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THE ENVEST ENERGY PLANNING SUPPORT SYSTEM

USER'S MANUAL

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What EnVest Does

As a user of the EnVest planning support package, you are presumably charged with the responsibility to analyze major policy options in the energy sector. EnVest has been designed as a tool for you to handle the tasks flowing from that responsibility. It helps you in preparing the data, conducting the analysis and preparing reports to inform and guide policy makers. First, it makes organizing, updating and keeping track of the data needed in energy planning much easier. These data include: descriptions of major building blocks of energy policy, namely specific investment projects and programs; information about the energy sector and its relation with the economy; assumptions and hypotheses (either your own or those of others) about trends and developments shaping the future environment for energy policies.

Second, EnVest gives you the means to analyze a particular planning issue easily and quickly. The issue may be narrowly defined; that is, some particular questions posed by policy decisions at hand. It may also be broader, such as an exploration of major strategic options in the energy sector. You can use the EnVest package to develop quantitative estimates of the economic or financial performance of some energy investment project, or to appraise the likely consequences of carrying out a particular energy investment program.

More specifically, EnVest helps the user in any of the four major tasks of national energy planning:

(1) maintain an up-to-date file of energy investment projects, or major energy technology programs (such as rural electrification through small-scale power plants, or energy conservation efforts);

(2) formulate scenarios describing possible environments for individual energy investment projects or for overall energy strategies, such as price trends for energy products;

(3) conduct economic appraisals of particular energy investment projects under alternative assumptions about how project inputs and outputs should be valued (priced), using a common analytical framework across different types of projects;

(4) explore the consequences of an energy investment portfolio -- a program of major energy investments defined over a suitably long time horizon -- under different assumptions about the economic and technological policy environment in the future.

The EnVest software package is integrated in the sense that the analytical portions for both project appraisal and portfolio analysis use the same data sets, and that you can go from one part of the package to another by simply choosing options from a series of menus and submenus. These menus list the available options at each step, making it possible for you to pro-

ceed without much additional guidance, once the basic tasks and concepts of national energy planning are understood. You can even request instructions or explanations of particular options at many points in the system. Thus, even the uninitiated could (in principle) use EnVest without recourse to written instructions or information.

That implies, of course, that this manual is superfluous. But things rarely go as smoothly as the program designer expected. This manual, therefore, serves three functions: it provides an introduction to the various functions of EnVest, in a step-by-step overview, and by means of selected examples; it explains some of the concepts and methods used at least in a more general form to help you understand why things are done a certain way and what happens at various steps; finally, the manual should serve as a simple reference if menus and on-screen explanations are no longer enough. For further clarification, all menus and screen prompts are provided here in English, rather than the original French.

Preparations: Before You Get Started

To keep things simple, we assume that the hardware is set up, and that both the Apple Pascal Operating System, which controls the microcomputer and its peripherals like the printer, and the EnVest planning support system have been installed. Let's review briefly what's there. (Appendix A provides some more detailed instructions to transferring the EnVest system from the floppy-disks used for storage and backup to the hard-disk, and getting it all up and running.)

The hardware needed to run the Apple version of EnVest for Morocco comprises the following components:

- the microcomputer itself, either an Apple II+ with a Language Card (or some other memory expansion card) to bring its total memory (RAM) to 64K, or an Apple IIe, which already comes with a minimum of 64K installed;
- a video monitor, which could be either a color or a monochrome monitor;
- a printer, preferably the C. Itoh Prowriter (8510A) to allow you to print out graphs along with tables and text (any other printer with the Grappler interface card should work too);
- a floppy-disk drive; and
- a hard-disk, presumably the Corvus hard-disk with at least 5 megabytes of storage (formatted).

Let's assume all these pieces are there and properly connected. To get started, turn on the monitor, the printer, the hard-disk drive and -- last -- the computer itself. What happens then depends on the specific setup. Under the regular arrangement, the screen will show the logo of the Ministry of Energy and Mines:

After a few seconds, the following message will appear at the bottom of the screen:

PRESS RETURN TO CONTINUE...

Once you hit the RETURN key, the system prompts you for today's date (day, month and year). To keep the date shown, simply press RETURN for any line. After you have finished the date, the EnVest access menu will appear on the screen (since it is a disk-based system, the transition from one component to the next always takes a few seconds):

```
                    MAIN OPERATIONS MENU
                       *** ENVEST ***
==========================================

WORK OPTION CHOICE:

(1) MODIFY/EXAMINE THE INVENTORY OF
      PROJECTS;
(2) FORMULATE SCENARIOS (ECONOMIC-
      DEMOGRAPHIC, RATES, WORLD PRICES,
      ENERGY USE);
(3) ACTIVATE THE ECONOMIC ANALYSIS
      OF A PROJECT;
(4) CREATE A PORTFOLIO OR SIMULATE
      ITS YIELD;
(5) DISPLAY GRAPHIC SUMMARIES;
(6) CHANGE THE RECORDED DATE;

(9) QUIT ENVEST/RETURN TO APPLE PASCAL.

SELECTED CHOICE: _
```

If the system didn't start with the MEM logo, you should find yourself in the command mode of the Apple Pascal Operating System:*

```
COMMAND: E(DIT, R(UN, F(ILE, C(OMP, L(IN


WELCOME SYS, TO APPLE II PASCAL 1.1

BASED ON UCSD PASCAL II.1

CURRENT DATE IS 28-MAR-84


(C) APPLE COMPUTER INC. 1979, 1980
(C) U.C. REGENTS 1979
```

To get from there to the EnVest access menu, simply type "X" (for eXecute). The Operating System clears the screen and asks:

EXECUTE WHAT FILE?_ - (the _ refers to the cursor which is a rectangle on the screen)

In response to that, you type (what else?) "ENVEST", and press the RETURN key. That will bring up the EnVest access menu which gives you a choice of any of the applications parts of EnVest, allows you to change the date, or put you back into the command mode of the Apple Pascal Operating System.

One more introductory comment. The EnVest planning support system is designed to work with a 40-column screen. However, the Apple Pascal Operating System in fact works with 80 columns, showing only the first 40 on the screen. In general, that is sufficient. However, there are instances when 40 columns are not enough, for example, when you want to see some descriptive comments which may be up to 80 columns long. In that case, you can see the other 40 columns, the second page so to speak, by pressing CTRL-A (holding down the CTRL key and typing A). Pressing CTRL-A again gets you back to the first page. EnVest will also work with an Apple II equipped with an 80-column card. For example, much of the development work in fact used an Apple IIe with 80 columns.

---

* Appendix A of this manual presents a very brief introduction to the Pascal Operating System on the Apple II.

The next few sections will guide you through the applications options listed in the EnVest access menu; that is, the first five choices.

Project Data Base Management

When you choose option "1" from the EnVest access menu, you can now inspect, modify, add to or print out portions of the energy investment data base. When you type "1" (without pressing RETURN), EnVest switches to the other menu, the project data base management menu:

```
                PROJECT FILE MANAGEMENT
                   *** ENVEST ***
========================================

CHOICE OF OPERATIONS:

(1) SCAN THE CONTENTS OF THE FILE;
(2) MODIFY/ADD A PROJECT RECORD;
(3) EXAMINE A PROJECT RECORD;
(4) PRINT THE SUMMARY OF A PROJECT;

(9) RETURN TO THE MAIN MENU

SELECTED OPTION: _
```

Let's look at the major options in this menu. To get a listing of the projects currently in the file, you would type "1" (again without a RETURN). EnVest then prompts you for a choice of the medium for the listing, the screen, the printer, or both:

```
                PROJECT FILE MANAGEMENT
                   *** ENVEST ***
========================================

SCAN THE CONTENTS OF THE FILE

(1) ON THE SCREEN
(2) ON THE PRINTER, OR
(3) ON BOTH?

(9) TERMINATE/SKIP THE OPERATION

SELECTED OPTION:
```

Normally, you would keep an up-to-date list of the contents of the investment project file by printing a new listing every time you add any projects. But you may not have that list handy to find the number of a project you want to examine or modify, or to find an open slot for a new project you want to add. That's why EnVest gives you the option here to scan the contents of the project file.

To keep things organized, it is probably a good idea to maintain some rough grouping of projects by type. For the initial set of projects, we have organized them into the following groups:

Project No.	Project Type	Project Type No.
1-10	Thermal power plants	1
11-20	Hydropower plants	2
21-30	Refineries and shale oil retorting	3, 4
31-40	Upgrading of shale crude and other	5
41-50	Natural gas field development	7
51-60	Coal or shale oil mines	6
61-70	Fuelwood	8
71-80	Renewable/nonconventional energy	9, 10
81-90	Energy Conservation	11
91-100	Infrastructure investment/R&D	12, 13

As currently designed, the data base has room for 100 projects. Please note that the rough assignment of project types to project numbers is intended only as an aid to finding a particular project quickly. It is perfectly permissable to use any number for any project type.

That said, let's take a look at the listing of projects in the file on the screen. In response to the last prompt, you type "1". EnVest then scans the data base to identify and list projects already entered. It lists them in groups of four to give you time to digest the information:

```
                PROJECT FILE MANAGEMENT
                    *** ENVEST ***
=========================================

PROJECT NO. 1   TYPE NO.  1
MOHAMMEDIA PLANT, UNITS 3 AND 4

PROJECT NO. 2   TYPE NO.  1
NUCLEAR PLANT, 600 MW

PROJECT NO. 3   TYPE NO.  1
COAL-FIRED PLANT, 2 X 300 MW

PROJECT NO. 4   TYPE NO.  1
GAS TURBINE, 2 X 90/100, (KENITRA, OPT.)


              RECORD EXAMINED:    4
C(ONTINUE OR Q(UIT THE PROGRAM....
```

As shown, EnVest gives you the project number, the project type number, and the project name.

In this listing, EnVest skips any blank record (any project number for which nothing has been defined as yet). The bottom of the screen shows the project (or record) number the project has just examined. By the way, you can quit the project data base management program after any set of four projects shown by typing "Q" (instead of "C") in response to the prompt at the bottom of the screen,

C(ONTINUE OR Q(UIT THE PROGRAM..._

Typing "Q" will bring you back to the EnVest access menu.

Figure 1 presents a sample listing of the contents of the project data base on the printer. If you select the printer only (option "2"), the screen remains blank, showing only the number of the record currently examined. If you choose a listing on both media (option "3"), EnVest first presents the listing on the screen, then on the printer. Exhibit 1 shows a sample listing.

Once it is done with the listing of projects, EnVest will put you back into the main menu for project data base management. Suppose you want to add a new project or modify data for an existing one. In that case, you select option "2" from this menu. EnVest now asks you for the desired project number:

```
PROJECT FILE MANAGEMENT
*** ENVEST ***
========================================

MODIFY/ADD WHICH PROJECT?
SELECT THE NUMBER (1 ... 100)      __
```

Before we go on, let's just note that there is really only one difference between options 2 and 3 in the main project menu: if you choose to examine some project (option "3"), you cannot alter any of the data. Otherwise, the project description screens will appear in the same order as for option "2". The examination-only screens also show the line,

C(ONTINUE OR Q(UIT THE PROGRAM..._

at the bottom of the screen to allow to go through the various screens at your own pace. Because options "2" and "3" are so similar in appearance, we'll go only once through the sequence of screens displaying project information for changes/additions or simply for inspection.

These screens present in sequence the descriptors for each project. When you enter a new project, the information displayed is all zeroes and blanks. Project descriptors are grouped into two sets -- those common to all project types, and those specific for any of the thirteen different types of projects. This guide shows you the information categories common to all project types, as well as the project-specific information for the project type 1. Appendix B provides a list of the descriptors for all project types with brief explanations.

Now to choose a project, type the desired number and press RETURN. (If EnVest knows how many keystrokes are possible in a particular answer, the RETURN is not needed. For example, all menu choices can be specified by typing a single number. In those cases, EnVest reacts as soon as the number has been typed. When the answers may involve a number of keystrokes, as in the case of the project number, you have to let the system know that you are done with the entry by pressing RETURN. If you just press RETURN without typing a number, EnVest will assume the default value shown, project no. 1.

Suppose now you want to modify any of the data for project no. 1, which in the baseline data base describes the in-construction conversion of units III and IV of the Mohammedia power plant from the original design to burn fuel oil to coal. EnVest starts out by presenting you with a screen containing four lines of information -- the project number, the project type number, project title or description and the brief identifier. (The brief identifier is used in graphics and in other places where the full name won't fit.) The cursor will be on the project type number:

```
PROJECT NUMBER:   1      TYPE NO.  1
NAME OF PROJECT:
 MOHAMMEDIA PLANT, UNITS 3 AND 4
PROJECT IDENTIFIER:   MOH34
=====================================
```

At this point, you have an option which has not been documented on the screen, for good reason. At this point, you can, in fact, change the type number; thereby freeing up one record in the file for that type number. This process effectively destroys the information in that record. It's a fairly radical operation, and should, therefore, be used only if you are running out of space in the project file. (Since we are far from that point, all the effects of changing the type number have not been fully tested. Care is advised in using this option.)

In most cases, such radical surgery on the data base is not required. To continue, simply press RETURN. EnVest then presents the remainder of the screen:

```
PROJECT NUMBER:   1      TYPE NO.  1
NAME OF PROJECT:
 MOHAMMEDIA PLANT, UNITS 3 AND 4
PROJECT IDENTIFIER:   MOH34
=====================================
INVESTMENT - FOREIGN EXCHANGE
                        (DH): 1.25000E+09
INVESTMENT
  - LOCAL CURRENCY 1   (DH): 5.50000E+08
  - LOCAL CURRENCY 2   (DH):          0

EXCHANGE RATE     (DH/US-$):        8.00
EFFECTIVE DATE OF THIS EXCHANGE
RATE (MONTH/DAY/YEAR):       01/01/84

CONSTRUCTION LABOR FORCE
   - UNSKILLED                 200
   - SKILLED                   400
   - PROFESSIONAL STAFF        150
   - OFFICE WORKERS             10
```

The screen displays nine pieces of information on the project. The first three lines below the dashed line refer to the investment associated with the project. All these figures are in Dirhams, calculated at some given exchange rate. Unless the amount is less than 1 million Dirhams, these figures are displayed in scientific (or engineering) notation. For example, the foreign exchange component of the investment for our sample project, Units III and IV of the Mohammedia power plant, has been estimated at the equivalent of 1,250,000,000 Dirhams (at the early-1984 exchange rate of 8 Dirhams/US-$). This estimate is displayed as 1.25000E+09, or 1.25 x 10 to the 9th power. You can type in any new figure either in the same notation or enter all the digits. To illustrate the options, let's take an example. Suppose you want to change the 1.25 billion Dirhams shown for project no. 1 to 1.35 billion Dirhams. With the cursor on the original figure, you can now type in this new estimate in any of the following forms:

```
1.35E9
1.35E+09
1350E6
1350E+06
1350E+6
1350000000 (seven 0's)
etc.
```

Once you press RETURN, EnVest will display for all of these options the same result: 1.35000E+09. Smaller number, up to a million, are shown using the American/British convention for delineating thousands, e.g., 999,999.

The first of the three investment cost figures is the portion of the total needed in foreign exchange. That figure is usually easily available. The second item is the local currency component. It's broken down into two parts. The first part refers to all purchases as part of the investment that are truly local, such as raw materials, etc. The second part ("LOCAL CURRENCY 2"), refers to those local purchases that have been imported by somebody else and are offered on the domestic market. If such a figure is

in fact available, it will assist the analyst in using the true foreign exchange cost of the project in the economic appraisal process. However, the indirect foreign exchange costs are usually not available. In that case, the total investment comprises the first two elements, the foreign exchange and the local currency components.

The conversion of the foreign exchange estimate to Dirhams uses a certain exchange rate, specified on the next line, followed by the date for which this exchange rate held. The date specification uses the American convention of putting the month first.

Finally, the first screen also holds the information on the labor force required for the construction of the project. That information is needed for appraising employment impacts. It can also be used downstream to perform an economic appraisal of the project by pricing labor in the different categories at its true economic cost (its shadow price).

Once you are done with this screen, either by replacing the information displayed with new estimates, or by keeping the existing information by pressing RETURN, EnVest goes on to the next project screen which shows estimates of the uncertainty parameters for total investment and construction time.

```
INVESTMENT & CONSTRUCTION DATA
======================================
ESTIMATES (INVESTMENT):
 IN PERCENT; LOW VALUE:   95.0
             - AVERAGE:  100.0
                - HIGH:  105.0

ESTIMATES (CONSTRUCTION TIME):
 IN MONTHS;  LOW VALUE:      40
             - AVERAGE:      42
                - HIGH:      44

COVARIANCE OF INVESTMENT/
  CONSTRUCTION TIME:                1.000
```

The first three items under the title lines show the project planner's expectations of the minimum, the maximum, and the most likely value for total investment, all expressed as a percentage of the sum of the three investment elements shown on the first screen. The most likely value ("AVERAGE") must always be 100 percent. In the case of our example, the three percentages are very close together, since the project is virtually completed and estimates have been updated. In general, the criterion for the extreme estimates is simple: the project analyst should be certain that the project cannot be completed for less than the minimum, or that it will require more than the maximum. To reach that certainty, it may be necessary to increase the spread a little more.

The next three data items show the project analyst's estimates of the minimum, the maximum and the most likely construction time for the project. The most likely value is the design target. The minimum and maximum estimates are derived using the same decision rules as for the investment cost uncertainty percentages. In the typical case, the difference between the

maximum value and the most likely value will be greater than between the minimum and the most likely value: experience suggests that time and cost overruns are more common than underruns.

The last data item on this screen shows a measure of the association between investment and construction time. This measure relates to EnVest's treatment of risk associated with investment cost and construction time: the two are assumed to be interdependent. A project that takes longer to complete than expected probably also costs more. For some types of projects, empirical studies have been conducted on the nature and extent of this inter-dependence. If such information is available, you can supply it here in the form of the covariance between investment cost and construction time. If you accept the default value of "1.000" shown, EnVest will derive an association between the two measures by assuming that investment costs will vary with construction time according to the spending rate for the last few months of the design construction period.

