDE		0.00	No File	No File
3	KEROSENE		0.00	No File	No File
4	DIESEL		0.00	No File	No File
5	FUELOIL		0.00	No File	No File
6	LPG		0.00	No File	No File
7	NATGAS		0.00	No File	No File
8	HYDRO		0.00	No File	No File
9	COAL		0.00	No File	No File
10	BAGASSE		0.00	No File	No File
11	WOOD		0.00	No File	No File
12	CHARCOAL		0.00	No File	No File

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1996.0
Activity group : PROCESS,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 2 PROCESS

Page 1. (PROCESS)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE		$	TCAL	100.00	0.00
2	CRUDE		$	TCAL	100.00	0.00
3	CRUDE	REFINERY	$	TCAL	95.00	0.00
4	NATGAS	PLANT	$	TCAL	90.00	0.00
5	HYDRO		$	TCAL	100.00	0.00
6	COAL		$	TCAL	100.00	0.00
7	BAGASSE		$	TCAL	100.00	0.00
8	WOOD		$	TCAL	100.00	0.00
9	CHARCOAL	PLANT	$	TCAL	20.00	0.00

Page 2. (PROCESS)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	GASOLINE		20024.17	0.00	0.00	0.00
2	CRUDE		132752.13	0.00	0.00	0.00
3	CRUDE	REFINERY	156165.48	99000.00	0.00	7808.27
4	NATGAS	PLANT	29123.88	0.00	0.00	2912.39
5	HYDRO		38511.72	0.00	0.00	0.00
6	COAL		175870.34	0.00	0.00	0.00
7	BAGASSE		20233.36	0.00	0.00	0.00
8	WOOD		48573.74	0.00	0.00	0.00
9	CHARCOAL	PLANT	3907.88	0.00	0.00	3126.30

Page 3. (PROCESS)
Unit energy costs.

No	Name	Category	per unit energy Base Yr	% Growth	cost per unit existing capacity Base Yr	% Growth
1	GASOLINE		0.00	0.00	0.00	0.00
2	CRUDE		0.00	0.00	0.00	0.00
3	CRUDE	REFINERY	2199.00	0.00	0.00	0.00
4	NATGAS	PLANT	629.00	0.00	0.00	0.00
5	HYDRO		0.00	0.00	0.00	0.00
6	COAL		0.00	0.00	0.00	0.00
7	BAGASSE		0.00	0.00	0.00	0.00
8	WOOD		0.00	0.00	0.00	0.00
9	CHARCOAL	PLANT	1000.00	0.00	0.00	0.00

Page 4. (PROCESS)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE		0.00	0.00
2	CRUDE		0.00	0.00
3	CRUDE	REFINERY	0.00	0.00
4	NATGAS	PLANT	0.00	0.00
5	HYDRO		0.00	0.00
6	COAL		0.00	0.00
7	BAGASSE		0.00	0.00
8	WOOD		0.00	0.00
9	CHARCOAL	PLANT	0.00	0.00

Page 5. (PROCESS)
Capacity of the network

No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE		0.00	20024.17	0.00	0.00
2	CRUDE		0.00	132752.13	0.00	0.00
3	CRUDE	REFINERY	157.74	57165.48	0.00	0.00
4	NATGAS	PLANT	0.00	29123.88	0.00	0.00
5	HYDRO		0.00	38511.72	0.00	0.00
6	COAL		0.00	175870.34	0.00	0.00
7	BAGASSE		0.00	20233.36	0.00	0.00
8	WOOD		0.00	48573.74	0.00	0.00
9	CHARCOAL	PLANT	0.00	3907.88	0.00	0.00

Page 6. (PROCESS)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE		0.00	0.00	0.00
2	CRUDE		0.00	0.00	0.00
3	CRUDE	REFINERY	0.00	343407880.34	343407880.34
4	NATGAS	PLANT	0.00	18318920.22	0.00
5	HYDRO		0.00	0.00	0.00
6	COAL		0.00	0.00	0.00
7	BAGASSE		0.00	0.00	0.00

R E F E R E N C E   E N E R G Y   S Y S T E M.

Energy flow data - Print of calculation results.
Model : COL
Date : 1996.0
Activity group : SUPPLY,

Notes on printout.

Pages 5/6.
Total annual costs of the network

Percentage capacity saturation = Energy flow / capacity
Energy flow over capacity = Energy flow - capacity
Total capital cost = Existing + Incremental capital cost
Total Energy cost = Total capital + Total variable cost

Page 7.
External file energy flows.

Percentage flow adjustment is a variable which allows the user to dead-end a proportion of the flow at each activity element - useful for defining exports in the system. A positive value represents a percentage increase in the energy flow in the activity element (import) while a negative value is a flow out (export).

If "energy flows in" or "energy flows out" are true then energy flows in to or out from the RES at this point enabling the user to bypass part of the RES network by using external process models and their associated external files. If no external file is defined for this activity group, then "No file" will be written.