The information needed to do that is provided on the next screen, which first shows total construction time in years, using the most likely value and rounding up to the nearest year. This estimate is provided by EnVest based on the months you have typed in:

```
CONSTRUCTION/INVESTMENT BY YEAR:
========================================
LENGTH OF CONSTRUCTION IN YEARS      5
ANNUAL INVESTMENT AS A
  PERCENTAGE OF THE TOTAL:
  YEAR: 1                          7.0
  YEAR: 2                         15.0
  YEAR: 3                         33.0
  YEAR: 4                         30.0
  YEAR: 5                         15.0
  YEAR: 6                          0.0
  YEAR: 7                          0.0
  YEAR: 8                          0.0
  YEAR: 9                          0.0
  YEAR: 10                         0.0
  YEAR: 11                         0.0
  YEAR: 12                         0.0

EXTERNAL BORROWING   9.00000E+08
INTEREST (PERCENT)              10.5
```

The next lines describe the distribution of total investment over the construction period, showing the percentage of the total due each year. These estimates outline the planned rate of spending, which can then be used to adjust capital cost estimates according to the projected performance in terms of time. Once you have entered the information (the percentage) for the last year of the construction period, EnVest skips to the next data items on this screen, the proposed external borrowing for this project, and the expected effective interest rate. These two pieces of information can be used at a later point to calculate the effects of a particular portfolio on the total external debt of the country and on the annual debt service burden. While this is not yet being done in EnVest, the information is sufficient to prepare at least a rough estimate of these impacts. Clearly,

further information on amortization schedules, grace periods, etc., would be required to develop more detailed financial impact assessments of this nature.

Once you are done with this screen, we move on to information concerning project life and operating costs:

```
PROJECT DURATION & OPERATING COSTS
==========================================

LIFE OF THE PROJECT - YEARS:          20

OPERATING COSTS (IN DH):
 - ANNUAL FIXED COSTS        3.53000E+07
 - VARIABLE COSTS PER UNIT         4,762

PERCENT OF ANNUAL FIXED COSTS
 IN FOREIGN EXCHANGE:                30.0

PERCENT OF ANNUAL VARIABLE COSTS
 IN FOREIGN EXCHANGE, NOT INCLUDING
 ENERGY PURCHASES:                   75.0
```

The first line is simply project life in years; that is, the expected productive life of the project after construction has been completed. The next two lines deal with fixed and variable operating costs. Both types of costs are defined net of any labor costs, provided that estimates of labor employed by the project are provided. Fixed operating costs are those incurred regardless of output level. These costs would have to be paid even if nothing was being produced; they comprise mostly maintenance expenditures. Variable operating costs are defined per unit of output, net of any outlays for energy. These costs include such items as raw materials and intermediate products related directly to the actual production level.

In many instances, it may not be possible to break projected operating and maintenance (O&M) costs down into fixed and variable costs. In those cases, the total O&M cost estimate should be entered in the fixed-cost line. Also, please make sure that any variable costs are in fact defined per unit or output; e.g., by ton or GWh produced.

The next two items on this screen refer to the analyst's estimates of the foreign-exchange cost component of the fixed and variable costs of the project. This information is used to keep track of the total foreign exchange costs of a particular investment program, and to adjust cost estimates in project appraisal according to projected exchange rates. Typically, the foreign exchange impacts of O&M costs of some project are dwarfed by those of the initial investment. However, there are significant exceptions. The EnVest data base keeps track of this aspect to be able to deal with those exceptions.

The next screen is the final one regarding information common to all projects. It specifies the annual costs for energy inputs for the project operating at full capacity. It also shows total annual employment by labor category -- unskilled, skilled, professional and technical personnel, and office staff:

ENERGY COSTS AND DEVELOPMENT
MANPOWER

==========

ANNUAL ENERGY COSTS AT FULL OPERATION:	3.76100E+08
ANNUAL LABOR FORCE	
- UNSKILLED	50
- SKILLED	152
- PROFESSIONAL STAFF	8
- OFFICE WORKERS	0

[..P-10..]

The estimated energy costs have been introduced here for two reasons. First, they serve as a check on the other cost estimates provided. Second, they can be used in a quick appraisal of the likely performance of the project. However, any such estimates require assumptions about operating levels and energy prices. Consequently, EnVest calculates estimates of annual energy costs based on estimates of energy consumption for any given type of project, using the specified price scenario. Because of this approach, the energy cost item is optional.

The estimates of the employment associated with the project will be used by the analytical portions of EnVest in two ways. First, they are combined with wage rates established in the specified price scenario to calculate annual costs. Given the breakdown by labor category, adjustments to market distortions are possible, using estimated shadow wages. Second, employment information will be used to assess the overall employment impact of a particular investment portfolio: What is the job creation effect? Are the country's human resources (its educated labor force) sufficient to meet projected needs in this sector?

The estimates of project employment should be provided in full-time equivalents; i.e., the number of people employed throughout the year, with appropriate adjustments for part-time employment.

At this point, the data base management portion of the EnVest planning support system goes on to the project-specific subfiles. (Basically, the project master file contains the common information for all projects. For each type of project, EnVest keeps a separate subfile with the necessary data structure.) If you are working with thermal power plants, the project type we are using for our examples here, you'll now see the transition screen:

PROJECT FILE MANAGEMENT
*** ENVEST ***

THERMAL PLANTS

(1) EXAMINE RECORD DATA,
(2) MODIFY THE DATA, OR

(9) RETURN TO THE MAIN MENU...

YOUR CHOICE: _

You have now three choices. You can either just examine the data in the subfile for your project, change any piece of information, or quit here. Quitting,typing a "9", gets you back to the main menu for the project data base portion of EnVest.

The difference between options "1" and "2" is the same as for the portion of the project information common to all projects -- "1" lets you just look, allowing you to control the speed at which the screens appear by typing "C" in response to the prompt

C(ONTINUE OR Q(UIT THE PROGRAM..._,

and "2" allows you to change any of the information displayed, including the initial blanks and zeroes.

Once you have made your choice, EnVest puts up the first screen for the project-specific information. For thermal power plants, you would see now

PROJECT NUMBER	1	
TYPE NUMBER	1	
MODIF. = 1, NEW PLANT = 0	0	
PLANT NUMBER (MODIF.)		
NUMBER OF UNITS	2	
NOMINAL CAPACITY/UNIT (MW)		150
TECHNICAL MINIMUM (MW)		50
ENERGY CONSUMPTION (GJ/GWH)		9,839
CONSUMPTION AT TECH. MINIMUM (GJ/GWH)		10,000

Each screen shows the project and the type number for the project you are working with. For the thermal power plants, the first data line defines whether the project is a new power plant, or the modification of an existing one (e.g., to switch from fuel oil to coal). A "1" declares the project to be a modification, a "0" identifies it as a new one. The next line is used only in the case of a modification, providing the ID number of the power plant to be modified. This information is used in the portfolio simulation to change the characteristics of the corresponding thermal power plant. The existing power plants in Morocco have been numbered as follows:

1 - Mohammedia, Units I and II
2 - Kenitra
3 - Jerada
4 - Roches Noires, Unit I
5 - Roches Noires, Unit III
6 - Gas Turbine Plant, Tetouan
7 - Gas Turbine Plant, Tangier
8 - Gas Turbine Plant, Agadir

Each power plant is described in terms of the characteristics of its generating units. The next line specifies how many units make up the power plant. In our sample case, Mohammedia Units III and IV is, of course, defined as two units. For each one of these units, the analyst now specifies the nominal capacity in MW (150 MW for the example), and then the technical minimum, the MW-level at which the plan must be run at any time it is not down for scheduled maintenance or unforeseen causes (50 MW for the sample case); the technical minimum is zero for gas turbine plants.

The last two lines on this screen show the energy consumption per GWh produced, the first one for operation at full capacity, the second for operation at the technical minimum. Both measures are defined in Gigajoules per GWh. Since the plant does not operate at peak efficiency at the technical minimum, fuel consumption is higher at that level.

The next screen defines the parameters that define the analyst's assessment of the uncertainties associated with the output side of the project.

PROJECT NUMBER	1
TYPE NUMBER	1

==========

FORCED OUTAGE RATE (%)	
LOW ESTIMATE	10.0
- AVERAGE	12.0
- HIGH	14.0
REGULAR MAINTENANCE (DYS/YR)	47
MARGINAL UTILIZATION (%)	
- LOW	85.0
- AVERAGE	100.0
- HIGH	103.0

The first three lines specify three estimates of the forced outage rate. This is the probability (in percent) that the plant has to shut down because of unforeseen problems. In our example, the plant is expected to be down for unpredictable reasons with a probability of at least 10 and at most 14 percent. These percentages (times the number of days in a year) can, of course, also be interpreted as the length of time the plant will be down in the average year. The next line shows the estimated number of days the plant will be shut down for scheduled maintenance.

These two pieces of information are used in the project appraisal portion of EnVest to estimate the actual production of the plant at the technical minimum and above. The level of operation at the level above the technical minimum cannot be known with certainty. It depends to some extent

on technical performance, but also on the positioning of the plant in the load order sequence, whether it will be used primarily in base, intermediate or peak mode. In our sample case, the efficiency of the new units of the Mohammedia power plants make it likely that the plant will be run close to capacity in the base mode. The relevant percentages for plant use above the technical minimum could, in fact, be derived from system simulations, if their results were available.

The next screen describes the planned introduction of the given power plant; this information applies primarily to new power plants.

```
PROJECT NUMBER                    1
TYPE NUMBER                       1
========================================

PERCENT OF FINAL CAPACITY
  AVAILABLE:        YEAR 1        85.0
                    YEAR 2       100.0
                    YEAR 3       100.0
                    YEAR 4       100.0
                    YEAR 5       100.0
                    YEAR 6       100.0
                    YEAR 7       100.0
                    YEAR 8       100.0
                    YEAR 9       100.0
                    YEAR 10      100.0
```

Planned deployment is defined in terms of the total capacity available in the first ten years of the plant's existence. This specification assumes, of course, that the plant will be fully operational in ten years -- which is not unreasonable.

The final screen for the thermal power plants defines the fuel used in the production of electricity. Both the principal fuel and a substitute are specified, selected from the list of options provided.

```
PROJECT NUMBER                    1
TYPE NUMBER                       1
========================================

FUEL USED                         C
  G = NATURAL GAS
  N = NUCLEAR
  S = BITUMINOUS SHALES
  B = BIOMASS (ALFALFA)
  C = COAL
  F = FUEL OIL
ALTERNATIVE FUEL                  F
```

The substitute fuel must not require any significant modification of the power plant. For example, natural gas could substitute for fuel oil without a significant investment to modify the plant. Coal, however, typically requires major investment to substitute for fuel oil. If no adequate substitute exists, the same letter should be used in both places.

With that you are done with your task of updating the information on our sample project, the construction of Units III and IV of the Mohammedia power plant. EnVest puts you back into the main menu for the project data base management portion:

```
                    PROJECT FILE MANAGEMENT
                       *** ENVEST ***
=====================================

CHOICE OF OPERATIONS:

(1) SCAN THE CONTENTS OF THE FILE;
(2) MODIFY/ADD A PROJECT RECORD;
(3) EXAMINE A PROJECT RECORD;
(4) PRINT THE RESUME OF A PROJECT;

(9) RETURN TO THE MAIN MENU

SELECTED CHOICE: _
```

As you go to other types of projects, the project-type specific screens will, of course, look different. Please consult Appendix B on specific definitions and explanations for individual data items for other project types.

For your records, you can also obtain a printed summary of the information for any given project. Exhibit 2 shows a sample printout for project no. 1.

At this point, we'll go on to the component of EnVest used in specifying the various elements of the overall policy scenario.

Setting Up and Modifying Elements of the Policy Scenario

The definition of the elements that make up your policy scenarios for the economic appraisal of energy investment projects and for the simulation of a particular energy investment portfolio requires the most work in the EnVest planning support system. Fortunately, much of it is a one-time effort. Using the support functions for forecasting and data manipulation built into the EnVest system, you can enter the information once and use it as many times as needed in the actual analysis. The main advantage of the current system is that you can make small changes quickly and easily, and that you can try out different combinations of assumptions and hypotheses in the analysis. However, EnVest does not free you completely from the important task of formulating your expectations concerning the performance of the country's economy, the technology of energy use, domestic pricing policies and international price trends. These hypotheses may, of course, also be provided by others -- either policy makers in the Ministry of Energy and Mines, its sous-tutelles, or other Ministries or agencies of the Government of Morocco.

The important point is that these assumptions must, in fact, be specified in a form that allows us to use quantitative analysis. EnVest is designed to make it as easy as possible to translate general notions about

trends and possibilities into quantitative estimates. But it will force you to be specific about the parameters and variables that make up the policy scenario. Typically, you can work with "default" values; EnVest is set up to use some reasonable estimates, even if you don't provide any descriptions of your particular expectations and forecasts. However, these default values typically will not give you results that provide adequate guidance in your policy problems. You should review each one of the elements carefully to determine whether the built-in assumptions are acceptable and useful for your particular policy questions.

We should also add here a very strong recommendation for good documentation. EnVest will contain only the results of a process of reasoning regarding the future policy environment for energy investment policies. You, as planner, have the responsibility to keep a careful record of the underlying assumptions and calculations. Moreover, the ease with which you (or any other user) can change the forecasts and projections making up the policy scenario elements raise the possibility that some of the assumptions within a particular scenario have changed without the analyst being aware of it. This possibility demands a good organization of any analysis session. For a series of analysis runs, you should review the relevant elements of the scenarios you want to use, and maybe even print out some portions to keep with the results of the analysis.

All that said, let's move on to a step-by-step review of the scenario-building elements of the EnVest planning support system. Some of the introductory comments will make more sense once you have seen the way these elements work to help you in the task of (quantitative) scenario formulation and modification.

You start again with the EnVest access menu:

```
                    MAIN OPERATIONS MENU
                       *** ENVEST ***
=========================================

WORK OPTION CHOICE:

(1) MODIFY/EXAMINE THE INVENTORY OF
      PROJECTS;
(2) FORMULATE SCENARIOS (ECONOMIC-
      DEMOGRAPHIC, RATES, WORLD PRICES,
      ENERGY USE);
(3) ACTIVATE THE ECONOMIC ANALYSIS
      OF A PROJECT;
(4) CREATE A PORTFOLIO OR SIMULATE
      ITS YIELD;
(5) DISPLAY GRAPHIC SUMMARIES;
(6) CHANGE THE RECORDED DATE;

(9) QUIT ENVEST/RETURN TO APPLE PASCAL.

SELECTED OPTION: _
```

To get into the scenario-building portion of EnVest, choose option 2. Once you type "2" in response to the prompt for the "SELECTED OPTION: _", EnVest will bring up the main scenario menu:

```
                    SCENARIO MENU
                  *** ENVEST ***
=========================================

OPTIONS:

(1) PRICING AND PRICE TRENDS;
(2) ECONOMIC/DEMOGRAPHIC PROJECTIONS;
(3) ENERGY CONSUMPTION;
(4) BASE YEAR ENERGY SECTOR;
(5) ENERGY IMPORT POLICIES/CONSTRAINTS;

(9) RETURN TO MAIN MENU

SELECTED OPTION: _
```

The scenario menu gives you access to five major elements of the overall policy scenario: pricing and price trends, economic and demographic projections, energy consumption, the description of the energy sector for the base year, and energy import policies or constraints.

Pricing and Price Trends

If you choose the first option from the scenario menu (by typing "1" in response to the prompt), EnVest brings up the price scenario menu. The price scenario component involves three parts. For the financial appraisal of energy investment projects, you need projections of official prices for energy products, as well as for two key resources, labor and foreign exchange. For the economic appraisal, official prices may be inadequate, because they may open or hide taxes or subsidies. If the analyst can develop the required estimates, such an appraisal requires economic or shadow prices -- which make up another scenario element.

The analyst's projections of official prices are also needed in any attempt to examine the possible energy demand responses to alternative pricing policies. A third set of price forecasts, for the world market prices of internationally traded energy products, is needed in the portfolio simulations to estimate the foreign exchange cost of Morocco's projected energy imports.

These options are offered in the pricing scenario menu:

PRICE SCENARIOS
*** ENVEST ***
==========

WHAT TYPE OF PRICE SCENARIO?

(1) MARKET PRICES (OFFICIAL);
(2) SHADOW PRICES (ECONOMIC);
(3) WORLD MARKET PRICES;

(9) RETURN TO SCENARIO MENU.

SELECTED OPTION: _

The structure of the work sessions is the same for official and economic prices. You will see the same screens, and the same prompts. The only difference is in the interpretation of the price estimates you enter. These two scenario elements are kept separate in the EnVest system because of the importance of the distinction between the underlying concepts. Because of that importance, you as a user, should be well aware of the choices you make for the economic and financial appraisal of projects. However, for the explanations here, we can just treat the two cases together.

The third part, concerned with world market price scenarios, differs from the other two in three ways. First, the list of energy products is much shorter. Second, expected prices are entered in (US) dollars per energy unit (Gigajoules in all three pricing scenario parts). Third, price forecasts are required only for the actual planning period; for the domestic (official and economic) prices, the period covered is much longer, since the information should be sufficient to examine cases in which projects are realized toward the end of the planning period, yielding net revenue streams beyond the planning horizon. The maximum useful life of an energy investment project can be assumed to be 40 years, as in the case of hydroelectric installations. Thus, scenarios for official and market prices must cover a 60-year time period -- 20 years for the planning period and 40 years for the useful life of the project. EnVest is designed to make it easy to deal with such a long time horizon.

Let's start with the scenario of official prices. In response to the prompt in the main price scenario menu, you would type a "1." EnVest then gives a choice of operations (which you will find in all of the scenario elements): you can add a particular scenario to the existing specifications, you can modify a scenario you have defined earlier, you can clear a space for a completely new scenario by erasing an old one, inspect an existing scenario, or you can request some general information on the part of the EnVest scenarios you are working on now:

```
OFFICIAL PRICE SCENARIO
*** ENVEST ***
=========================================

CHOICE OF OPERATIONS:

(1) ADD A SCENARIO;
(2) MODIFY A SCENARIO;
(3) DELETE A SCENARIO;
(4) EXAMINE A SCENARIO;
(5) READ EXPLANATIONS (HELP SCREENS);

(9) RETURN TO PRICING MENU.

OPTION SELECTED: _
```

For the case of official (and shadow) prices, each scenario represents a particular combination of values over time for the monthly wages of four labor categories, the official exchange rate, and the prices (per Gigajoule) for 15 energy products, all expressed in (constant) Dirhams. The relevant categories are listed in the help screen, which you can access by typing "5" in response to the prompt in the operations menu:

```
THIS PROGRAM IS DEVISED TO ALLOW THE USER
TO SPECIFY PREDICTIONS OF RESOURCE PRICES
OVER A PERIOD OF 60 YEARS (1981 => 2040)

RESOURCES EXAMINED ---

  I - EXCHANGE RATE, DIRHAMS PER DOLLAR

 II - MANPOWER, BY CATEGORY
      1. UNSKILLED      2. SKILLED
      3. PROF./TECH.    4. OFFICE STAFF

III - ENERGY PRODUCTS, 15 TYPES:
  1. ELECTRICITY        2. PROPANE
  3. BUTANE             4. GASOLINE
  5. KEROSENE           6. GAS OIL
  7. FUEL OIL           8. COAL
  9. NATURAL GAS       10. BIOMASS
 11. NUCLEAR           12. SHALES
 13. SHALE OIL         14. CRUDE OIL
 15. CONDENSATE

C(ONTINUE OR Q(UIT THE PROGRAM... _
```

Technically, each scenario you define becomes a single record in a file. In its current version, EnVest allows you to define up to 10 different scenarios for official prices and 3 for shadow prices. In addition to your projections of exchange rates, wages and energy prices, each one of the records also contains a brief identifier of the scenario (up to five characters long, used to refer to it in record keeping for the analytical portions of EnVest), and a description of the scenario.

To get started with the official price scenarios, let's get back to the operations menu from the help screen. Simply type a "C" in response to the prompt. Now suppose you want to create a new pricing scenario. You type "1" in response to the operations prompt. EnVest first looks for a free record, which is identified by a blank for the brief scenario name. The scenario you want to define will be put in the first free record found; EnVest will show the number of that record. If all records have already been defined, EnVest gives you a choice of erasing or modifying an existing scenario. For now, let's assume that you have a free record for your new scenario.

EnVest now prompts you for the brief identifier and the description of the scenario you are about to define. For the brief identifier, you can use any combination of five characters (alphabetic or numeric or symbols). Generally, you try and come up with short names that give you some idea of the underlying hypotheses. In the description, you can use up to 80 characters to characterize these hypotheses further. These descriptions are used in the preparation of printed records of a given scenario, as shown in Exhibit 3.

The actual specification of the projected values of the prices of interest uses a simple option. First of all, you can of course type in the value of each of the 20 variables (exchange rate, four labor categories and 15 energy products) for each year of the 60-year forecasting period individually. Alternatively, you can use constant (compounded) annual growth rates to define these values for the entire forecasting period or for individual subperiods. For this option, EnVest prompts you for the baseyear for the period you want, and the final year of that period. It then shows you the value of the respective price for the baseyear and gives you the option to replace that value by a new one. Once the value for the baseyear has been defined, EnVest asks for the average annual growth rate to be used. It then calculates the corresponding price values for each year in that period.

Let's illustrate this procedure with an example. Suppose we are working with a planning period from 1981 to 2000 (which is what EnVest is currently still using, to be updated soon). For that case, your price projections cover the period 1981 to 2040. Suppose now, you are looking at the domestic price of coal, and you are contemplating the following hypothesis:

- fairly rapid price increases (price adjustments in the short run, say for the period 1981-85, followed by moderate growth until the year 1995, when you expect a significant jump in the domestic price of coal, followed by another period of moderate increases until the end of the forecasting period.)

In this case, you would start out by choosing the initial period for your forecasts as 1981-85. You would supply the baseyear price for domestic coal for that year, followed by a high growth rate; say, 10 percent per year. (For this by now historical period, you could, of course, supply the actual prices for each year one by one.) You then choose the period 1985-95, using the value for 1985 as the baseyear figure. Moderate growth in real terms may correspond to an annual growth of 1 percent. You complete this exercise by choosing the final subperiod, 1995 to 2040. Since you are expecting a

jump in 1995, you first correct the price estimate provided for that year (which is based on the 1985 figure and a 1 percent annual growth rate.) You then supply another low growth rate; say, again 1 percent per year. And that's it. You have defined the expected price trends for coal, using a composite hypothesis of the development of this price over time. EnVest enables you to go back over these numbers and adjust and modify them until you are satisfied with the trends over time.

EnVest does not force you to define all of the variables for all years in a given scenario. Gaps that you leave are filled by the default value, which is based on the price per Gigajoule for crude petroleum (reflecting 1984 prices and exchange rates). Developing adequate and complete pricing scenarios is a difficult and time-consuming operation.

At the end of each operation (addition or modification of a pricing scenario), EnVest gives you the choice of obtaining a printed copy of the contents of the record, as shown in Exhibit 3.

To get some idea of the sequence and the individual screens, let's look at the case in which we just want to inspect a particular scenario. In response to the main pricing scenario prompt, you would type "4" (for "EXAMINE A SCENARIO"). EnVest then gives you two options to identify the scenario you want to examine, either by record number or by the short name of the scenario:

```
        OFFICIAL PRICES SCENARIO
            *** ENVEST ***
=====================================

CHOICE OF OPERATIONS

OPTIONS FOR SEARCHING THE
  PRICE SCENARIOS

   BY (1) RECORD NUMBER;
OR BY (2) IDENTIFIER;

      (9) QUIT THIS OPERATION.

OPTION SELECTED: _
```

If we take option "1" -- by record number --EnVest shows all the record numbers and the short names for any existing scenarios. The record numbers for the official pricing scenario go from 0 to 9, for the shadow pricing scenario from 0 to 2:

```
                OFFICIAL PRICES SCENARIO
                    *** ENVEST ***
=========================================

CHOICE OF OPERATIONS

NUMBER (0 -> 9):  _

CURRENTLY RECORDED SCENARIOS:
  0    REEL0       5        55
  1    REEL1       6        66
  2    PRIX2       7        77
  3    HYPO3       8     TEST8
                   9     PRIX9
```

You respond to that by typing in the number of the record (without a RETURN, since EnVest is expecting only a single digit).

Once the scenario of interest has been identified, EnVest asks you what part of the scenario you want to inspect, the first part made up of the short name and the description of the scenario as well as the data on the exchange rate and labor wages, and the second comprising all energy prices:

```
                OFFICIAL PRICES SCENARIO
                    *** ENVEST ***
=========================================

CHOICE OF OPERATIONS

  EXAMINE

  (1) IDENTIFIER, DESCRIPTION OF THE
      SCENARIO AND PREDICTED EXCHANGE
      RATE AND SALARIES;

  (2) ENERGY PRICES;
  (3) ALL VARIABLES;

  (9) TERMINATE THE EXAMINATION.

        SELECTED OPTION:  _
```

Suppose we pick the first part; that is, type a "1" in response to the prompt. EnVest then immediately asks you for the year you want to look at. The default value shown on the screen is the initial year of the planning period, here 1981. A simple RETURN would show the information for that baseyear:

```
                OFFICIAL PRICES SCENARIO
                     *** ENVEST ***
=========================================

CHOICE OF OPERATIONS

  EXAMINE

  (1) IDENTIFIER, DESCRIPTION OF THE
      SCENARIO AND PREDICTED EXCHANGE
      RATE AND SALARIES;

  (2) ENERGY PRICES;
  (3) ALL VARIABLES;

  (9) TERMINATE THE EXAMINATION.

        SELECTED OPTION:  1

YEAR TO EXAMINE (1981 -> 2040)?  1981
```

If you choose the baseyear now, EnVest will show the information on the next screen:

```
                OFFICIAL PRICES SCENARIO
                     *** ENVEST ***
=========================================

CHOICE FOR EXAMINATION
SCENARIO IDENTIFIER:          REELO
SCENARIO DESCRIPTION:
ACTUAL PRICES WITH HIGH GR RATES

EXCHANGE RATE, 1981           5.00

WAGES/LABOR, 1981

  UNSKILLED                     566
  SKILLED                     1,133
  PROF./TECH.                 2,266
  OFFICE STAFF                1,133


C(ONTINUE OR Q(UIT THE PROGRAM...
```

with the values shown following the American convention. Basically, in this case, the scenario REELO, "Actual prices with high gr[owth] rates", assumes an exchange rate of 5 Dirhams to the US-dollar for 1981, and average monthly wages of 566 to 2266 Dirhams for the four labor categories.

Once you are done with this screen, you type "C" for "C(ONTINUE..." EnVest then gives you the option of looking at the same data for another year:

```
OFFICIAL PRICES SCENARIO
*** ENVEST ***
========================================

CHOICE FOR EXAMINATION


ANOTHER YEAR? _
```

The same sequence for the energy prices would yield a screen like the following one:

```
OFFICIAL PRICES SCENARIO
*** ENVEST ***
========================================

CHOICE FOR EXAMINATION
 1. ELECTRICITY              106.00
 2. PROPANE                   50.00
 3. BUTANE                    50.00
 4. GASOLINE                 135.00
 5. KEROSENE                  61.00
 6. GAS OIL                   67.00
 7. FUEL OIL                  32.00
 8. COAL                      11.00
 9. NATURAL GAS               15.00
10. BIOMASS                   58.00
11. NUCLEAR                    5.00
12. SHALE                      5.00
13. SHALE OIL                  5.00
14. CRUDE OIL                 40.00
15. CONDENSATE                 5.00

C(ONTINUE OR Q(UIT THE PROGRAM..._
```

Once you are done with the examination (that is, once you have typed a "9" in response to the "CHOICE FOR EXAMINATION" menu), EnVest offers you the option of obtaining a printed copy of the scenario you just studied:

```
OFFICIAL PRICES SCENARIO
*** ENVEST ***
========================================

CHOICE FOR EXAMINATION

DO YOU WANT A PRINTED COPY OF
THIS SCENARIO? _
```

A "Y[es]" or "O[ui]" (or even a "S[i]") would get you a report of the type shown in Exhibit 6.

Finally, EnVest also gives you the option of carrying another operation:

ANOTHER OPERATION? _

A "Y", "O" or "S" response would bring you back into the main pricing scenario menu for the "CHOICE OF OPERATIONS."

The operations for the world market price scenarios are just about the same as for the domestic pricing scenarios. They are simpler because the data structure for the world market price scenarios is simpler. These scenarios cover only eight tradeable products (crude petroleum, refined products, and coal). Moreover, projections are needed only for the actual planning period, such as the 20-year period now used in EnVest.

The Economic and Demographic Scenarios

The preparation of economic and demographic growth scenarios underlies the estimation of energy demand patterns over the planning period. Ideally, as an energy planner you could turn to your colleagues in other agencies (such as the Ministry of Plan) to obtain long-term forecasts of economic growth by Sector and of demographic growth patterns. Unfortunately, such forecasts are not yet available. Even if they were, though, energy planning must examine the implications of possible extremes as well as the most likely growth path. Hence the inclusion of a economic/demographic forecasting component in the EnVest planning support system.

The preparation of economic/demographic growth scenarios involves two elements, preparation and application. The application, the development of forecasts of value added for some 15 economic sectors and of the number of persons in rural and urban households, uses background data which can be updated periodically through the preparation element. To sort these two things out, let's look briefly at the way in which EnVest produces long-term economic and demographic forecasts. A more detailed discussion is provided in EnVest Technical Memorandum No. 4.

For the economic forecasts, EnVest uses a very simple (open and static) input-output model. Given the input-output coefficients, the analyst can obtain economic forecasts by sector by providing estimates of the development of final demand in four categories, households, government, fixed capital formation, and exports, over the planning period. These final-demand forecasts are then translated into total production and value-added estimates, given assumptions about the share of imports in each sector.

For the demographic forecasts, the analyst (you) provides estimates of the average annual percentage increase for the country as a whole for selected subperiods. EnVest takes these overall growth rates and breaks them down by region and by type of residence (urban/rural) to generate forecasts of theurbanandrural population which are in linewithpastgrowth trends; that is, with the relationship between urban and rural growth in the past.

Thus, in the application phase, the analyst/planner only has to provide the estimates of the average annual growth rates for final demand components and for the population as a whole. However, it is also possible to modify the parameters used in translating these growth rate hypotheses into forecasts of economic and demographic growth. By choosing that option, the preparation element, you can update the input-output coefficients for the 15 sectors we are using in projecting energy demand. You only have to provide the direct technical coefficients. EnVest calculates the so-called Leontieff inverse used in the forecasts. You can also change the baseyear values for final demand. For the demographic projections, you can change the population estimates by region and urban/rural breakdown, as well as a parameter showing the historical relationship between urban and rural growth rates for each region. This manual will not cover the actual mechanics of that option. Please consult EnVest Technical Memoranda No. 4 and 5 for some of the background discussion and for the derivation of the parameters used in the current specifications.

To get to the economic/demographic forecasting portion, you type a "2" in response to the scenario main menu. EnVest then presents you with the two basic options and the option to return to the main menu:

```
        ECONOMIC-DEMOGRAPHIC SCENARIO
              *** ENVEST ***
=======================================

CHOICE OF OPERATIONS

(1) FORMULATE/MODIFY ECONOMIC-
     DEMOGRAPHIC SCENARIOS
(2) MODIFY BASE DATA

(9) RETURN TO SCENARIO MENU

SELECTED OPTION:  _
```

For the application element, you choose option "1." EnVest now responds with the familiar operations menu:

```
        ECONOMIC-DEMOGRAPHIC SCENARIO
              *** ENVEST ***
=======================================

CHOICE OF OPERATIONS

(1) ADD A SCENARIO;
(2) MODIFY A SCENARIO;
(3) DELETE A SCENARIO;
(4) EXAMINE A SCENARIO:
(5) READ EXPLANATIONS (HELP SCREENS);

(9) RETURN TO MAIN MENU.

SELECTED OPTION:  _
```

The general comments under the pricing scenario discussion apply here as well. The general structure of the data base for all scenario elements is the same. Each scenario represents one record (up to five scenarios are allowed for the economic/demographic portion), containing the actual data as well as a brief identifier and a description.

Suppose we want to inspect an existing scenario. Generally, you may not even use this option all that frequently, since you are probably keeping printed records of the individual scenario elements. But for now, we may just work with it to demonstrate some of the principles and requirements. To examine a scenario, you choose option "4" of the operations menu. EnVest again offers you two options to search for a scenario, by record number or by brief identifier:

```
        ECONOMIC-DEMOGRAPHIC SCENARIO
              *** ENVEST ***
========================================

EXAMINE A SCENARIO?

SEARCH FOR THE ECONOMIC-DEMOGRAPHIC
SCENARIO

   BY (1) RECORD NUMBER
OR BY (2) IDENTIFIER

      (9) TERMINATE THIS OPERATION

SELECTED OPTION: _
```

Let's suppose we want to use the brief identifier this time. You respond with a "2." EnVest again lists the existing scenarios or records at the bottom of your screen:

```
        ECONOMIC-DEMOGRAPHIC SCENARIO
              *** ENVEST ***
========================================

EXAMINE A SCENARION?

IDENTIFIER:              FHGJJ


CURRENTLY RECORDED SCENARIOS:
  0    MOYEN        3
  1                 4
  2
```

As you can see, only one scenario has been identified in our example, record no. 0, scenario "MOYEN." The user who prepared the examples decided to test EnVest and typed a name that doesn't exist ("FHGJJ"). In general, things like that don't faze EnVest. It just beeps and tells you that the scenario you have requested does not exist:

```
ECONOMIC-DEMOGRAPHIC SCENARIO
*** ENVEST ***
=====================================

EXAMINE A SCENARIO?

THIS SCENARIO DOES NOT EXIST...


CURRENTLY RECORDED SCENARIOS:
  0    MOYEN        3
  1                 4
  2
```

Once you have typed "C" for "C(ONTINUE..." you can specify the correct name of the scenario you want.

EnVest now can show you the summary information for this scenario, expressed in terms of average annual growth rates for four subperiods of the planning period, each five years long. The first screen just shows you what the analyst defining the scenario provided as hypothesis:

```
ECONOMIC-DEMOGRAPHIC SCENARIO
*** ENVEST ***
=================================:========
SCENARIO IDENTIFIER:       MOYEN
SCENARIO DESCRIPTION:
HYPOTHESIS OF AVERAGE ECONOMIC GROWTH

GROWTH RATES PROVIDED ---
                    1981- 1986- 1991- 1996-
1. DEMAND - END      1985  1990  1995  2000
HOUSEHOLDS:           2.0   3.0   3.4   3.2
GOVERNMENT:           1.8   4.6   5.9   5.2
FIXED CAP.:           1.2   3.0   3.9   3.5
EXPORTS   :           2.0   2.0   3.0   2.9

2. POPULATION

URBAN                4.93 4.764.45  4.61
RURAL               1.61  1.35  0.97  1.16
TOTAL               3.05  2.95  2.75  2.55

C(ONTINUE OR Q(UIT THE PROGRAM..._
```

The top of the screen shows the name of the scenario ("MOYEN") and the description. (Remember, the description is up to 80 characters long. You can only see 40 at a time. To see the second "page" of this screen, type CTRL-A. To get back to the first page, type CTRL-A again.) The first table shows the average annual growth rates for final demand in the four final demand categories. These growth rates are calculated. In stating your hypotheses, you can use the same combination of subperiods, baseyear values, and average annual growth rates discussed in the context of the pricing scenario creation. These combinations allow you to construct any particular time series for the final demand categories. The summary table shown here

simply takes the projected values and describes the implied growth pattern in the form of average annual growth rates for five-year periods.

Please note that our example is a little pessimistic with respect to export growth. At least for the medium term, the next five to ten years, planners are working with much higher growth rates for export. Government final demand, in contrast, may have been overstated.