Energy flow data - Print of calculation results.
Activity group : 1 SUPPLY

Page 1. (SUPPLY)
Activity element names and efficiencies.

Activities No	Name	Category	Price unit [P]	Energy unit [E]	Percentage thermal efficiencies Base Yr	% Growth
1	GASOLINE	IMPORT	$	TCAL	97	0
2	CRUDE	DOMESTIC	$	TCAL	97	0
3	NATGAS	DOMESTIC	$	TCAL	97	0
4	HYDRO	DOMESTIC	$	TCAL	100	0
5	COAL	DOMESTIC	$	TCAL	99	0
6	BAGASSE	DOMESTIC	$	TCAL	99	0
7	WOOD	DOMESTIC	$	TCAL	97	0

Page 2. (SUPPLY)
Activity element energy flows and capacities (in energy units).

No	Name	Category	Activity Energy flow	Activity energy capacity Base Yr	% Growth	Activity energy losses
1	GASOLINE	IMPORT	20643	0	0	619
2	CRUDE	DOMESTIC	297853	0	0	8936
3	NATGAS	DOMESTIC	30025	33647	0	901
4	HYDRO	DOMESTIC	38512	0	0	0

6	BAGASSE	DOMESTIC	20438	0	0	204
7	WOOD	DOMESTIC	54105	0	0	1623

Page 3. (SUPPLY)
Unit energy costs.

No	Name	Category	Variable cost per unit energy Base Yr	% Growth	Annualised capital cost per unit existing capacity Base Yr	% Growth
1	GASOLINE	IMPORT	19630	0	0	0
2	CRUDE	DOMESTIC	6597	0	0	0
3	NATGAS	DOMESTIC	2421	0	0	0
4	HYDRO	DOMESTIC	0	0	0	0
5	COAL	DOMESTIC	4175	0	0	0
6	BAGASSE	DOMESTIC	0	0	0	0
7	WOOD	DOMESTIC	0	0	0	0

Page 4. (SUPPLY)
More unit energy costs.

No	Name	Category	Incremental capital cost per unit existing annual capacity Base Yr	% Growth
1	GASOLINE	IMPORT	0	0
2	CRUDE	DOMESTIC	0	0
3	NATGAS	DOMESTIC	0	0
4	HYDRO	DOMESTIC	0	0
5	COAL	DOMESTIC	0	0
6	BAGASSE	DOMESTIC	0	0
7	WOOD	DOMESTIC	0	0

Page 5. (SUPPLY)
Capacity of the network

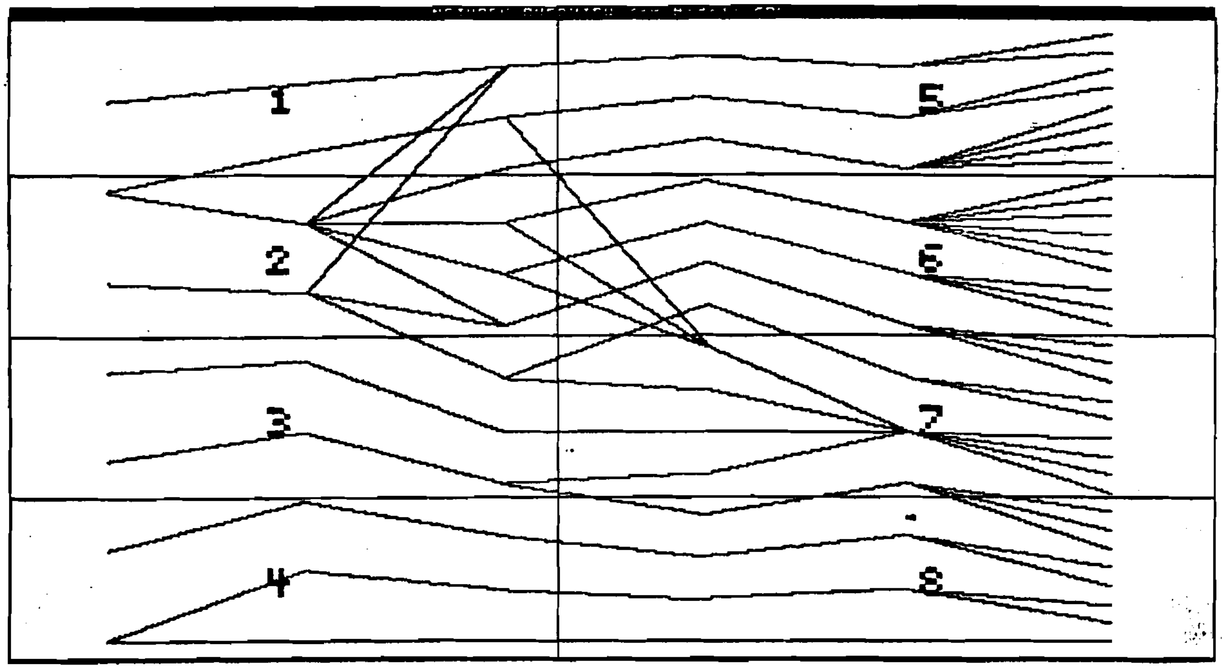
No	Name	Category	Percentage capacity saturation	Energy flow over capacity	Existing capital cost	Incr capital cost
1	GASOLINE	IMPORT	0	20643	0	0
2	CRUDE	DOMESTIC	0	297853	0	0
3	NATGAS	DOMESTIC	89	0	0	0
4	HYDRO	DOMESTIC	0	38512	0	0
5	COAL	DOMESTIC	0	177647	0	0
6	BAGASSE	DOMESTIC	0	20438	0	0
7	WOOD	DOMESTIC	0	54105	0	0