The next table on this screen shows the total population growth rates provided for five-year periods for the 15 primary sectors and the one supplemental one used in the EnVest demand forecasts:

ECONOMIC-DEMOGRAPHIC SCENARIO
*** ENVEST ***

==========

SCENARIO IDENTIFIER: MOYEN

ESTIMATED RATES OF GROWTH

	1981-1985	1986-1990	1991-1995	1996-2000
AGRICULTURE :	2.0	3.0	3.4	3.2
PHOSPHATES :	2.0	2.0	3.0	2.9
OTH. MINERALS :	1.8	2.9	3.4	3.2
ENERGY & WATER:	1.8	3.1	3.7	3.4
AGRO-INDUSTRY :	2.0	3.0	3.4	3.2
TEXTILES :	2.0	3.1	3.6	3.4
LEATHERS :	1.9	3.6	4.4	4.0
CEMENT :	1.5	3.1	3.9	3.5
MECHAN/ELECTR.:	1.6	3.1	3.8	3.5
CHEMISTRY :	1.9	3.1	3.6	3.3
OTH. MANUFCTR :	1.9	3.1	3.7	3.4
CONSTRUCTION :	1.3	3.1	3.9	3.5
TRANSPORT :	1.9	3.1	3.7	3.4
COMMUNICATIONS:	1.8	3.8	4.7	4.3
COMM. SERVICES:	1.9	3.1	3.6	3.4
NON-COM. SRVCS:	1.8	4.6	5.9	5.2

C(ONTINUE OR Q(UIT THE PROGRAM...

As in the other scenario elements, you can request a printed copy of the scenario you have been working with. This printout actually lists the projected value-added figures for the planning period, as shown in Exhibit 4.

Energy Use Technology Scenario

EnVest uses a simple linear model to translate forecasts of economic and demographic growth into projections of energy needs of the economy. We assume that each sector uses a certain amount of energy of a particular type per unit of value added or per person. This use can be expressed in terms of an energy use coefficient. Multiplying the projected value added and population figures by the respective coefficients for a particular energy product and summing across sectors gives us the projected energy needs for that product. More mathematically, we can multiply the activity vector (value added and population) for a given year by the matrix of energy use coefficients for that year to obtain the energy needs vector (energy needed

by product category).

In addition to the short name and description of the scenario, the energy use technology scenario records contain four elements:

- the energy use coefficients for the baseyear, essentially an 18 (16 economic sectors plus two household sectors) by 10 (end use energy categories) matrix; the coefficients are defined in Gigajoules per Dirham of value added for the economic sectors and per person for the two household sectors;

- associated rates of change: for each energy use coefficient, we may have evidence or a suspicion that it changes gradually over time; for example, there may be long-term trend toward higher energy intensity in some sector; the rates of change (expressed in percent) describe these long-term trends; they are applied to the baseyear estimates to simulate the effects of "autonomous technological change;"*

- associated short- and long-term price elasticities of energy use; these are basically estimates of the percentage change in the energy use coefficient following a 1-percent change in current prices (short-term) or a corresponding change 3 years ago (long-term); these are parameters that are very difficult to obtain, even though the approach here uses a very crude approach; the inclusion of these price elasticities (as well as of the autonomous change rates) in the scenario data base is intended to allow you some flexibility in simulating alternative trends in energy demand.

The structure of the EnVest component dealing with energy use technology scenarios is similar to that shown for pricing and economic/demographic growth scenarios. To add a scenario, you specify a scenario name and the description. EnVest then prompts you for appropriate "cell" -- the sector and the energy product desired. It displays the value currently in the data base (initial default values for all parameters are zero), and lets you change it or accept it as it is. You can also choose the type of parameter you want to work on.

---

* For the economists among the users: autonomous technological change is very difficult to define and estimate. Much of the technological change of the nature considered here is <u>induced</u>; i.e., caused by relative price movements. These induced changes in production technology would, in principle, be reflected in the demand elasticity estimates. But the allowance for autonomous technological change here allows us to simulate seminal trends in energy use technology without depending on the usually questionable estimates of own and cross-price elasticities of demand.

The results of this work are illustrated by the printout for a sample scenario shown in Exhibit 5. The scenario shown incorporates our current best estimates of energy use patterns in the Moroccan economy. In this scenario, no attempt has been made to introduce such more speculative measures as autonomous rates of change or short- or long-term price elasticities. Under these conditions, any changes in energy use coefficients would come through projects.

Import Policy Scenarios

Import policy scenarios are defined simply in terms of the maximum amount (in tons) that can be imported in any year of the planning period. These values for the eight tradeable energy products are defined in a manner analogous to the process of projecting prices, using baseyear values and average annual growth rates for selected subperiods. The default values imply unlimited imports in any of the eight categories; these values are shown in the printed report on a sample scenario shown in Exhibit 6.

Baseline Conditions for the Energy Supply/Conversion System

Strictly speaking, the description of the baseline conditions for the energy supply and conversion system is not a scenario element. In principle, the system would have to be defined only once. However, new information may become available, and the baseyear for the planning exercise will change as we move ahead in time. Thus, EnVest allows you to modify descriptors of the starting conditions of the energy system.

These conditions comprise four elements: (1) characteristics of thermal power plants currently in existence; (2) characteristics of the hydroelectric system; (3) the product slate and capacity for the nation's two refineries; and (4) projected annual production of primary energy in the absence of any new investments. Current specifications are shown in Exhibit 6.

Economic Project Appraisal

The first two segments of the EnVest planning support system are basically designed to help you prepare the basis for the actual analysis that constitutes the heart of energy planning. The analysis tasks fall into two categories -- economic/financial project appraisal and the assessment of the performance of a particular portfolio of investment projects. For both, you have already done most of the work. At this point, you can just choose from a menu of options, leaving most of the actual work to the EnVest system.

You get to the economic project appraisal portion of the EnVest system by choosing option "3" of the EnVest access menu. EnVest responds to that choice with the following options:

ECONOMIC ANALYSIS OF PROJECTS
*** ENVEST ***

==========

CHOICE OF OPERATIONS

(1) ANALYSE A PROJECT
(2) GRAPHIC DISPLAY OF RESULTS OF
A PREVIOUS ANALYSIS

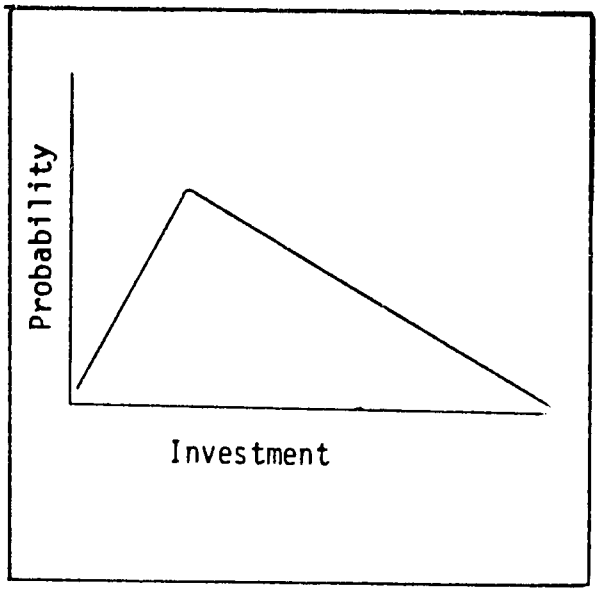
(9) RETURN TO MAIN MENU

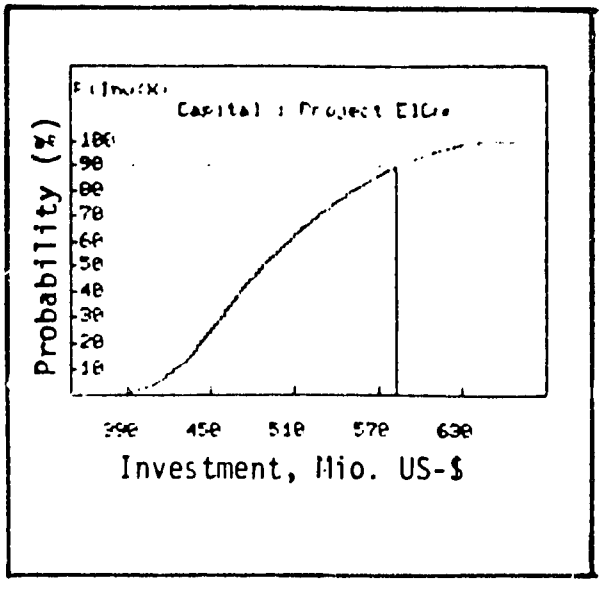
SELECTED OPTION:

You can now either proceed to the economic appraisal of some project, or you can inspect the graphical summary description of some project appraisal you (or one of your colleagues) have performed earlier.

What graphical description? Let's briefly summarize what we are doing in the economic project appraisal component of EnVest before we look at the actual process. To reflect uncertainty about project costs and uncertainty in the measures used for economic project appraisal, EnVest allows you to simulate the performance of a given project under different assumptions. Different assumptions are expressed in terms of three key variables, the investment cost, the time required to complete construction of the project, and the output (or sales) of the project. EnVest experiments with different combinations and summarizes the results of a series of experiments in the form of frequency distributions for the three principal performance measures, the net present value, the internal rate of return, and the profitability index (the ratio of the net present value of costs to that of revenues). That method is known as the Monte Carlo approach, since the specific values used in combination in a particular simulation run are determined by a random procedure. The resulting frequency distributions are provided in tabular form. But EnVest offers you the option of presenting them in graphical form as bar graphs or histograms on the screen and on paper.

As in any game of chance in the casino of Monte Carlo, the probability of a given value for any of the three key variables is predetermined (hence the name). In fact, EnVest calculates these probabilities on the basis of the minimum, maximum and most likely estimates of key project characteristics that we introduced in the project data base. For that purpose, we have assumed that the probabilities are determined by a triangular distribution, shown in the graph on the left. The graph on the right translates this probability density function into a cumulative distribution: the values on the ordinate (the y-axis) show the probability that the actual value of the particular variable is at most equal to (is less than or equal to) the corresponding value on the abscissa (the x-axis). EnVest uses a built-in random number generator to pick values between 0 and 1, with any value having the same probability. It then uses the cumulative function to find the corresponding value of the project characteristic -- the construction time, the investment cost, and annual production.





In this process, EnVest also considers some interdependencies between and within risk categories. Other things being equal, investment costs vary directly with the construction time. For example, if our random procedure were to yield a time overrun for one simulation run, a cost overrun would be more likely. Similarly, while there may be considerable uncertainty about the likely output of a project, we may safely assume more consistency from one year to the next. If the random procedure chooses a good performance for the first year of the project, better-than-average performance becomes more likely for subsequent years. If the initial choice yields a project performing below average, EnVest even allows for some improvement over time: below-average performance would be more likely for the first few years, but the expected output will approach the original design value in later years. EnVest Technical Memorandum No. 3 describes this approach in greater detail, using mathematical notation.

All of these calculations and random choices are handled by EnVest. You have to specify the project you want to analyze, the pricing scenario you want to use to value project outputs and some of the inputs, the appropriate discount rate for calculating the net present value for each simulation run, and the start year for the project. You also have the option of changing a critical parameter that describes the degree to which one year's output depends on the value for the preceding year, the autoregression coefficient. Let's look at some of the screens you will encounter in this process.

You start by choosing option "1" from the main economic-analysis menu:

```
ECONOMIC ANALYSIS OF PROJECTS
*** ENVEST ***
========================================

CHOICE OF OPERATIONS

(1) ANALYSE A PROJECT
(2) GRAPHIC DISPLAY OF RESULTS OF
    A PREVIOUS ANALYSIS

(9) RETURN TO MAIN MENU

    SELECTED OPTION: _
```

EnVest then gives you the option of entering your choices or referring to some brief explanation:

```
ECONOMIC ANALYSIS OF PROJECTS
*** ENVEST ***
========================================

ENTER CHOICES

(1) BEGIN ENTRY
(2) READ EXPLANATIONS

(9) QUIT THE PROGRAM

   SELECTED OPTION: _
```

The explanations are essential to what we have just discussed here. When you choose option "2", you'll see the following information:

```
ECONOMIC ANALYSIS OF PROJECTS
*** ENVEST ***
========================================

THIS PROGRAM HELPS THE USER PREPARE THE
EVALUATION OF AN INVESTMENT PROJECT.  YOU
MUST CHOOSE .....

  - THE PROJECT

  - THE NUMBER OF MONTE CARLO SIMULATIONS

  - THE ACTUALIZATION RATE

  - THE PROJECT START DATE, AND

  - THE PRICING SCENARIO.

YOU MAY ALSO CHANGE THE VALUE OF THE
AUTOREGRESSION COEFFICIENT.

C(ONTINUE OR Q(UIT THE PROGRAM..._
```

Typing "C" for "C(ONTINUE..." gets you back to the previous menu. Let's go ahead now with our choices. The first one is the choice of the project you want to examine. If you don't have a listing handy, EnVest gives you the option of examining the contents of the investment project data base, either on the screen, on paper, or both:

```
ECONOMIC ANALYSIS OF PROJECTS
*** ENVEST ***
========================================

SELECT PROJECT TO EVALUATE

LIST TO ...
  (1) THE SCREEN,
  (2) THE PRINTER,
  (3) BOTH,

  (4) SKIP THE LISTING, OR

  (9) QUIT THE PROGRAM.

      OPTION SELECTED:  _
```

If we do not need another listing (which is similar to the one we have already encountered in connection with the project data base management portion of EnVest), we can proceed to the actual project selection:

```
ECONOMIC ANALYSIS OF PROJECTS
*** ENVEST ***
========================================

SELECT PROJECT TO EVALUATE

CHOOSE THE PROJECT NUMBER,
1...100, FOLLOWED BY <RETURN>.

     PROJECT NUMBER  __1
```

Suppose we choose project No. 1 (which is also the default project which you would pick by pressing RETURN). EnVest then gives you the option of correcting your choice:

```
ECONOMIC ANALYSIS OF PROJECTS
*** ENVEST ***
========================================

SELECT PROJECT TO EVALUATE

CHOOSE THE PROJECT NUMBER,
1...100, FOLLOWED BY <RETURN>.

     PROJECT NUMBER  __1

PROJECT SELECTED:
MOHAMMEDIA PLANT, UNITS 3 AND 4

CORRECT PROJECT?  _
```

If it is the right project, answer "O" for "oui," "Y" for "yes" or "S" for "si". You can then enter the other choices. If not, EnVest puts you back into the previous screen to pick another project number.

For each of the other choices for the economic analysis, EnVest offers you a brief explanation (if desired) and a default value. Once you have entered all your choices, including the official or shadow pricing scenario you wish to use to value project inputs and outputs, your Apple microcomputer begins the fairly slow process of Monte Carlo simulation. For each simulation run, EnVest estimates the cash flows or their equivalents and then calculates the economic performance measures. The estimation of the internal rate of return uses a reasonably fast iteration procedure. Even so, this whole process takes time. You may want to do something else in the meantime. EnVest will let you know which simulation run it is currently working on.

Once all the calculations have been completed, EnVest sorts the results and prints out the frequency distributions, as shown in Exhibit 7. Please make sure that the printer is on. Otherwise, the computer should beep and inform you that the printer is not connected.

After the printout is completed, EnVest gives you the option to view a graphic summary of the frequency distributions for the internal rate of return or the profitability index. You can do that at some other time as

well, since EnVest allows you to store the results of up to 50 economic analysis runs and inspect them later. If you want to see the histogram, you can also obtain a printed copy in the regular size or enlarged, as illustrated by the example in Exhibit 8. Finally, EnVest also gives you the option of storing a copy of the graph itself on a diskette. You need to have a diskette formatted under the Apple Pascal system, named APPRGRAF:. You can keep up to 14 graphs on a single diskette. This option is particularly useful if you want to put together a demonstration, using the computer-generated graphs in "slide-show" fashion.

Simulating the Performance of an Investment Portfolio

The simulation of an investment portfolio is the final component of EnVest. Again, it is much less complicated than the project data base management component or the scenario preparation portion. All you have to do now is to choose the projects and the scenario elements, and EnVest does the actual analysis for you.

Before we go into the mechanics of preparing and running a portfolio simulation, here's a brief overview of what you are doing as an analyst and what EnVest is doing with your choices. A portfolio is simply defined as a program of investments. You define a portfolio by choosing from the project data base the projects you want to implement and the years when you want to start construction. As in the case of putting together a stock portfolio, you pick these projects and their timing in a way that meets a number of objectives (satisfying energy demand, protection against supply disruptions, promotion of technological development, etc.) within a general budget constraint. One of the useful things about EnVest is that you can define ambitious or cautious investment programs and examine their performance under a variety of conditions (defined by your scenarios).

Typically, you would start with some baseline portfolio that reflects choices or programs of the various specialized agencies (ONE, ONAREP, CdM,...). You would examine this program under different assumptions about economic growth, availability of investment funds, etc., to identify strengths and weaknesses. Gradually, you change the investment portfolio, by taking out some projects, adding others, or moving projects forward or backward in time. When you reflect for a moment on all the options you have, you begin to understand why we have chosen an approach of showing consequences of specific decisions through the EnVest simulation, rather than trying to develop an "optional" program from a set of specific objectives. At any given point, you can change the schedule, the projects selected, and the characteristics of the projects themselves (by going back into the investment project data base). Given all these options, judgment and reflection are essential to move to an acceptable solution.

To select a portfolio or run a portfolio simulation, you choose "4" from the EnVest access menu. After a few seconds, you'll see the simulation control screen:

```
DEFINITION/SIMULATION OF PORTFOLIOS
*** ENVEST ***
========================================

WHICH TYPE OF OPERATION ---

(1) DEFINE OR MODIFY A PORTFOLIO,

(2) SIMULATE THE RETURN OF A
    PORTFOLIO,


(9) RETURN TO THE MAIN MENU.

OPTION SELECTED: _
```

You can either choose a new portfolio, change one you have defined earlier or run the simulation. Let's start out with the selection of a portfolio. You would respond by typing "1" to the main prompt. EnVest goes to the first portfolio selection screen:

```
CONSTITUTION OF A PORTFOLIO
*** ENVEST ***
========================================

DO YOU WANT A LISTING OF RECORDED
  PORTFOLIOS? (Y/N) _
```

which offers you the option of listing all the portfolio defined so far. Let's look at them; to do that, you respond in the affirmative (O, Y, or S). EnVest then shows you a listing of the portfolios defined earlier and filed away for reference or future use:

```
CONSTITUTION OF A PORTFOLIO
*** ENVEST ***
========================================
LIST OF RECORDED PORTFOLIOS

PORTFOLIO NO.        IDENTIFIER

     1                PRINCIPAL
     2          *** EMPTY/AVAILABLE ***
     3          *** EMPTY/AVAILABLE ***
     4          *** EMPTY/AVAILABLE ***
     5          *** EMPTY/AVAILABLE ***
     6          *** EMPTY/AVAILABLE ***
     7          *** EMPTY/AVAILABLE ***
     8          *** EMPTY/AVAILABLE ***
     9          *** EMPTY/AVAILABLE ***
    10          *** EMPTY/AVAILABLE ***
    11          *** EMPTY/AVAILABLE ***
    12          *** EMPTY/AVAILABLE ***
    13          *** EMPTY/AVAILABLE ***
    14          *** EMPTY/AVAILABLE ***

C(ONTINUE OR Q(UIT THE PROGRAM..._
```

In this case, only one portfolio has been defined. It is called "Principal." If you press "C" for "C(ONTINUE..." you'll see further listings of portfolios and an indication whether they have already been defined. EnVest allows you to keep up to 30 portfolios ready for a simulation.

Rather than defining a new portfolio, we'll now just modify the (one) existing one. EnVest first of all shows you the composition of the portfolio:

```
              CONSTITUTION OF A PORTFOLIO
                    *** ENVEST ***
=========================================

COMPOSITION OF PORTFOLIO:  PRINCIPAL
SUPPLY-SIDE PROJECTS

PROJECT  ID.    YEAR   TYPE
=========================================
   1     MOH34  1981   SUPPLY
  40     NG40   1982   SUPPLY
   5     KORM2  1984   SUPPLY
   6     THALF  1985   SUPPLY
  12     MENZL  1985   SUPPLY
   4     KNTR2  1987   SUPPLY
  10     M'DEZ  1987   SUPPLY
  11     MATMA  1987   SUPPLY
   3     ELCHR  1988   SUPPLY
  13     QUED   1989   SUPPLY
  51     CL51   1989   SUPPLY
   2     NUC01  1991   SUPPLY

C(ONTINUE OR Q(UIT THE PROGRAM..._
```

EnVest distinguishes between two types of projects, demand- and supply-side projects. Demand-side projects change the parameters that determine energy use and demand patterns (project type 11). In listing the projects in a particular portfolio, EnVest will first show all of the demand-side projects, then those for the supply side. Our sample screen shows the supply-side projects for the portfolio "Principal." The listing shows the project numbers, the brief (five-character) identifier, the year in which construction is supposed to start, and the type.

You can now add or subtract projects or change the name of the portfolio. Suppose we want to take out one project scheduled for a particular year. In that case, we answer in the affirmative (O/Y/S) when EnVest asks whether any projects are to be eliminated. In that case, Envest presents a list of the projects and asks you for each one whether you wish to keep or eliminate it. If you respond with "G" for "G(ARDER," EnVest moves to the next one. If you want to throw it out, you respond with "E" for "E(LIMINER" or "J" for "J(ETER)."

An "E" or a "J" response gets EnVest to ask you for a confirmation of your choice:

```
                CONSTITUTION OF A PORTFOLIO
                     *** ENVEST ***
==========================================
ELIMINATE PROJECTS, PORTFOLIO NO.     1
FOR EACH PROJECT ...
>>G(ARDER OR          J(ETER?  (Y/N) _
>>E(LIMINATE:

    PROJECT  ID.     YEAR   TYPE
    ====================================
       1     MOH34   1981   SUPPLY
      40     NG40    1982   SUPPLY
       5     KORM2   1984   SUPPLY
? >>>  6     THALF   1985   SUPPLY   <<<
      12     MENZL   1985   SUPPLY
       4     KNTR2   1987   SUPPLY
      10     M'DEZ   1987   SUPPLY
      11     MATM.\  1987   SUPPLY
       3     ELCHR   1988   SUPPLY
      13     QUED    1989   SUPPLY
      51     CL51    1989   SUPPLY
       2     NUC01   1991   SUPPLY
```

EnVest highlights the project with the ">>" markers, and allows you to change your mind by offering you the confirmation choice in the upper right-hand corner of the screen.

If you elect to add some projects, EnVest will sort the list of projects to keep them all in order. In the actual simulation, EnVest examines the portfolio in each year to see whether any projects are scheduled for construction. If they are, it introduces them and changes the structure of the energy sector or in the structure of demand accordingly, starting in the year in which construction is expected to be completed (using the most likely value for total construction time).

When you have modified an existing or defined a new portfolio, EnVest files it away, either as a new one or as the replacement of an existing one. At that point, you can move to the actual simulation of any given portfolio. You choose option "2" from the simulation menu:

```
      DEFINITION/SIMULATION OF PORTFOLIOS
                 *** ENVEST ***
=====================================

WHICH TYPE OF OPERATION ---

(1) DEFINE OR MODIFY A PORTFOLIO,

(2) SIMULATE THE RETURN OF A
    PORTFOLIO,


(9) RETURN TO THE MAIN MENU.

     OPTION SELECTED:  _
```

EnVest responds with the option of rerunning a simulation you have run before (perhaps by changing some assumptions), or running a new one. A simulation is defined here as a particular combination of a portfolio and scenario elements. If you want to rerun some simulation, EnVest lists the ones that have been recorded already:

```
                PORTFOLIO SIMULATION
                   *** ENVEST ***
=======================================

LIST OF RECORDED SIMULATIONS...
 1 -     MEM DEMO       11 -
 2 -                    12 -
 3 -                    13 -
 4 -                    14 -
 5 -                    15 -
 6 -                    16 -
 7 -                    17 -
 8 -                    18 -
 9 -                    19 -
10 -                    20 -

C(ONTINUE OR Q(UIT THE PROGRAM..._
```

For now, let's start with a new simulation. As in the case of the economic appraisal of investment projects, EnVest gives you a choice of going ahead with the choice of simulation elements or getting some brief instructions. You start with the choice of the portfolio:

```
                PORTFOLIO SIMULATION
                   *** ENVEST ***
=======================================

PORTFOLIO CHOICE

CHOICE ENTRY ...

(1) BEGIN ENTRY
(2) READ EXPLANATIONS

(9) QUIT THE PROGRAM

    OPTION SELECTED: _
```

You then pick the domestic pricing scenario (official prices), the energy use technology scenario, the import policy, the world market price scenario, and the economic/demographic growth scenario. At each point, EnVest is ready to give some brief information or refresh your memory about the step you are in:

PORTFOLIO SIMULATION
*** ENVEST ***
==========

PRICING SCENARIO CHOICE

CHOICE ENTRY ...

(1) BEGIN ENTRY
(2) READ EXPLANATIONS

(9) QUIT THE PROGRAM

SELECTED OPTION: _

Once you have picked all of the elements of a portfolio simulation run, EnVest goes into the actual simulation. First, it determines the total energy demanded in each of the product categories. It then simulates the behavior of the energy supply and conversion sector over time. All of that again takes some time on the Apple microcomputer. EnVest will keep you "up to date," showing the year that the simulation is in currently.

When the simulation reaches the end of the planning period (right now the year 2000), it starts printing out the results of the simulation. Again, make sure that your printer is hooked up and ready to print. Otherwise, you may have some difficulties, although it is generally fairly easy to correct such an oversight. When the printing is done, EnVest again offers you a choice of examining the outcomes of this particular simulation in graphical form. You have two forms of graphs. The first one shows the demand-supply relationships for individual energy pro- ducts, the other type illustrates financial implications -- the investment and operating costs and the total foreign exchange costs.

Appendix A

THE APPLE PASCAL OPERATING SYSTEM

On the Apple II family, EnVest is running under the Apple Pascal Operating System which is based on the p-System developed originally at the University of California at San Diego. This Operating System includes the basic functions of any operating system, such as control of the hardware, input and output functions, file management, as well as an editor (a low-level word processor) needed to write programs, the Pascal compiler -- which can be replaced by a FORTRAN compiler -- and a library with a number of useful subprogams. This appendix is designed to provide a quick overview of some of the features of the Apple Pascal Operating System, and to outline the steps needed to transfer EnVest from the backup floppy-disks to the hard disk, should this ever become necessary, as a result of any system crash or operator error, or to set up another hard-disk for the EnVest system. Even for the basic operations covered here, the manuals for both the Apple Pascal Operating System and for the (Corvus) hard-disk will remain indispensable.

When you turn on the Apple II computer, it checks first whether the "boot drive" (in the case of floppy-disks, the one connected to the upper plug on the disk controller card in slot no. 6, for the hard-disk the volume designated no. 4) contains the files needed to function under the Pascal (or some other) Operating System. If these files are present, the computer will run under this Operating System. If the system you have is set up for EnVest, the Pascal Operating System will take over. Depending on the specific setup, you find yourself either in the main menu for the Pascal Operating System or in the EnVest access menu. From the EnVest access menu, you can get to the Operating System by choosing option "9."

The Pascal Operating System comprises a number of components. Any one represents a set of programs and can be called with a single letter, as shown in the top line of the main menu:

```
COMMAND: E(DIT, R(UN, F(ILE, C(OMP, L(IN


WELCOME SYS, TO APPLE II PASCAL 1.1

BASED ON UCSD PASCAL II.1

CURRENT DATE IS 28-MAR-84


(C) APPLE COMPUTER INC. 1979, 1980
(C) U.C. REGENTS 1979
```

For our purposes, only three of these components are of interest:

eX(ecute: to run a particular program;
F(iler: to manipulate files on floppy-disks or on the hard-disk;
E(ditor: to write new programs.

Before we look at each of these major components in turn, let's review briefly how the Operating System organizes the computer itself, its peripherals, such as the printer, and the contents of the floppy-disks or any hard-disks attached. Basically, each peripheral element is treated as a separate volume. The monitor or screen represents one volume, the keyboard another one, and the printer yet another one. None of these are of much concern to the user (unless you are a programmer). More important to us is the fact that each floppy-disk "on-line," that is, in a floppy-disk drive, is also treated as a separate volume, provided it has been set up (or formatted) for the Pascal Operating System. The formatting itself gives each floppy-disk a name, which can be changed using the C(hange option of the F(iler. This name consists of up to seven characters, followed by a colon. Thus, the following volume names are permissible:

BLANK:
SIMULA:
ENVEST1:
APPLE0:

There are a number of restrictions on naming disk volumes. The name cannot start with a digit and it may not contain blanks or punctuation marks.

On the hard disk, you can set up several volumes, each of which will be treated by the Operating System as if it were a floppy-disk, although hard-disk volumes typically are bigger. The Pascal Operating System can handle up to six of these volumes on-line at a time. To each volume name, the system assigns a number, which can be used in place of the name to refer to that volume. These numbers are #4:, #5:, and #9: through #12: (the "#" sign must always and the colons should generally be included).

Each volume can hold a certain amount of information. On the Apple, each floppy-disk holds approximately 140,000 bytes (characters), organized into 280 blocks of 512 bytes each. Volumes on a hard-disk can be of different lengths, as determined by the user. Customarily, one defines the lengths of hard disk volumes in multiples of 256.

Each volume typically contains several files. For our purposes, we only distinguish three types of files: TEXT files, CODE files, and DATA files. For the first two categories, "TEXT" or "CODE" is attached as a suffix by the system to the file name. DATA files need not use "DATA" as their suffix. TEXT files simply contain information entered by the user, employing the E(ditor. These files can be called up on the screen with the E(ditor to be modified or expanded. You'll rarely find TEXT files used for anything but the source code of programs. When you compile one of these programs (using the C(ompiler option of the main system menu), you create a CODE file. In most cases, any such CODE can then be eX(ecuted as a program. However, not all CODE files are in fact executable, since Apple Pascal allows the user to compile segments separately and then combine them later into a complete program.

In the Pascal Operating System, each file on any volume is identified by a name which includes the volume name and an optional suffix. Thus, the following names refer to specific files in the EnVest system:

SYS:SYSTEM,APPLE
ENV1:DEMAND.CODE (the program for demand forecasting)
DONN:SIMULA (the data file with the results of the portfolio simulation)
SIM:DEMAND.TEXT (the TEXT file with the listing of part of the program which is contained in compiled form in ENV1:DEMAND.CODE)

The Pascal Operating System adds the TEXT and CODE suffixes automatically. You can override these automatic suffixes, as discussed briefly in the section on the F(iler below. However, the system will not be able to eX(ecute any file without the CODE suffix. Similarly, you cannot E(dit a file without the TEXT suffix.

Using the F(iler

The F(iler is used to manipulate individual files on one of the volumes on-line. You get to the F(iler by typing "F" in response to the options shown in the main system menu (no RETURN required). The menu then changes to the F(iler menu, which allows you to:

T(ransfer files from one volume to another;
C(hange the name of a file (or a volume);
L(ist the files in a given volume (or produce an E(xtended list of these files with additional information);
K(runch a volume by pushing the files together to get rid of small pieces of unused space on a volume;
R(emove certain files from the directory of a volume, that is, it effectively erases that file;
Z(ero the directory of a particular volume, thereby erasing all information on that file.

The F(iler still includes other operations, but this may suffice as a sample of its functions. For our purposes, we are likely to use only three or four anyway: "T" to T(ransfer files from one volume on-line to another; "L" or "E" to generate a listing of the contents of a file, and "K" to close down any "gaps" between files and combine all unused space on a volume into a single block.

Let's take the listing options first. Both "L" and "E" will produce a list of all the files on a volume. The only difference between these two options is the amount of information you receive on each file. The "L" option produces a list faster, while the "E" option adds a few more items such as the location of the file on the volume, its length, the date of its last modification or creation, and its type. To get a list, type "E" or "L." The Operating System responds by prompting you for the name of the volume for which you want a listing. You can type now either the name of the volume desired, such as "ENV1:" (don't forget the colon), or the volume number, such as "#5:" (in this case, the colon is optional). If you then hit RETURN, the system will provide the list on the screen. If you want a printed list, follow the volume name or number with a comma, followed by "PRINTER:" and RETURN. This will give you the same information as on the screen on paper.

An important option is the "T" for T(ransfer. This option is used to copy a file from one volume to another. You type "T" in response to the main menu to invoke this option. The Operating System will then prompt you "Transfer what?" You respond by typing the name of the file you wish to transfer; e.g., "SIM:DEMAND.CODE." If you hit RETURN after the file name, the system simply prompts you "To where?" You now have to provide the name of the "destination file," such as "ENV1:DEMAND.CODE." In this particular example, you could also use the so-called wildcard option in naming a file. To transfer the file named "SIM:DEMAND.CODE" to another volume, ENV1:, you respond to the prompt "To where?" by typing "ENV1:$" -- where the "$" simply means: "use the file name of the source file without the volume name and append it to the name of the destination volume to name the new file."

You can also abbreviate the transfer process by responding to the original prompt, "Transfer what file?", by typing the name of the source file and the name of the destination file, separated by a comma, before hitting RETURN. The fastest form for our example would, therefore, look something like this:

"Transfer what file? SIM:DEMAND.CODE,ENV1:$"

You can also use the T(ransfer function to print out a TEXT file. For example, to list SIM:DEMAND.TEXT, you respond to "Transfer what file?" by typing "SIM:DEMAND TEXT, PRINTER:". Don't forget the colon in "PRINTER:"!

In reconstituting EnVest after some accident, or in creating a new (hard) disk containing EnVest, you would use the T(ransfer function of the F(iler extensively. We'll describe the appropriate procedures below following a quick overview of the capabilities of the system E(ditor.

Using the E(ditor

The system editor in the Pascal Operating System is actually comparable to a word processor, although it doesn't have certain features you have come to expect from a word processing program. But it is very well suited to the task of program development, with features such as auto-indentation, etc. For our purposes here, we just want to examine some of the features relevant to an understanding of EnVest.

You invoke the E(ditor by typing "E" in response to the main system menu. That puts the E(ditor prompt line on the screen. You can now work on an existing (TEXT) file, or set up a new one. The file you are working on becomes the system's work file. When you end an editing session (by typing "Q" for Q(uit, with the U(pdate option) the system saves this file on the "boot" volume -- the volume corresponding to "#4" as numbered by the system -- under the name "#4:SYSTEM.WRK.TEXT." Whenever such a file exists, invoking the E(ditor automatically loads it into memory as the system working file. If no such file is present on the boot volume, the system will prompt you for the name of the file you want to E(dit. To create a new file, simply respond to this prompt with a RETURN. Otherwise, you'd type the name of the file you want without the .TEXT suffix. The system checks whether the named file is in fact on-line; if it is, it loads it into memory.

The entire working file in the Apple Pascal Operating System must be in memory. That means that the size of the file is limited. Generally, no text file can contain more than 16,000 bytes (or characters). Since EnVest contains a number of programs whose TEXT version is longer than that, these programs have been broken up into several TEXT files which are then combined by the C(ompiler in translating the TEXT version into an eX(ecutable CODE file. In practice, that means that you often have to examine the program listing closely to find the TEXT file corresponding to a part of the program you wish to edit.

Once you have a working file, the E(ditor offers a number of possible operations, each one of which is invoked by typing the corresponding letter. You can I(nsert text (which is also the appropriate choice for creating a new text file), you can D(elete a portion of the text, you can overwrite existing text under the eX(change option, and you can C(opy text from another TEXT file or from temporary storage in memory. This latter option is useful in any cut-and-paste operations. When you delete some portion of text, that portion is not immediately lost. Until you execute some other operation, the system holds the deleted text in memory in a "buffer." You can now reposition the cursor where you want to place the text and issue the C(opy demand. In response to the prompt "From F(ile or B(uffer?" you respond with "B" for buffer. The system now copies the text you just deleted into the new position. Copying from the buffer does not erase its contents. The text remains until you I(nsert or D(elete, or Q(uit the E(ditor. You can, therefore, copy the same text several times into different locations.

What portion of the text you are working on is determined by the location of the cursor. Cursor control is fairly simple. The arrow keys can be used to move the cursor left and right, while you'd use CTRL-O (holding the CTRL key and pressing the letter "O" at the same time) to move the cursor up and CTRL-L to move it down. You can proceed quickly through the text by typing "P" for P(age which advances to the next screen, i.e., jumps the cursor 23 lines. If you preceded the "P" with a ",", you reverse the direction of P(aging, as well as of RETURN and of the space bar. To get back to the normal direction, type a ".". The E(ditor also gives you the option of J(umping to the B(eginning or to the E(nd of a TEXT file.