Page 6. (SUPPLY)
Total costs of the network

No	Name	Category	Total capital cost	Total variable cost	Total energy cost
1	GASOLINE	IMPORT	0	405231427	0
2	CRUDE	DOMESTIC	0	1964937595	0
3	NATGAS	DOMESTIC	0	72689600	72689600
4	HYDRO	DOMESTIC	0	0	0
5	COAL	DOMESTIC	0	741675440	0
6	BAGASSE	DOMESTIC	0	0	0

Page 7. (SUPPLY)
External file energy flows.

No	Name	Category	% Flow adjust (+/-)	Energy flows out ?	Energy flows in ?
1	GASOLINE	IMPORT	0	No File	No File
2	CRUDE	DOMESTIC	0	No File	No File
3	NATGAS	DOMESTIC	0	No File	No File
4	HYDRO	DOMESTIC	0	No File	No File
5	COAL	DOMESTIC	0	No File	No File
6	BAGASSE	DOMESTIC	0	No File	No File
7	WOOD	DOMESTIC	0	No File	No File



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DISAGREGATED DEMAND ANALYSIS SYSTEM

. DEMAND PROJECTIONS FOR THE RESIDENTIAL SECTOR

****

Local Variables for path: \NATIONAL\RESIDENT\GAS
Current Energy Toolbox Model: COL

****

(1) Annotated list of variable names, attributes and units.

Name	Attributes	Comment	Unit
GASOLINE	DEN		TCAL
GASINTEN	EPX		TCAL/$
GDP	G	in million US$ - real 1987 prc	

****

(2) List of variable names and values.

****

Name	Unit	1988.0	1989.0	1990.0	1991.0
GASOLINE	TCAL	2624.00	2755.20	2892.96	3037.61
GASINTEN	TCAL/$	0.09	0.09	0.09	0.09
GDP		30588.00	32117.40	33723.27	35409.43

Name	Unit	1992.0	1993.0	1994.0	1995.0
GASOLINE	TCAL	3189.49	3348.96	3516.41	3692.23
GASINTEN	TCAL/$	0.09	0.09	0.09	0.09
GDP		37179.91	39038.90	40990.85	43040.39

Name	Unit	1996.0	1997.0	1998.0	1999.0
GASOLINE	TCAL	3876.84	4070.69	0.00	0.00
GASINTEN	TCAL/$	0.09	0.09	0.00	0.00
GDP		45192.41	47452.03	0.00	0.00

```
**************************************************
Local Variables for path: \NATIONAL\RESIDENT\KER
Current Energy Toolbox Model: COL
**************************************************
```

(1) Annotated list of variable names, attributes and units.

Name	Attributes	Comment	Unit
KEROSENE	DEN		TCAL
KERINTEN	EPX		TCAL/$
GDP	G	in million US$ - real 1987 prc	

```
**************************************************
(2) List of variable names and values.
**************************************************
```

Name	Unit	1988.0	1989.0	1990.0	1991.0
KEROSENE	TCAL	1383.00	1452.15	1524.76	1601.00
KERINTEN	TCAL/$	0.05	0.05	0.05	0.05
GDP		30588.00	32117.40	33723.27	35409.43

Name	Unit	1992.0	1993.0	1994.0	1995.0
KEROSENE	TCAL	1681.05	1765.10	1853.35	1946.02
KERINTEN	TCAL/$	0.05	0.05	0.05	0.05
GDP		37179.91	39038.90	40990.85	43040.39

Name	Unit	1996.0	1997.0	1998.0	1999.0
KEROSENE	TCAL	2043.32	2145.49	0.00	0.00
KERINTEN	TCAL/$	0.05	0.05	0.00	0.00
GDP		45192.41	47452.03	0.00	0.00

```
***************************************************
Local Variables for path: \NATIONAL\RESIDENT\LPG
Current Energy Toolbox Model: COL
***************************************************
```

(1) Annotated list of variable names, attributes and units.