Finally, you can locate a particular portion of the text by using the F(ind operation. Typically, you just type a character string enclosed by slashes, e.g., "/ENVEST/". The system will then position the cursor following the first occurrence of "EnVest" in the text. Typing "F" for F(ind, followed by "S" for the S(ame, locates the second occurrence of the character string. The F(ind option is case-sensitive. If you search for "EnVest," it would not find "ENVEST," "envest," or any other version except "EnVest." That brings us to one option that has been used extensively in developing the programs that make up the EnVest planning support system -- mixing upper and lower-case letters. Much of the development work was done on an Apple II with an 80-column card which allows for upper and lower-case writing. However, even on the 40-column Apples, the Pascal E(ditor allows for the use of upper and lower case. Pressing CTRL-E puts you into a lower-case mode. Pressing CTRL-E again puts you back into upper-case. In other words, CTRL-E "toggles" between the two modes. Pressing CTRL-W puts the letter immediately following in upper-case, and all subsequent letters in lower-case.

When you turn on the computer, you start in upper case. Pressing either CTRL-E or CTRL-W puts you into lower-case mode, in which the system shows upper-case letters in reverse video (black on white) and lower-case letters in normal video. Even if you now toggle back into upper-case mode by typing CTRL-E again, the screen display retains the reverse-video mode for upper-case letters.

The E(ditor also gives you the option of replacing one character string with another -- throughout the text, for a certain number of times only, or only after V(erification. For specific options on this and any other commands, please consult the Pascal Operating System Manual.

Transferring EnVest System to the Hard Disk

For the following description of the steps needed to transfer EnVest from the floppy-disk backups to the hard-disk, we assume the standard hardware setup: one floppy-disk drive and one formatted hard-disk. The transfer operation basically involves inserting a series of diskettes into the disk drive and copying their contents to the hard-disk using the T(ransfer option of the F(iler.

In setting up (or reconstituting) EnVest, you have two basic options. Under the first option, you put only those files on the hard disk that are needed to run EnVest. Under the second option, you would also transfer the files needed for further program development or modification. The first option requires four volumes:

SYS: which contains all the system files as well as the EnVest access menu (backup diskettes SYS1: - SYS3:);

ENV1: which contains the programs for managing the project data base, the scenario formulation, and the economic/financial analysis (backup diskettes ENV11: - ENV14:);

ENV2: which contains primarily the programs for the portfolio simulation (backup diskettes ENV21: - ENV23:);

DONN: which contains all the data files used in the EnVest planning support system (backup diskettes DONN1: - DONN3:).

To add the files needed for program development, you need four more volumes:

PROJ: which contains all program files related to the project data base management task (backup diskettes PROJ1: - PROJ4:);

SCEN: which contains all program files related to the preparation and modification of policy scenario elements (backup diskettes SCEN1: - SCEN4:);

NPV: which contains all program files related to the financial or economic appraisal of projects (backup diskettes NPV1: - NPV3:); and

SIM: which contains all program files related to the selection and simulation of a particular portfolio of energy investment projects under specific policy scenarios (backup diskettes SIM1 - SIM4:).

The number of files on each of these volumes varies depending on the complexity of the tasks involved. In some instances, the program volumes also contain some more general utility programs that have not been transferred to one of the ENV_: volumes. (The EnVest system uses two volumes for the executable program files, because the Pascal Operating System allows only 77 files per volume, a number exceeded by EnVest.)

Finally, the complete EnVest system also includes a volume UTIL: with a few programs for background tasks (backup diskette UTIL1:).

The first step in setting up the system is to transfer all files from the SYS_: backup diskettes to the boot volume on the hard disk; please consult the Corvus manual to get to that step (changes in formatting procedures etc. for the hard disk may require different steps now than for the original system). All the system files are contained on the SYS_: backup diskettes. You can, therefore, skip the original step of assembling the various system files and hard disk control files on a single diskette, as described in the Corvus manual.

Once the SYS: volume has been created and all files from the SYS_: backup diskettes have been transferred, you can use the VMGR program to create the volumes needed for the creation/reconstitution of the hard-disk based EnVest system. To do that, simply type "X" for eX(ecute in response to the main system menu. The Pascal Operating System then prompts for the name of the CODE file to execute. You respond to that by typing "VMGR", the full name of the file you want to execute, SYS:VMGR.CODE. The system adds the name of the boot volume as a default prefix: unless you type another volume name (identified by the colon), it assumes that the SYS: volume is meant. You can change this default prefix by using the P(refix option of the F(iler. The system also adds the ".CODE" suffix to the file name you type in.

The VMGR (Volume ManaGeR) allows you to create the Pascal volumes you need. From the VMGR menu, you choose the N(ew option. The program then prompts you for the name of the volume and the number of blocks to be reserved for this volume. As briefly discussed above, the blocks are units of 512 bytes or characters. A volume with 1024 blocks, therefore, can hold up to (roughly) 550,000 bytes or characters. In setting up the volumes for EnVest, you should use the 1024-block default option for all volumes, with the exception of DONN:, which needs 2048 blocks, and NPV: and UTIL: for which 512 blocks are sufficient.

Once you have created all the volumes needed, you have to M(ount the ones you need for the actual T(ransfer of the files. You are limited to six volumes on-line at any given time. If you are interested only in working with the executable version of EnVest, that restriction does not pose a problem. In that case, you might end up with the following assignment:

Volume No.	Volume Name
4	SYS: (this assignment is permanent)
5	DONN:
9	Reserved for the floppy-disk drive
10	ENV1:
11	ENV2:

In this case, volume no. 12 would be available for other assignments. If you are working with the full system including all of the program volumes, some of the volumes must remain unmounted at any given time. To change the set of volumes mounted, you always have to invoke the VMGR program.

Once all the volumes have been defined and mounted, you can proceed to transferring the files from the floppy backup disks to the hard-disk volumes. From the main system menu, invoke the F(iler by typing "F." Insert the backup diskette into the floppy-disk drive which is always assigned the volume number #9: by the system unless you change it, and choose the F(iler T(ransfer option by typing "T." In response to the prompt "Transfer what file?" you respond in all cases:

#9:=,XXX:$,

where XXX: refers to the name of the destination volume. The definition of the source file uses another wildcard option, '=', which refers to all files on the volume #9:. To create the various volumes, you simply copy their backup disks in sequence to the corresponding hard-disk volume.

APPENDIX B

LIST OF VARIABLES

Project Descriptors: Common Variables

Variable Name	Description
ProjNo	Project number
TypeNo	Project type (1-13)
Projet	Project name (up to 40 characters)
ProjId	Brief project identifier (up to 5 characters)
InvImp	Part of total investment required in foreign exchange (in Dirhams at Exchange rate)
InvDom1	Domestic investment purchases of purely domestic goods (in Dirhams)
InvDom2	Domestic investment purchases (primarily imported goods -- in Dirhams)
InvEmp(1..4)	Construction labor by four labor categories (in person-hours)
ExDate	Date for which Exchange rate holds
Exchange	Exchange rate used in calculating InvImp and InvDom
InvPerc(1..2)	High and low limits for total investment as percent of most likely value
ConDelai(1..3)	Low, most likely and high estimates of construction time (in months)
CovTInv	Covariance, construction time/ investment
ConTAns	Most likely construction time estimate in years
Credit	Total investment financed by foreign loans
Interet	Average interest rate for loan
Profile(1..12)	Percentage of total investment planned for each year of the construction period
PLife	Project life in years
COpFix	Fixed operating costs
COpVar	Variable operating costs

COpFxDev	Percentage of total operating costs in foreign exchange
COpVrDev	Percentage of total variable costs in foreign exchange
COpEnerg	Energy-related operating costs at full capacity operation
COpOeuvr(1..4)	Total employment by labor category during typical project year

Note: COpFix and COpVar exclude costs for energy and labor.

Project-Specific Variables (Subfiles)

1. Thermal Power Plants *

Nouv1	power plant modification indicator, = 1 if modification of existing power plant, = 0 or blank for a new power plant;
CentrNo	number of power plant to be modified; blank, if Nouv1 = 0/blank
NombUnits	number of units in the power plants;
NominCap	nominal capacity of each unit;
MinTech	minimum technique, the level at which the unit must be run;
Heatrate	overall heatrate for the unit (total consumption of fuel of type combustible per unit output at nominal capacity);
MinHtrate	heatrate for the minimum technique;
Combustible	type of fuel used: F - fuel oil G - natural gas N - nuclear S - oil shale B - biomass (alfa) C - coal;
OptCombust	optional fuel (same codes) -- switchover possible without significant investments;
TauxDefaiTl(1..3)	forced outage rate (high, medium, low);
Indispon	no. of days in year unit is to be closed down for planned maintenance;
Increment(1..3)	low, medium and high usage at which plant will be run (percentage of time);
Buildup(1..10)	percentage of final capacity achieved in years 1..10;

2. Hydro Power Plants

FilEauAv	run-of-the-river capacity, average years;
FilEauSec	run-of-the-river capacity, (average) dry years;
LibreAv	additional capacity, average years,

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* All subproject files include project type and number.

Project-Specific Variables (Subfiles) (Cont'd)

LibreSec	additional capacity, dry years;
SecChance	probability that any given year is a dry year;
Liblotti(1..3)	low, medim, and high range on additional capacity;

3. Refineries and Their Modifications

OldCap	refinery capacity in Unite3 per year before modification (if 0, then we have a new refinery);
RefNo	No. of the refinery to be modified (blank if OldCap is zero);
refCap	capacity of the refinery after construction/modification
Unite3	unit in which refinery capacity is measured;
BrutType	type of crude processed: 'S' - shale crude 'P' - regular crude;
RcapLim(1..2)	low and high limits on capacity, as percentage of RefCap;
OldCoeff(1..6)	production coefficients by type of product before modification in percent; (0's in the case of a new refinery);
NewCoeff(1..6)	production coefficients by type of product after modification in percent;
CoalPerTon	coal use per Unite3 (also measured in Unite3 to simplify things)

4. Shale Retorting

SchProd(1..10)	production in years 1...10;
Unite4	unitT/bbl/Tj
SchLim(1..2)	upper/lower annual limit (%)
ElectrSch	electricity consumption in GWh per Unite4 produced;
GasoilSch	diesel consumption per Unite4 produced (also measured in Unite4);

4. Shale Oil Upgrading

SynCap(1..10)	output for years 1...10;
Unite5	unit T/BBLS/TJ

Project-Specific Variables (Cont'd)

SynLim(1..2)	upper/lower limit (%) on annual product;
SchBrut	consumption of shale crude in Unite5 per Unite5 produced;
CoalSyn	consumption of coal in Unite5 per Unite5 produced.

6. Mines

MinType	type of mine	C - coal S - shale
MinProd(1..20)	planned production for year 1..20;	
Unite6	tonnes/TJ	
MinLim(1..2)	upper/lower (%) on annual production	
ElMines	electricity consumption in GWh/Unite6	
GOMines	diesel consumption in Unite6/Unite6	
EssMines	gasoline consumption in Unite6/Unite6	
FOMines	fuel oil consumption in Unite6/nite6	

7. Natural Gas

GazProd(1..20)	production of gas for years 1..20	
Unite7G	1000m³ - M tonnes - T bbls - B mmft³ - F	for the gas production
GazCal	caloric value of gas (Kgcal/Unite7G)	
GazLim(1..2)	upper/lower limit (%)	
CondProd(1..20)	production of condensate for years 1...20	
Unite7C	unit of CondProd	
Densite	density of condensate	
CondLim(1..2)	upper/lower limit	
PegPrice	assumed ratio between price of LPG and that of butane	

Project-Specific Variables (Cont'd)

8. Fuelwood

BoisProd(1..20)	planned production for years 1..20	
Unite8	unit of BoisProd:	T - tonnes J - terajoules M - m^3
BoisCal	Caloric value of wood (Kgcal/Unite8)	
BoisLim(1..2)	upper/lower limit (%)	

9. Renewable Energy

RenType	type of reneable energy	S - solaire E - eolienne A - alcool O - autre
SecRemp(1..16)	sector where energy is replaced	
EnRemp(1..12)	energy product replaced	
RenProd(1..20)	annual production of renewable energy for years 1..20	
Unite9	unit of RenProd	T - Tonnes M - m^3 L - litres J - terajoules
RenCal	caloric value per unit.	

10. Small-scale power plants

MicType	type of small power plant/	H - hydro P - photovoltaïque
MicProd	annual production per plant	
MicLim(1..2)	upper/lower limit on MicProd	
Unite10	unit of MicProd	G - Gwhrs J - terajoules
MicNo(1..20)	number of plants coming on-line for years 1...20	
MicLim2(1..2)	upper/lower limit for MicNo (%)	

Project-Specific Variables (Cont'd)

Secteur	sector number(1...16)
CoeffUt(1..12)	new coefficients of energy consumption (in terajoule per unit of level activity)
ElShort(1..12)	short-term demand elasticity
ElLong(1..12)	long-term demand elasticity

12. Infrastructure Investment

EnType	energy product affected
InfType	infrastructure type (pipeline, port...)
InfCap	annual capacity
Unite12	unit of capacity (InfCap)
InfLim(1..2)	upper/lower annual limits on capacity (%)

13. Research and Development

RdType	type of research and development project.

EXHIBIT 1

LIST OF PROJECTS IN INVENTORY

Liste actuelle des projets enregistres dans la base de donnees

Projet no. 1 Type no. 1
RECONVERSION AU CHARBON DE MOHAMMEDIA

Projet no. 2 Type no. 1
600 MW Centrale Nucleaire

Projet no. 3 Type no. 2
USINE HYDRO-ELECTRIQUE DE MJAARA

Projet no. 4 Type no. 1
CENTRALE AU CHARBON IMPORTE (2X300MW)

Projet no. 6 Type no. 6
CDM-SIEGE 5-EXPANSION

Projet no. 7 Type no. 1
CENTRALE A L'ALFA 3MW

Projet no. 8 Type no. 1
TURBINE A GAZ DE KORIMATE (25/30MW)

Projet no. 9 Type no. 1
TURBINE A GAZ (2X90/100MW) KENITRA

Projet no. 10 Type no. 2
USINE HYDRO-ELECTRIQUE DE M'DEZ

Projet no. 11 Type no. 2
USINE HYDRO-ELECTRIQUE DE MATMATA

Projet no. 12 Type no. 2
USINE HYDRO-ELECTRIQUE D'EL MENZEL

Projet no. 13 Type no. 2
USINE HYDRO-ELECTRIQUE D'EL OUED

Projet no. 20 Type no. 3

Projet no. 21 Type no. 3

Projet no. 22 Type no. 3
PYROLYSE SCHISTES 3.6 MT

Projet no. 40 Type no. 7
DEV'T GISEMENT DE MESKALA 600000 MC/J

Projet no. 50 Type no. 6
EXPANSION-SIEGE 5

Liste actuelle des projets enregistres dans la base de donnees

Projet no. 51 Type no. 6
SIEGE 6

EXHIBIT 2

PROJECT SAMPLE

Projet No. 1: Centrale Mohammedia, Tranches 3 et 4 (Moh34) Type

Donnees d'Investissement et de Construction

Investissements - devises (DH):	1.25000E9	Main d'oeuvre de chantier	
Investissements - monnaie locale		- Non-qualifiee:	200
Monnaie locale (DH):	5.50000E8	- Qualifiee:	400
Importations ind. (DH):	0.0	- Cadres professionels	150
		- Personnel du bureau	10

Taux de change (DH/US-$): 8.00
Date effective du taux: 1-Janv-84

Estimations des Aleas

(1) Investissement (en pourcent)		(2) Delai de construction (en mois)	
- bas:	95.0%	- bas:	48
- moyen:	100.0	- moyen:	60
- haut:	105.0	- haut:	72

Covariance investissement/delai de construction: 1.00000

Delai de construction moyen (en ans): 5

Distribution d'investissement par an (en pourcent):

An:	1	7.0
An:	2	15.0
An:	3	33.0
An:	4	30.0
An:	5	15.0

Credit budgetaire: 9.00000E8
Interet (pourcent) 10.5

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EXHIBIT 3

PRICING SCENARIO

MINISTERE DE L'ENERGIE ET DES MINES, ROYAUME DU MAROC
U.S. Agency for International Development/Development Sciences Inc.