Name	Attributes	Comment	Unit
LPG	DEN		TCAL
LPGINTEN	EPX		TCAL/$
GDP	G	in million US$ - real 1987 prc	

```
***************************************************
(2) List of variable names and values.
***************************************************
```

Name	Unit	1988.0	1989.0	1990.0	1991.0
LPG	TCAL	3823.00	4014.15	4214.86	4425.60
LPGINTEN	TCAL/$	0.12	0.12	0.12	0.12
GDP		30588.00	32117.40	33723.27	35409.43

Name	Unit	1992.0	1993.0	1994.0	1995.0
LPG	TCAL	4646.88	4879.22	5123.19	5379.34
LPGINTEN	TCAL/$	0.12	0.12	0.12	0.12
GDP		37179.91	39038.90	40990.85	43040.39

Name	Unit	1996.0	1997.0	1998.0	1999.0
LPG	TCAL	5648.31	5930.73	0.00	0.00
LPGINTEN	TCAL/$	0.12	0.12	0.00	0.00
GDP		45192.41	47452.03	0.00	0.00

****
Local Variables for path: \NATIONAL\RESIDENT\ELEC
Current Energy Toolbox Model: COL
****

(1) Annotated list of variable names, attributes and units.

Name	Attributes	Comment	Unit
ELECTRIC	DEN		TCAL
ELECINTEN	EPX		TCAL/$
GDP	G	in million US$ - real 1987 prc	

****
(2) List of variable names and values.
****

Name	Unit	1988.0	1989.0	1990.0	1991.0
ELECTRIC	TCAL	9745.00	10232.25	10743.86	11281.06
ELECINTEN	TCAL/$	0.32	0.32	0.32	0.32
GDP		30588.00	32117.40	33723.27	35409.43

Name	Unit	1992.0	1993.0	1994.0	1995.0
ELECTRIC	TCAL	11845.11	12437.36	13059.23	13712.19
ELECINTEN	TCAL/$	0.32	0.32	0.32	0.32
GDP		37179.91	39038.90	40990.85	43040.39

Name	Unit	1996.0	1997.0	1998.0	1999.0
ELECTRIC	TCAL	14397.80	15117.69	0.00	0.00
ELECINTEN	TCAL/$	0.32	0.32	0.00	0.00
GDP		45192.41	47452.03	0.00	0.00

****
Local Variables for path: \NATIONAL\RESIDENT\COAL
Current Energy Toolbox Model: COL
****

(1) Annotated list of variable names, attributes and units.

Name	Attributes	Comment	Unit
COAL	DEN		TCAL
COALINTEN	EPX		TCAL/$
GDP	G	in million US$ - real 1987 prc	

****
(2) List of variable names and values.
****

Name	Unit	1988.0	1989.0	1990.0	1991.0
COAL	TCAL	1792.00	1881.60	1975.68	2074.46
COALINTEN	TCAL/$	0.06	0.06	0.06	0.06
GDP		30588.00	32117.40	33723.27	35409.43

Name	Unit	1992.0	1993.0	1994.0	1995.0
COAL	TCAL	2178.19	2287.10	2401.45	2521.52
COALINTEN	TCAL/$	0.06	0.06	0.06	0.06
GDP		37179.91	39038.90	40990.85	43040.39

Name	Unit	1996.0	1997.0	1998.0	1999.0
COAL	TCAL	2647.60	2779.98	0.00	0.00
COALINTEN	TCAL/$	0.06	0.06	0.00	0.00
GDP		45192.41	47452.03	0.00	0.00

****

Local Variables for path: \NATIONAL\RESIDENT\CHARC

Current Energy Toolbox Model: COL

****

(1) Annotated list of variable names, attributes and units.

Name	Attributes	Comment	Unit
CHARCOAL	DEN		TCAL
CHARCINTEN	EPX		TCAL/$
POPULATION	G	in thousands	

****

(2) List of variable names and values.

****

Name	Unit	1988.0	1989.0	1990.0	1991.0
CHARCOAL	TCAL	648.00	660.25	672.73	684.23
CHARCINTEN	TCAL/$	0.02	0.02	0.02	0.02
POPULATION		32000.00	32604.80	33221.03	33789.11

Name	Unit	1992.0	1993.0	1994.0	1995.0
CHARCOAL	TCAL	695.93	707.83	719.93	732.24
CHARCINTEN	TCAL/$	0.02	0.02	0.02	0.02
POPULATION		34366.90	34954.58	35552.30	36160.25

Name	Unit	1996.0	1997.0	1998.0	1999.0
CHARCOAL	TCAL	742.50	752.89	0.00	0.00
CHARCINTEN	TCAL/$	0.02	0.02	0.00	0.00
POPULATION		36666.49	37179.82	0.00	0.00

****
Local Variables for path: \NATIONAL\RESIDENT\WOOD
Current Energy Toolbox Model: COL
****

(1) Annotated list of variable names, attributes and units.