Scenario des prix no. 0; prix du marche/officiels
Identificateur: REELO Date: 30-Nov-84

ACTUAL PRICES WITH HIGH GR RATES

Annee	Taux de change	Salaires de la main-d'oeuvre (Dh/mois) Non-qualifiee	Qualifiee	Cadres	Personnel bureau
1981	5.00000	5.66000E2	1.13300E3	2.26600E3	1.13300E3
1982	6.25000	7.07500E2	1.35960E3	2.60590E3	1.35960E3
1983	7.81250	8.84375E2	1.63152E3	2.99678E3	1.63152E3
1984	9.76562	1.10547E3	1.95782E3	3.44630E3	1.95782E3
1985	1.22070E1	1.38184E3	2.34939E3	3.96325E3	2.34939E3
1986	1.30615E1	1.72729E3	2.81927E3	4.55773E3	2.81927E3
1987	1.39758E1	2.15912E3	3.38312E3	5.24139E3	3.38312E3
1988	1.49541E1	2.69890E3	4.05974E3	6.02760E3	4.05974E3
1989	1.60009E1	3.37362E3	4.87169E3	6.93174E3	4.87169E3
1990	1.71210E1	4.21703E3	5.84603E3	7.97151E3	5.84603E3
1991	1.83195E1	5.27129E3	7.01524E3	9.16723E3	7.01524E3
1992	1.96018E1	6.58911E3	8.41829E3	1.05423E4	8.41829E3
1993	2.09740E1	8.23638E3	1.01019E4	1.21237E4	1.01019E4
1994	2.24421E1	1.02955E4	1.21223E4	1.39422E4	1.21223E4
1995	2.40131E1	1.28694E4	1.45468E4	1.60335E4	1.45468E4
1996	2.56940E1	1.60867E4	1.74562E4	1.92403E4	1.74562E4
1997	2.74926E1	2.01084E4	2.09474E4	2.30883E4	2.09474E4
1998	2.94171E1	2.51355E4	2.51369E4	2.77060E4	2.51369E4
1999	3.14763E1	3.14193E4	3.01643E4	3.32472E4	3.01643E4
2000	3.36796E1	3.92741E4	3.61971E4	3.98966E4	3.61971E4
2001	3.40164E1	4.12378E4	3.72830E4	4.08940E4	3.72830E4
2002	3.43566E1	4.32997E4	3.84015E4	4.19164E4	3.84015E4
2003	3.47001E1	4.54647E4	3.95536E4	4.29643E4	3.95536E4
2004	3.50471E1	4.77380E4	4.07402E4	4.40384E4	4.07402E4
2005	3.53976E1	5.01249E4	4.19624E4	4.51393E4	4.19624E4
2006	3.57516E1	5.26311E4	4.32212E4	4.62678E4	4.32212E4
2007	3.61091E1	5.52626E4	4.45179E4	4.74245E4	4.45179E4
2008	3.64702E1	5.80258E4	4.58534E4	4.86101E4	4.58534E4
2009	3.68349E1	6.09271E4	4.72290E4	4.98254E4	4.72290E4
2010	3.72032E1	6.39734E4	4.86459E4	5.10710E4	4.86459E4
2011	3.75753E1	6.71721E4	5.01052E4	5.23478E4	5.01052E4
2012	3.79510E1	7.05307E4	5.16084E4	5.36565E4	5.16084E4
2013	3.83305E1	7.40572E4	5.31567E4	5.49979E4	5.31567E4
2014	3.87138E1	7.77601E4	5.47514E4	5.63729E4	5.47514E4
2015	3.91010E1	8.16481E4	5.63939E4	5.77822E4	5.63939E4
2016	3.94920E1	8.36893E4	5.72398E4	5.86489E4	5.72398E4
2017	3.98869E1	8.57815E4	5.80984E4	5.95286E4	5.80984E4
2018	4.02858E1	8.79260E4	5.89699E4	6.04216E4	5.89699E4
2019	4.06886E1	9.01242E4	5.98544E4	6.13279E4	5.98544E4
2020	4.10955E1	9.23773E4	6.07522E4	6.22478E4	6.07522E4
2021	4.15065E1	9.46867E4	6.16635E4	6.31815E4	6.16635E4
2022	4.19215E1	9.70539E4	6.25885E4	6.41292E4	6.25885E4
2023	4.23408E1	9.94802E4	6.35273E4	6.50912E4	6.35273E4
2024	4.27642E1	1.01967E5	6.44802E4	6.60675E4	6.44802E4
2025	4.31918E1	1.04516E5	6.54474E4	6.70586E4	6.54474E4

Scenario des prix no. 0; prix du marche/officiels
Identificateur: REELO Date: 30-Nov-84
ACTUAL PRICES WITH HIGH GR RATES

Annee	Taux de change	Salaires de la main-d'oeuvre (Dh/mois) Non-qualifiee	Qualifiee	Cadres	Personnel bureau
2026	4.36237E1	1.07129E5	6.64291E4	6.80644E4	6.64291E4
2027	4.40600E1	1.09808E5	6.74256E4	6.90854E4	6.74256E4
2028	4.45006E1	1.12553E5	6.84369E4	7.01217E4	6.84369E4
2029	4.49456E1	1.15367E5	6.94635E4	7.11735E4	6.94635E4
2030	4.53950E1	1.18251E5	7.05054E4	7.22411E4	7.05054E4
2031	4.58490E1	1.21207E5	7.15630E4	7.33247E4	7.15630E4
2032	4.63075E1	1.24237E5	7.26365E4	7.44246E4	7.26365E4
2033	4.67705E1	1.27343E5	7.37260E4	7.55410E4	7.37260E4
2034	4.72382E1	1.30527E5	7.48319E4	7.66741E4	7.48319E4
2035	4.77106E1	1.33790E5	7.59544E4	7.78242E4	7.59544E4
2036	4.81877E1	1.37135E5	7.70937E4	7.89916E4	7.70937E4
2037	4.86696E1	1.40563E5	7.82501E4	8.01764E4	7.82501E4
2038	4.91563E1	1.44077E5	7.94239E4	8.13791E4	7.94239E4
2039	4.96479E1	1.47679E5	8.06152E4	8.25998E4	8.06152E4
2040	5.01443E1	1.51371E5	8.18244E4	8.38388E4	8.18244E4

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Scenario des prix no. 0; prix du marche/officiels
Identificateur: REELO Date: 30-Nov-84
ACTUAL PRICES WITH HIGH GR RATES

	Prix energetiques (Dh/GJ)					
Annee	Electricite	Propane	Butane	Essence	Kerosene	Gas Oil
1981	106.00	50.00	50.00	135.00	61.00	67.00
1982	121.90	57.50	57.50	155.25	70.15	77.05
1983	140.18	66.13	66.13	178.54	80.67	88.61
1984	161.21	76.04	76.04	205.32	92.77	101.90
1985	185.39	87.45	87.45	236.12	106.69	117.18
1986	200.23	89.20	89.20	240.84	108.82	119.53
1987	216.24	90.98	90.98	245.65	111.00	121.92
1988	233.54	92.80	92.80	250.57	113.22	124.36
1989	252.23	94.66	94.66	255.58	115.48	126.84
1990	272.41	96.55	96.55	260.69	117.79	129.38
1991	294.20	98.48	98.48	265.90	120.15	131.97
1992	317.73	100.45	100.45	271.22	122.55	134.61
1993	343.15	102.46	102.46	276.65	125.00	137.30
1994	370.60	104.51	104.51	282.18	127.50	140.04
1995	400.25	106.60	106.60	287.82	130.05	142.85
1996	432.27	108.73	108.73	293.58	132.65	145.70
1997	466.86	110.91	110.91	299.45	135.31	148.62
1998	504.20	113.13	113.13	305.44	138.01	151.59
1999	544.54	115.39	115.39	311.55	140.77	154.62
2000	588.10	117.70	117.70	317.78	143.59	157.71
2001	617.51	123.58	123.58	333.67	150.77	165.60
2002	648.38	129.76	129.76	350.35	158.31	173.88
2003	680.80	136.25	136.25	367.87	166.22	182.57
2004	714.84	143.06	143.06	386.26	174.53	191.70
2005	750.59	150.21	150.21	405.58	183.26	201.29
2006	788.11	157.72	157.72	425.86	192.42	211.35
2007	827.52	165.61	165.61	447.15	202.05	221.92
2008	868.90	173.89	173.89	469.51	212.15	233.01
2009	912.34	182.59	182.59	492.98	222.75	244.67
2010	957.96	191.72	191.72	517.63	233.89	256.90
2011	1005.86	201.30	201.30	543.51	245.59	269.74
2012	1056.15	211.37	211.37	570.69	257.87	283.23
2013	1108.96	221.93	221.93	599.22	270.76	297.39
2014	1164.40	233.03	233.03	629.18	284.30	312.26
2015	1222.62	244.68	244.68	660.64	298.51	327.87
2016	1283.76	256.92	256.92	693.67	313.44	344.27
2017	1347.94	269.76	269.76	728.36	329.11	361.48
2018	1415.34	283.25	283.25	764.78	345.57	379.56
2019	1486.11	297.41	297.41	803.02	362.84	398.53
2020	1560.41	312.28	312.28	843.17	380.99	418.46
2021	1638.43	327.90	327.90	885.32	400.04	439.38
2022	1720.35	344.29	344.29	929.59	420.04	461.35
2023	1806.37	361.51	361.51	976.07	441.04	484.42
2024	1896.69	379.58	379.58	1024.87	463.09	508.64
2025	1991.52	398.56	398.56	1076.12	486.25	534.07

MINISTERE DE L'ENERGIE ET DES MINES, ROYAUME DU MAROC
U.S. Agency for International Development/Development Sciences Inc.

Scenario des prix no. 0; prix du marche/officiels
Identificateur: REELO Date: 30-Nov-84
ACTUAL PRICES WITH HIGH GR RATES

	Prix energetiques (Dh/GJ)					
Annee	Electricite	Propane	Butane	Essence	Kerosene	Gas Oil
2026	2091.10	418.49	418.49	1129.92	510.56	560.78
2027	2195.66	439.41	439.41	1186.42	536.09	588.82
2028	2305.44	461.39	461.39	1245.74	562.89	618.26
2029	2420.71	484.45	484.45	1308.03	591.03	649.17
2030	2541.75	508.68	508.68	1373.43	620.59	681.63
2031	2668.83	534.11	534.11	1442.10	651.62	715.71
2032	2802.27	560.82	560.82	1514.20	684.20	751.49
2033	2942.39	588.86	588.86	1589.91	718.41	789.07
2034	3089.51	618.30	618.30	1669.41	754.33	828.52
2035	3243.98	649.22	649.22	1752.88	792.04	869.95
2036	3406.18	681.68	681.68	1840.52	831.64	913.45
2037	3576.49	715.76	715.76	1932.55	873.23	959.12
2038	3755.31	751.55	751.55	2029.18	916.89	1007.07
2039	3943.08	789.13	789.13	2130.64	962.73	1057.43
2040	4140.23	828.58	828.58	2237.17	1010.87	1110.30

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ACTUAL PRICES WITH HIGH GR RATES

Annee	Prix energetiques (Dh/GJ)					
	Fuel Oil	Charbon	Gaz Naturel	Biomasse	Nucleaire	Schistes
1981	32.00	12.00	15.00	58.00	5.00	5.00
1982	36.80	15.60	17.25	66.70	5.00	5.00
1983	42.32	20.28	19.84	76.70	5.00	5.00
1984	48.67	26.36	22.81	88.21	5.00	5.00
1985	55.97	34.27	26.24	101.44	5.00	5.00
1986	57.09	34.96	26.76	103.47	5.10	5.10
1987	58.23	35.66	27.29	105.54	5.20	5.20
1988	59.39	36.37	27.84	107.65	5.31	5.31
1989	60.58	37.10	28.40	109.80	5.41	5.41
1990	61.79	37.84	28.97	112.00	5.52	5.52
1991	63.03	38.60	29.54	114.24	5.63	5.63
1992	64.29	39.37	30.14	116.53	5.74	5.74
1993	65.58	40.16	30.74	118.86	5.86	5.86
1994	66.89	40.96	31.35	121.23	5.98	5.98
1995	68.22	41.78	31.98	123.66	6.09	6.09
1996	69.59	42.61	32.62	126.13	6.22	6.22
1997	70.98	43.47	33.27	128.65	6.34	6.34
1998	72.40	44.34	33.94	131.23	6.47	6.47
1999	73.85	45.22	34.62	133.85	6.60	6.60
2000	75.33	46.13	35.31	136.53	6.73	6.73
2001	79.09	48.43	37.07	143.35	7.07	7.07
2002	83.05	50.86	38.93	150.52	7.42	7.42
2003	87.20	53.40	40.87	158.05	7.79	7.79
2004	91.56	56.07	42.92	165.95	8.18	8.18
2005	96.14	58.87	45.06	174.25	8.59	8.59
2006	100.94	61.81	47.32	182.96	9.02	9.02
2007	105.99	64.91	49.68	192.11	9.47	9.47
2008	111.29	68.15	52.17	201.71	9.94	9.94
2009	116.85	71.56	54.78	211.80	10.44	10.44
2010	122.70	75.14	57.51	222.39	10.96	10.96
2011	128.83	78.89	60.39	233.51	11.51	11.51
2012	135.27	82.84	63.41	245.18	12.08	12.08
2013	142.04	86.98	66.58	257.44	12.69	12.69
2014	149.14	91.33	69.91	270.32	13.32	13.32
2015	156.60	95.90	73.40	283.83	13.99	13.99
2016	164.43	100.69	77.07	298.02	14.69	14.69
2017	172.65	105.72	80.93	312.92	15.42	15.42
2018	181.28	111.01	84.98	328.57	16.19	16.19
2019	190.34	116.56	89.22	345.00	17.00	17.00
2020	199.86	122.39	93.69	362.25	17.85	17.85
2021	209.85	128.51	98.37	380.36	18.75	18.75
2022	220.35	134.93	103.29	399.38	19.69	19.69
2023	231.36	141.68	108.45	419.35	20.67	20.67
2024	242.93	148.76	113.87	440.32	21.70	21.70
2025	255.08	156.20	119.57	462.33	22.79	22.79

Scenario des prix no. 0; prix du marche/officiels
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ACTUAL PRICES WITH HIGH GR RATES

	Prix energetiques (Dh/GJ)					
Annee	Fuel Oil	Charbon	Gaz Naturel	Biomasse	Nucleaire	Schistes
2026	267.83	164.01	125.55	485.45	23.93	23.93
2027	281.23	172.21	131.82	509.72	25.12	25.12
2028	295.29	180.82	138.42	535.21	26.38	26.38
2029	310.05	189.87	145.34	561.97	27.70	27.70
2030	325.55	199.36	152.60	590.07	29.08	29.08
2031	341.83	209.33	160.23	619.57	30.54	30.54
2032	358.92	219.79	168.24	650.55	32.06	32.06
2033	376.87	230.78	176.66	683.07	33.67	33.67
2034	395.71	242.32	185.49	717.23	35.35	35.35
2035	415.50	254.44	194.76	753.09	37.12	37.12
2036	436.27	267.16	204.50	790.74	38.98	38.98
2037	458.09	280.52	214.73	830.28	40.92	40.92
2038	480.99	294.54	225.46	871.79	42.97	42.97
2039	505.04	309.27	236.74	915.38	45.12	45.12
2040	530.29	324.73	248.57	961.15	47.37	47.37

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Scenario des prix no. 0; prix du marche/officiels
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ACTUAL PRICES WITH HIGH GR RATES

Annee	Prix energetiques (Dh/GJ) Huile sch.	Petrole brt	Condensat	Bois de feu	Chrbn/bois
1981	5.00	40.00	5.00	5.00	5.00
1982	5.00	46.00	5.00	5.00	5.00
1983	5.00	52.90	5.00	5.00	5.00
1984	5.00	60.83	5.00	5.00	5.00
1985	5.00	69.96	5.00	5.00	5.00
1986	5.10	71.36	5.10	5.00	5.00
1987	5.20	72.79	5.20	5.00	5.00
1988	5.31	74.24	5.31	5.00	5.00
1989	5.41	75.73	5.41	5.00	5.00
1990	5.52	77.24	5.52	5.00	5.00
1991	5.63	78.79	5.63	5.00	5.00
1992	5.74	80.36	5.74	5.00	5.00
1993	5.86	81.97	5.86	5.00	5.00
1994	5.98	83.61	5.98	5.00	5.00
1995	6.09	85.28	6.09	5.00	5.00
1996	6.22	86.99	6.22	5.00	5.00
1997	6.34	88.73	6.34	5.00	5.00
1998	6.47	90.50	6.47	5.00	5.00
1999	6.60	92.31	6.60	5.00	5.00
2000	6.73	94.16	6.73	5.00	5.00
2001	7.07	98.87	7.07	5.00	5.00
2002	7.42	103.81	7.42	5.00	5.00
2003	7.79	109.00	7.79	5.00	5.00
2004	8.18	114.45	8.18	5.00	5.00
2005	8.59	120.17	8.59	5.00	5.00
2006	9.02	126.18	9.02	5.00	5.00
2007	9.47	132.49	9.47	5.00	5.00
2008	9.94	139.11	9.94	5.00	5.00
2009	10.44	146.07	10.44	5.00	5.00
2010	10.96	153.37	10.96	5.00	5.00
2011	11.51	161.04	11.51	5.00	5.00
2012	12.08	169.09	12.08	5.00	5.00
2013	12.69	177.55	12.69	5.00	5.00
2014	13.32	186.42	13.32	5.00	5.00
2015	13.99	195.75	13.99	5.00	5.00
2016	14.69	205.53	14.69	5.00	5.00
2017	15.42	215.81	15.42	5.00	5.00
2018	16.19	226.60	16.19	5.00	5.00
2019	17.00	237.93	17.00	5.00	5.00
2020	17.85	249.83	17.85	5.00	5.00
2021	18.75	262.32	18.75	5.00	5.00
2022	19.69	275.43	19.69	5.00	5.00
2023	20.67	289.21	20.67	5.00	5.00
2024	21.70	303.67	21.70	5.00	5.00
2025	22.79	318.85	22.79	5.00	5.00

Scenario des prix no. 0; prix du marche/officiels
Identificateur: REELO Date: 30-Nov-84
ACTUAL PRICES WITH HIGH GR RATES

	Prix energetiques (Dh/GJ)				
Annee	Huile sch.	Petrole brt	Condensat	Bois de feu	Chrbn/bois
2026	23.93	334.79	23.93	5.00	5.00
2027	25.12	351.53	25.12	5.00	5.00
2028	26.38	369.11	26.38	5.00	5.00
2029	27.70	387.56	27.70	5.00	5.00
2030	29.08	406.94	29.08	5.00	5.00
2031	30.54	427.29	30.54	5.00	5.00
2032	32.06	448.65	32.06	5.00	5.00
2033	33.67	471.09	33.67	5.00	5.00
2034	35.35	494.64	35.35	5.00	5.00
2035	37.12	519.37	37.12	5.00	5.00
2036	38.98	545.34	38.98	5.00	5.00
2037	40.92	572.61	40.92	5.00	5.00
2038	42.97	601.24	42.97	5.00	5.00
2039	45.12	631.30	45.12	5.00	5.00
2040	47.37	662.86	47.37	5.00	5.00

EXHIBIT 4

ECONOMIC-DEMOGRAPHIC FORECASTS

SCENARIO ECONOMICO-DEMOGRAPHIQUE NO. 0
Identificateur: MOYEN Date: 7-Nov-84
Hypothese de la croissance economique moyenne; population: taux moyen