Name	Attributes	Comment	Unit
WOOD	DEN		TCAL
WOODINTEN	EPX		TCAL/$
POPULATION	G	in thousands	

****
(2) List of variable names and values.
****

Name	Unit	1988.0	1989.0	1990.0	1991.0
WOOD	TCAL	33134.00	33760.23	34398.30	34986.51
WOODINTEN	TCAL/$	1.04	1.04	1.04	1.04
POPULATION		32000.00	32604.80	33221.03	33789.11

Name	Unit	1992.0	1993.0	1994.0	1995.0
WOOD	TCAL	35584.78	36193.28	36812.19	37441.67
WOODINTEN	TCAL/$	1.04	1.04	1.04	1.04
POPULATION		34366.90	34954.58	35552.30	36160.25

Name	Unit	1996.0	1997.0	1998.0	1999.0
WOOD	TCAL	37965.86	38497.38	0.00	0.00
WOODINTEN	TCAL/$	1.04	1.04	0.00	0.00
POPULATION		36666.49	37179.82	0.00	0.00

```
****************************************************
Local Variables for path: \NATIONAL\RESIDENT\NATGAS
Current Energy Toolbox Model: COL
****************************************************
```

(1) Annotated list of variable names, attributes and units.

Name	Attributes	Comment	Unit
NATGAS	DEN		TCAL
NATGASINTE	EPX		TCAL/$
GDP	G	in million US$ - real 1987 prc	

```
****************************************************
(2) List of variable names and values.
****************************************************
```

Name	Unit	1988.0	1989.0	1990.0	1991.0
NATGAS	TCAL	878.00	921.90	968.00	1016.39
NATGASINTE	TCAL/$	0.03	0.03	0.03	0.03
GDP		30588.00	32117.40	33723.27	35409.43

Name	Unit	1992.0	1993.0	1994.0	1995.0
NATGAS	TCAL	1067.21	1120.58	1176.60	1235.43
NATGASINTE	TCAL/$	0.03	0.03	0.03	0.03
GDP		37179.91	39038.90	40990.85	43040.39

Name	Unit	1996.0	1997.0	1998.0	1999.0
NATGAS	TCAL	1297.21	1362.07	0.00	0.00
NATGASINTE	TCAL/$	0.03	0.03	0.00	0.00
GDP		45192.41	47452.03	0.00	0.00

File : C:\ETB\COL\COL.BOB(10/3/1991) Friday October 11, 1991

base year objective function

No	VarName	Cost Coef	TimeF	Change Rate	Group Name
1	GasRes	0.0000	0	0.0000	DEMAND
2	GasTra	0.0000	0	0.0000	DEMAND
3	CruExp	0.0000	0	0.0000	DEMAND
4	CruInd	0.0000	0	0.0000	DEMAND
5	KerRes	0.0000	0	0.0000	DEMAND
6	KerTra	0.0000	0	0.0000	DEMAND
7	KerExp	0.0000	0	0.0000	DEMAND
8	KerInd	0.0000	0	0.0000	DEMAND
9	DieTra	0.0000	0	0.0000	DEMAND
10	DieExp	0.0000	0	0.0000	DEMAND
11	DieInd	0.0000	0	0.0000	DEMAND
12	DieCom	0.0000	0	0.0000	DEMAND
13	DieAgr	0.0000	0	0.0000	DEMAND
14	DieOth	0.0000	0	0.0000	DEMAND
15	FueExp	0.0000	0	0.0000	DEMAND
16	FueInd	0.0000	0	0.0000	DEMAND
17	FueCom	0.0000	0	0.0000	DEMAND
18	LpgRes	0.0000	0	0.0000	DEMAND
19	LpgInd	0.0000	0	0.0000	DEMAND
20	LpgCom	0.0000	0	0.0000	DEMAND
21	NatRes	0.0000	0	0.0000	DEMAND
22	NatInd	0.0000	0	0.0000	DEMAND
23	EleRes	0.0000	0	0.0000	DEMAND
24	EleExp	0.0000	0	0.0000	DEMAND
25	EleInd	0.0000	0	0.0000	DEMAND
26	EleCom	0.0000	0	0.0000	DEMAND
27	CoaRes	0.0000	0	0.0000	DEMAND
28	CoaExp	0.0000	0	0.0000	DEMAND
29	CoaInd	0.0000	0	0.0000	DEMAND
30	BagInd	0.0000	0	0.0000	DEMAND
31	BagAgr	0.0000	0	0.0000	DEMAND
32	WooRes	0.0000	0	0.0000	DEMAND
33	WooAgr	0.0000	0	0.0000	DEMAND
34	ChaRes	0.0000	0	0.0000	DEMAND
35	Gasoli	0.0000	0	0.0000	TRA/DIST
36	Crude	0.0000	0	0.0000	TRA/DIST
37	Kerose	0.0000	0	0.0000	TRA/DIST
38	Diesel	0.0000	0	0.0000	TRA/DIST
39	Fueloi	0.0000	0	0.0000	TRA/DIST
40	Lpg	0.0000	0	0.0000	TRA/DIST
41	Natgas	0.0000	0	0.0000	TRA/DIST
42	EleGen	0.0000	0	0.0000	TRA/DIST
43	Coal	0.0000	0	0.0000	TRA/DIST
44	Bagass	0.0000	0	0.0000	TRA/DIST
45	Wood	0.0000	0	0.0000	TRA/DIST
46	Charco	0.0000	0	0.0000	TRA/DIST
47	Eleliq	3.4387	0	0.0000	ELECGEN
48	Elegas	3.4387	0	0.0000	ELECGEN
49	Elehyd	3.4387	0	0.0000	ELECGEN
50	Elecoa	3.4387	0	0.0000	ELECGEN

No	VarName	Cost Coef	TimeF	Change Rate	Group Name
51	Crude	0.0000	0	0.0000	ENGY PRD
52	Diesel	0.0000	0	0.0000	ENGY PRD
53	Fueloi	0.0000	0	0.0000	ENGY PRD
54	Natgas	0.0000	0	0.0000	ENGY PRD
55	Coal	0.0000	0	0.0000	ENGY PRD
56	Gasoli	0.0000	0	0.0000	PROCESS
57	CruRef	0.5251	0	0.0000	PROCESS
58	NatPla	0.1502	0	0.0000	PROCESS
59	ChaPla	0.2388	0	0.0000	PROCESS
60	GasImp	4.6876	0	0.0000	SUPPLY
61	CruDom	1.5754	0	0.0000	SUPPLY
62	NatDom	0.5781	0	0.0000	SUPPLY
63	CoaDom	0.9970	0	0.0000	SUPPLY
64	BagDom	0.0000	0	0.0000	SUPPLY
65	WooDom	0.0000	0	0.0000	SUPPLY
66	Crude1	0.0000	0	0.0000	Sup auxiliary
67	Diesel	0.0000	0	0.0000	Sup auxiliary
68	Fuelo1	0.0000	0	0.0000	Sup auxiliary
69	CruRe1	0.0000	0	0.0000	Sup auxiliary
70	CruRe2	0.0000	0	0.0000	Sup auxiliary
71	NatP11	0.0000	0	0.0000	Sup auxiliary
72	NatP12	0.0000	0	0.0000	Sup auxiliary

File : C:\ETB\COL\COL.BBD(10/13/1991) Sunday October 13, 1991

base year Bounds page : 1-1

No	Bound Name	Type(<=>)	Bound Value	TimeFeature	Group Name
1	GasRes	>=	10988274.7070	50	Lbound of GasRes
2	GasTra	>=	188706030.1500	49	Lbound of GasTra
3	CruExp	>=	328249581.2400	48	Lbound of CruExp
4	CruInd	>=	26989112.2280	47	Lbound of CruInd
5	KerRes	>=	5791457.2864	46	Lbound of KerRes
6	KerTra	>=	18961474.0370	45	Lbound of KerTra
7	KerExp	>=	5083752.0938	44	Lbound of KerExp
8	KerInd	>=	3333333.3333	43	Lbound of KerInd
9	DieTra	>=	32872696.8170	42	Lbound of DieTra
10	DieExp	>=	9886934.6734	41	Lbound of DieExp
11	DieInd	>=	7650753.7688	40	Lbound of DieInd
12	DieCom	>=	5757956.4489	39	Lbound of DieCom
13	DieAgr	>=	10561139.0280	38	Lbound of DieAgr
14	DieOth	>=	12654941.3740	37	Lbound of DieOth
15	FueExp	>=	132035175.8800	36	Lbound of FueExp
16	FueInd	>=	4451423.7856	35	Lbound of FueInd
17	FueCom	>=	1122278.0570	34	Lbound of FueCom
18	LpgRes	>=	16009212.7300	33	Lbound of LpgRes
19	LpgInd	>=	288944.7236	32	Lbound of LpgInd
20	LpgCom	>=	1206030.1508	31	Lbound of LpgCom
21	NatRes	>=	3676716.9179	30	Lbound of NatRes
22	NatInd	>=	37412060.3020	29	Lbound of NatInd
23	EleRes	>=	40808207.7050	28	Lbound of EleRes
24	EleInd	>=	30473199.3300	26	Lbound of EleInd
25	EleCom	>=	16042713.5680	25	Lbound of EleCom
26	CoaRes	>=	7504187.6047	24	Lbound of CoaRes
27	CoaExp	>=	284690117.2500	23	Lbound of CoaExp
28	CoaInd	>=	75774706.8680	22	Lbound of CoaInd
29	BagInd	>=	31616415.4100	21	Lbound of BagInd
30	BagAgr	>=	22864321.6080	20	Lbound of BagAgr
31	WooRes	>=	138752093.8000	19	Lbound of WooRes
32	WooAgr	>=	23182579.5640	18	Lbound of WooAgr
33	ChaRes	>=	2713567.8392	17	Lbound of ChaRes
34	Eleliq	<=	5360134.0033	0	Ubound of Eleliq
35	Elegas	<=	5360134.0033	0	Ubound of Elegas
36	Elehyd	<=	195561139.0300	0	Ubound of Elehyd
37	Elecoa	<=	56302345.0590	0	Ubound of Elecoa
38	kerose	<=	53333333.0000	0	Ubound of
39	Diesel	<=	82500000.0000	0	Ubound of Diesel
40	Fueloi	<=	144160000.0000	0	Ubound of Fueloi
41	CruRef	<=	414572864.3200	0	Ubound of CruRef
42	NatDom	<=	140900335.0100	0	Ubound of NatDom
43	CruRe1	<=	123750000.0000	0	Ubound of CruRe1
44	CruRe2	<=	8250000.0000	0	Ubound of CruRe2

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-1

Group : demand/supply balance constraints
Subgroup : supply constraints of Gasoli
ConsName : SupC1
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Gasoli	0.9500	0	0
2	GasRes	-1.0000	0	0
3	GasTra	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-2

Group : demand/supply balance constraints
Subgroup : supply constraints of Crude
ConsName : SupC2
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Crude	0.9500	0	0
2	CruExp	-1.0000	0	0
3	CruInd	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-3

Group : demand/supply balance constraints
Subgroup : supply constraints of Kerose
ConsName : SupC3
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Kerose	0.9500	0	0
2	KerRes	-1.0000	0	0
3	KerTra	-1.0000	0	0
4	KerExp	-1.0000	0	0
5	KerInd	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-4

Group : demand/supply balance constraints
Subgroup : supply constraints of Diesel
ConsName : SupC4
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Diesel	0.9500	0	0
2	DieTra	-1.0000	0	0
3	DieExp	-1.0000	0	0
4	DieInd	-1.0000	0	0
5	DieCom	-1.0000	0	0
6	DieAgr	-1.0000	0	0
7	DieOth	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-5

Group : demand/supply balance constraints
Subgroup : supply constraints of Fueloi
ConsName : SupC5
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Fueloi	0.9500	0	0
2	FueExp	-1.0000	0	0
3	FueInd	-1.0000	0	0
4	FueCom	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-6

Group : demand/supply balance constraints
Subgroup : supply constraints of Lpg
ConsName : SupC6
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Lpg	0.9500	0	0

3	LpgInd	-1.0000	0	0
4	LpgCom	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-7

Group : demand/supply balance constraints
Subgroup : supply constraints of Natgas
ConsName : SupC7
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Natgas	0.9500	0	0
2	NatRes	-1.0000	0	0
3	NatInd	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-8

Group : demand/supply balance constraints
Subgroup : supply constraints of EleGen
ConsName : SupC8
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	EleGen	0.7500	0	0
2	EleRes	-1.0000	0	0
3	EleExp	-1.0000	0	0
4	EleInd	-1.0000	0	0
5	EleCom	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-9

Group : demand/supply balance constraints
Subgroup : supply constraints of Coal
ConsName : SupC9
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Coal	0.9500	0	0

No	VarName	Coefficient	TimeF	Lifetime
3	CoaExp	-1.0000	0	0
4	CoaInd	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-10

Group : demand/supply balance constraints
Subgroup : supply constraints of Bagass
ConsName : SupC10
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Bagass	0.9500	0	0
2	BagInd	-1.0000	0	0
3	BagAgr	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-11

Group : demand/supply balance constraints
Subgroup : supply constraints of Wood
ConsName : SupC11
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Wood	0.9500	0	0
2	WooRes	-1.0000	0	0
3	WooAgr	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-12

Group : demand/supply balance constraints
Subgroup : supply constraints of Charco
ConsName : SupC12
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Charco	0.9500	0	0
2	ChaRes	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-13

Group : demand/supply balance constraints
Subgroup : demand constraints of EleGen
ConsName : DemC1
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	EleGen	-1.0000	0	0
2	Eleliq	0.2400	0	0
3	Elegas	0.2600	0	0
4	Elehyd	0.8000	0	0
5	Elecoa	0.2200	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-14

Group : demand/supply balance constraints
Subgroup : supply constraints of Crude
ConsName : SupC13
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Crude	1.0000	0	0
2	Crude	-1.0000	0	0
3	Crudel	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-15

Group : demand/supply balance constraints
Subgroup : supply constraints of Diesel
ConsName : SupC14
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Diesel	1.0000	0	0
2	Diesel	-1.0000	0	0
3	Diesel	-1.0000	0	0

```
File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints                                            cons : 30-16
==============================================================================
       Group : demand/supply balance constraints
    Subgroup : supply constraints of Fueloi
    ConsName : SupC15
    LEG(<=>) : =
         RHS : 0.0000
 TimeFeature : 0
ExpansiveCons : N
                   --------------------------------------------------
                        No   VarName   Coefficient   TimeF  Lifetime

                   --------------------------------------------------
                         1   Fueloi         1.0000     0        0
                         2   Fueloi        -1.0000     0        0
                         3   Fuelo1        -1.0000     0        0
==============================================================================

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints                                            cons : 30-17
==============================================================================
       Group : demand/supply balance constraints
    Subgroup : supply constraints of Natgas
    ConsName : SupC16
    LEG(<=>) : =
         RHS : 0.0000
 TimeFeature : 0
ExpansiveCons : N
                   --------------------------------------------------
                        No   VarName   Coefficient   TimeF  Lifetime

                   --------------------------------------------------
                         1   Natgas         1.0000     0        0
                         2   Natgas        -1.0000     0        0
                         3   Elegas        -1.0000     0        0
==============================================================================

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints                                            cons : 30-18
==============================================================================
       Group : demand/supply balance constraints
    Subgroup : supply constraints of Coal
    ConsName : SupC17
    LEG(<=>) : =
         RHS : 0.0000
 TimeFeature : 0
ExpansiveCons : N
                   --------------------------------------------------
                        No   VarName   Coefficient   TimeF  Lifetime

                   --------------------------------------------------
                         1     Coal         1.0000     0        0
                         2   Elecoa        -1.0000     0        0
                         3     Coal        -1.0000     0        0
==============================================================================

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
```

Group : demand/supply balance constraints
Subgroup : demand constraints of Eleliq
ConsName : DemC2
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Eleliq	-1.0000	0	0
2	Crude1	1.0000	0	0
3	Diese1	1.0000	0	0
4	Fuelo1	1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-20

Group : demand/supply balance constraints
Subgroup : supply constraints of CruRef
ConsName : SupC18
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	CruRef	0.9500	0	0
2	CruRe1	-1.0000	0	0
3	Kerose	-1.0000	0	0
4	Diesel	-1.0000	0	0
5	Fueloi	-1.0000	0	0
6	CruRe2	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-21

Group : demand/supply balance constraints
Subgroup : supply constraints of NatPla
ConsName : SupC19
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	NatPla	0.9000	0	0
2	NatPl1	-1.0000	0	0
3	NatPl2	-1.0000	0	0
4	Natgas	-1.0000	0	0

Group : demand/supply balance constraints
Subgroup : supply constraints of ChaPla
ConsName : SupC20
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	ChaPla	0.2000	0	0
2	Charco	-1.0000	0	0

Group : demand/supply balance constraints
Subgroup : demand constraints of Gasoli
ConsName : DemC3
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Gasoli	-1.0000	0	0
2	Gasoli	1.0000	0	0
3	CruRe1	1.0000	0	0
4	NatPl1	1.0000	0	0

Group : demand/supply balance constraints
Subgroup : demand constraints of Lpg
ConsName : DemC4
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	Lpg	-1.0000	0	0
2	CruRe2	1.0000	0	0
3	NatPl2	1.0000	0	0

Group : demand/supply balance constraints
Subgroup : supply constraints of GasImp
ConsName : SupC21
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	GasImp	0.0097	0	0
2	Gasoli	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-26

Group : demand/supply balance constraints
Subgroup : supply constraints of CruDom
ConsName : SupC22
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	CruDom	0.0097	0	0
2	Crude	-1.0000	0	0
3	CruRef	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-27

Group : demand/supply balance constraints
Subgroup : supply constraints of NatDom
ConsName : SupC23
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	NatDom	0.0097	0	0
2	NatPla	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-28

Group : demand/supply balance constraints
Subgroup : supply constraints of CoaDom
ConsName : SupC24
LEG(<=>) : =

TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	CoaDom	0.0099	0	0
2	Coal	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-29

Group : demand/supply balance constraints
Subgroup : supply constraints of BagDom
ConsName : SupC25
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	BagDom	0.0099	0	0
2	Bagass	-1.0000	0	0

File : C:\ETB\COL\COL.BCN(10/11/1991)C:\ETB\COL\COL.BCV(10/11/1991)
Print time : Sunday October 13, 1991
base year Constraints cons : 30-30

Group : demand/supply balance constraints
Subgroup : supply constraints of WooDom
ConsName : SupC26
LEG(<=>) : =
RHS : 0.0000
TimeFeature : 0
ExpansiveCons : N

No	VarName	Coefficient	TimeF	Lifetime
1	WooDom	0.0097	0	0
2	Wood	-1.0000	0	0
3	ChaPla	-1.0000	0	0