A. Taux de Croissance Fournis par l'Utilisateur (en Pourcent par An)

	1981-1985	1986-1990	1991-1995	1996-2000
Demande finale/Composante				
Menages	2.0%	3.0%	3.4%	3.2%
Gouvernement	1.8	4.6	5.9	5.2
FBCF	1.2	3.0	3.9	3.5
Exportations	2.0	2.8	3.0	2.9
Population				
Urbaine	4.9%	4.8%	4.5%	4.6%
Rurale	1.6	1.3	1.0	1.2
Totale	3.0	3.0	2.7	2.5

B. Taux de Croissance Sectorielle de la Valeur Ajoutee Estimee (en % par An)

	1981-1985	1986-1990	1991-1995	1996-2000
Secteur				
Agriculture	2.0%	3.0%	3.4%	3.2%
Phosphates	2.0	2.8	3.0	2.9
Autres minerais	1.8	2.9	3.4	3.2
Energie & eau	1.8	3.1	3.7	3.4
Agro-industrie	2.0	3.0	3.4	3.2
Textiles	2.0	3.1	3.6	3.4
Cuirs	1.9	3.6	4.4	4.0
Mineraux de carr.	1.5	3.1	3.9	3.5
Mecan & electr.	1.6	3.1	3.6	3.5
Chimie & para.	1.9	3.1	3.6	3.3
Autres manufact.	1.9	3.1	3.7	3.4
Batiments/trav pub	1.3	3.1	3.9	3.5
Transports	1.9	3.1	3.7	3.4
Communications	1.8	3.8	4.7	4.3
Autres services	1.9	3.1	3.6	3.4
Services non-march	1.8	4.6	5.9	5.2

SCENARIO ECONOMICO-DEMOGRAPHIQUE NO. 0
Identificateur: MOYEN Date: 7-Nov-84
Hypothese de la croissance economique moyenne; population: taux moyen

Prevision de la Valeur Ajoutee (millions de DH 1975)

Annee	Agriculture	Phosphates	Autres minerais	Energie & eau
1981	8123.5	2849.6	267.7	1163.4
1982	8283.3	2906.5	272.4	1184.9
1983	8446.2	2964.6	277.2	1206.7
1984	8612.4	3023.8	282.1	1229.0
1985	8781.9	3084.2	287.0	1251.6
1986	8954.1	3145.8	292.1	1274.7
1987	9243.6	3240.4	301.5	1318.8
1988	9542.5	3337.9	311.3	1364.5
1989	9851.2	3438.3	321.4	1411.8
1990	10170.0	3541.8	331.8	1460.9
1991	10497.1	3648.3	342.6	1511.5
1992	10857.9	3758.3	354.4	1568.4
1993	11231.2	3871.6	366.6	1627.6
1994	11617.6	3988.3	379.2	1689.2
1995	12017.6	4108.6	392.3	1753.2
1996	12430.9	4232.5	405.9	1819.7
1997	12849.2	4360.1	419.9	1887.9
1998	13281.9	4491.5	434.4	1958.9
1999	13729.4	4626.9	449.4	2032.7
2000	14192.3	4766.4	465.0	2109.5

Annee	Agro-industrie	Textiles	Cuirs	Mineraux de carr.
1981	2869.2	1503.8	223.4	502.4
1982	2926.3	1533.4	227.7	509.7
1983	2984.6	1563.7	232.0	517.1
1984	3044.0	1594.5	236.5	524.6
1985	3104.6	1625.9	241.0	532.2
1986	3166.2	1657.9	245.6	539.9
1987	3269.3	1714.3	255.6	559.1
1988	3375.7	1772.8	265.9	578.9
1989	3485.7	1833.3	276.7	599.4
1990	3599.2	1896.0	288.0	620.7
1991	3715.8	1960.5	299.7	642.7
1992	3844.6	2032.3	313.2	668.3
1993	3977.9	2106.8	327.3	694.9
1994	4116.0	2184.3	342.1	722.7
1995	4259.0	2264.8	357.6	751.5
1996	4406.8	2348.3	373.9	781.6
1997	4556.2	2433.5	390.9	812.7
1998	4710.7	2522.0	408.7	845.1
1999	4870.7	2614.0	427.3	878.9
2000	5036.2	2709.5	447.0	914.0

SCENARIO ECONOMICO-DEMOGRAPHIQUE NO. 0
Identificateur: MOYEN Date: 7-Nov-84
Hypothese de la croissance economique moyenne; population: taux moyen

Previsions de la Valeur Ajoutee (millions de DH 1975)

Annee	Mecan & electr.	Chimie & para.	Autres manufact.	Batiments/trav pub
1981	1145.8	799.3	845.4	2791.0
1982	1164.3	814.3	861.1	2827.2
1983	1183.2	829.5	877.2	2863.9
1984	1202.3	845.0	893.6	2901.1
1985	1221.8	860.8	910.3	2938.8
1986	1241.6	876.9	927.2	2976.9
1987	1284.8	906.4	959.2	3082.6
1988	1329.6	937.0	992.4	3192.1
1989	1376.0	968.7	1026.7	3305.6
1990	1424.1	1001.4	1062.3	3423.1
1991	1473.7	1035.1	1099.0	3544.8
1992	1530.7	1072.8	1140.2	3688.0
1993	1589.9	1112.0	1183.2	3837.1
1994	1651.5	1152.6	1227.8	3992.3
1995	1715.6	1194.8	1274.2	4153.9
1996	1782.2	1238.6	1322.3	4322.0
1997	1850.8	1283.3	1371.7	4496.8
1998	1922.2	1329.7	1422.9	4678.7
1999	1996.4	1377.8	1476.2	4868.1
2000	2073.7	1427.8	1531.7	5065.2

Annee	Transports	Communications	Autres services	Services non-march
1981	1752.6	341.8	14671.4	5473.1
1982	1785.5	348.1	14957.2	5571.6
1983	1819.1	354.5	15248.7	5671.9
1984	1853.4	361.1	15545.9	5774.0
1985	1888.2	367.7	15849.0	5877.9
1986	1923.7	374.5	16157.0	5983.7
1987	1990.3	390.5	16703.7	6300.9
1988	2059.3	407.2	17269.4	6634.8
1989	2130.8	424.7	17854.9	6986.5
1990	2204.9	443.0	18460.9	7356.7
1991	2281.5	462.0	19084.3	7746.7
1992	2366.7	484.2	19781.4	8211.5
1993	2455.4	507.5	20505.0	8704.1
1994	2547.6	532.0	21256.3	9226.4
1995	2643.6	557.8	22036.3	9780.0
1996	2743.3	584.9	22845.3	10366.8
1997	2846.0	613.2	23667.8	10988.8
1998	2952.9	643.0	24521.6	11648.1
1999	3064.1	674.4	25407.8	12347.0
2000	3179.8	707.4	26327.8	13087.8

SCENARIO ECONOMICO-DEMOGRAPHIQUE NO. 0
Identificateur: MOYEN Date: 7-Nov-84
Hypothese de la croissance economique moyenne; population: taux moyen

Previsions de la Population par Type de Residence (en Milliers de Personnes)

Annee	Urbaine	Rurale	Totale
1981	8421.0	11575.9	19996.9
1982	8837.9	11768.9	20606.8
1983	9274.4	11960.8	21235.3
1984	9731.4	12151.5	21882.9
1985	10209.6	12340.8	22550.4
1986	10699.4	12516.2	23215.6
1987	11211.0	12689.4	23900.5
1988	11745.1	12860.4	24605.5
1989	12302.5	13028.9	25331.4
1990	12883.9	13194.8	26078.7
1991	13463.7	13332.1	26795.8
1992	14066.5	13466.2	27532.7
1993	14692.9	13596.9	28289.9
1994	15343.4	13724.4	29067.8
1995	16018.6	13848.6	29867.2
1996	16686.4	13942.5	30628.8
1997	17377.1	14032.8	31409.9
1998	18091.1	14119.7	32210.8
1999	18828.8	14203.4	33032.2
2000	19590.5	14284.0	33874.5

EXHIBIT 5

ENERGY USE TECHNOLOGY SCENARIO

Scenario de la Technologie d'Utilisation d'Energie No. 0; Date: 7-Nov-84; p. 1
Identificateur: TECH0
Description: Scenario de base de l'utilisation de l'energie

Coefficient d'utilisation

Secteur	Electricite	Propane	Butane	Essence	Kerosene
Agriculture	0.030	0.060	0.000	0.250	0.010
Phosphates	0.200	0.260	0.000	1.630	0.000
Autres minerais	0.430	0.000	0.000	1.660	0.100
Energie & eau	0.000	0.000	0.000	0.000	0.000
Agro-industrie	0.120	0.510	0.000	0.280	0.170
Textiles	0.190	2.450	0.390	0.050	0.440
Cuirs	0.070	0.120	0.000	0.000	0.300
Mineraux/carr.	0.880	4.390	0.000	2.840	0.020
Mecan & electr.	0.090	1.930	0.000	0.870	0.010
Chimie/parachim	0.390	0.550	0.000	0.120	2.820
Autres manufact	0.260	0.220	0.000	0.110	0.000
Bat & trav publ	0.005	0.000	0.000	0.000	0.000
Transports	0.100	0.010	0.000	0.490	114.410
Communications	0.090	0.000	0.010	0.000	0.010
Autres serv mar	0.010	0.560	0.000	1.870	0.960
Serv non-march	0.038	0.229	0.006	0.518	0.000
Menages urbains	0.147	0.000	31.030	37.780	3.810
Menages ruraux	0.007	0.000	4.180	0.000	0.510

Secteur	Gasoil	Fuel Oil	Charbon	Gaz Naturel	Biomasse
Agriculture	34.110	1.400	0.000	0.000	0.000
Phosphates	7.140	39.720	0.390	14.660	0.000
Autres minerais	140.340	183.960	0.000	0.000	0.000
Energie & eau	0.000	0.000	0.000	0.000	0.000
Agro-industrie	5.430	39.840	15.900	0.000	0.000
Textiles	1.520	33.820	0.000	0.000	0.000
Cuirs	0.090	10.810	0.000	0.000	0.000
Mineraux/carr.	115.420	992.100	45.370	0.000	0.000
Mecan & electr.	2.670	4.530	12.730	0.000	0.000
Chimie/parachim	[illegible]	20.530	0.000	0.000	0.000
Autres manufact	2.710	58.870	0.000	10.990	0.000
Bat & trav publ	0.000	0.000	0.000	0.000	0.000
Transports	342.200	28.050	0.000	0.000	0.000
Communications	0.010	0.000	0.000	0.000	0.000
Autres serv mar	11.480	1.020	0.000	0.000	0.000
Serv non-march	6.827	3.780	0.000	0.000	0.000
Menages urbains	0.000	0.060	0.489	0.000	0.000
Menages ruraux	0.000	0.000	0.363	0.000	0.000

Scenario de la Technologie d'Utilisation d'Energie No. 0; Date: 7-Nov-84; p. 2
Identificateur: TECH0
Description: Scenario de base de l'utilisation de l'energie

Taux de changement technologique

Secteur	Electricite	Propane	Butane	Essence	Kerosene
Agriculture	0.000	0.000	0.000	0.000	0.000
Phosphates	0.000	0.000	0.000	0.000	0.000
Autres minerais	0.000	0.000	0.000	0.000	0.000
Energie & eau	0.000	0.000	0.000	0.000	0.000
Agro-industrie	0.000	0.000	0.000	0.000	0.000
Textiles	0.000	0.000	0.000	0.000	0.000
Cuirs	0.000	0.000	0.000	0.000	0.000
Mineraux/carr.	0.000	0.000	0.000	0.000	0.000
Mecan & electr.	0.000	0.000	0.000	0.000	0.000
Chimie/parachim	0.000	0.000	0.000	0.000	0.000
Autres manufact	0.000	0.000	0.000	0.000	0.000
Bat & trav publ	0.000	0.000	0.000	0.000	0.000
Transports	0.000	0.000	0.000	0.000	0.000
Communications	0.000	0.000	0.000	0.000	0.000
Autres serv mar	0.000	0.000	0.000	0.000	0.000
Serv non-march	0.000	0.000	0.000	0.000	0.000
Menages urbains	0.000	0.000	0.000	0.000	0.000
Menages ruraux	0.000	0.000	0.000	0.000	0.000

Secteur	Gasoil	Fuel Oil	Charbon	Gaz Naturel	Biomasse
Agriculture	0.000	0.000	0.000	0.000	0.000
Phosphates	0.000	0.000	0.000	0.000	0.000
Autres minerais	0.000	0.000	0.000	0.000	0.000
Energie & eau	0.000	0.000	0.000	0.000	0.000
Agro-industrie	0.000	0.000	0.000	0.000	0.000
Textiles	0.000	0.000	0.000	0.000	0.000
Cuirs	0.000	0.000	0.000	0.000	0.000
Mineraux/carr.	0.000	0.000	0.000	0.000	0.000
Mecan & electr.	0.000	0.000	0.000	0.000	0.000
Chimie/parachim	0.000	0.000	0.000	0.000	0.000
Autres manufact	0.000	0.000	0.000	0.000	0.000
Bat & trav publ	0.000	0.000	0.000	0.000	0.000
Transports	0.000	0.000	0.000	0.000	0.000
Communications	0.000	0.000	0.000	0.000	0.000
Autres serv mar	0.000	0.000	0.000	0.000	0.000
Serv non-march	0.000	0.000	0.000	0.000	0.000
Menages urbains	0.000	0.000	0.000	0.000	0.000
Menages ruraux	0.000	0.000	0.000	0.000	0.000

Scenario de la Technologie d'Utilisation d'Energie No. 0; Date: 7-Nov-84; p. 3
Identificateur: TECH0
Description: Scenario de base de l'utilisation de l'energie

Elasticite de prix a court terme

Secteur	Electricite	Propane	Butane	Essence	Kerosene
Agriculture	0.000	0.000	0.000	0.000	0.000
Phosphates	0.000	0.000	0.000	0.000	0.000
Autres minerais	0.000	0.000	0.000	0.000	0.000
Energie & eau	0.000	0.000	0.000	0.000	0.000
Agro-industrie	0.000	0.000	0.000	0.000	0.000
Textiles	0.000	0.000	0.000	0.000	0.000
Cuirs	0.000	0.000	0.000	0.000	0.000
Mineraux/carr.	0.000	0.000	0.000	0.000	0.000
Mecan & electr.	0.000	0.000	0.000	0.000	0.000
Chimie/parachim	0.000	0.000	0.000	0.000	0.000
Autres manufact	0.000	0.000	0.000	0.000	0.000
Bat & trav publ	0.000	0.000	0.000	0.000	0.000
Transports	0.000	0.000	0.000	0.000	0.000
Communications	0.000	0.000	0.000	0.000	0.000
Autres serv mar	0.000	0.000	0.000	0.000	0.000
Serv non-march	0.000	0.000	0.000	0.000	0.000
Menages urbains	0.000	0.000	0.000	0.000	0.000
Menages ruraux	0.000	0.000	0.000	0.000	0.000

Secteur	Gasoil	Fuel Oil	Charbon	Gaz Naturel	Biomasse
Agriculture	0.000	0.000	0.000	0.000	0.000
Phosphates	0.000	0.000	0.000	0.000	0.000
Autres minerais	0.000	0.000	0.000	0.000	0.000
Energie & eau	0.000	0.000	0.000	0.000	0.000
Agro-industrie	0.000	0.000	0.000	0.000	0.000
Textiles	0.000	0.000	0.000	0.000	0.000
Cuirs	0.000	0.000	0.000	0.000	0.000
Mineraux/carr.	0.000	0.000	0.000	0.000	0.000
Mecan & electr.	0.000	0.000	0.000	0.000	0.000
Chimie/parachim	0.000	0.000	0.000	0.000	0.000
Autres manufact	0.000	0.000	0.000	0.000	0.000
Bat & trav publ	0.000	0.000	0.000	0.000	0.000
Transports	0.000	0.000	0.000	0.000	0.000
Communications	0.000	0.000	0.000	0.000	0.000
Autres serv mar	0.000	0.000	0.000	0.000	0.000
Serv non-march	0.000	0.000	0.000	0.000	0.000
Menages urbains	0.000	0.000	0.000	0.000	0.000
Menages ruraux	0.000	0.000	0.000	0.000	0.000

Scenario de la Technologie d'Utilisation d'Energie No. 0; Date: 7-Nov-84; p. 4
Identificateur: TECH0
Description: Scenario de base de l'utilisation de l'energie

Elasticite de prix a long terme

Secteur	Electricite	Propane	Butane	Essence	Kerosene
Agriculture	0.000	0.000	0.000	0.000	0.000
Phosphates	0.000	0.000	0.000	0.000	0.000
Autres minerais	0.000	0.000	0.000	0.000	0.000
Energie & eau	0.000	0.000	0.000	0.000	0.000
Agro-industrie	0.000	0.000	0.000	0.000	0.000
Textiles	0.000	0.000	0.000	0.000	0.000
Cuirs	0.000	0.000	0.000	0.000	0.000
Mineraux/carr.	0.000	0.000	0.000	0.000	0.000
Mecan & electr.	0.000	0.000	0.000	0.000	0.000
Chimie/parachim	0.000	0.000	0.000	0.000	0.000
Autres manufact	0.000	0.000	0.000	0.000	0.000
Bat & trav publ	0.000	0.000	0.000	0.000	0.000
Transports	0.000	0.000	0.000	0.000	0.000
Communications	0.000	0.000	0.000	0.000	0.000
Autres serv mar	0.000	0.000	0.000	0.000	0.000
Serv non-march	0.000	0.000	0.000	0.000	0.000
Menages urbains	0.000	0.000	0.000	0.000	0.000
Menages ruraux	0.000	0.000	0.000	0.000	0.000

Secteur	Gasoil	Fuel Oil	Charbon	Gaz Naturel	Biomasse
Agriculture	0.000	0.000	0.000	0.000	0.000
Phosphates	0.000	0.000	0.000	0.000	0.000
Autres minerais	0.000	0.000	0.000	0.000	0.000
Energie & eau	0.000	0.000	0.000	0.000	0.000
Agro-industrie	0.000	0.000	0.000	0.000	0.000
Textiles	0.000	0.000	0.000	0.000	0.000
Cuirs	0.000	0.000	0.000	0.000	0.000
Mineraux/carr.	0.000	0.000	0.000	0.000	0.000
Mecan & electr.	0.000	0.000	0.000	0.000	0.000
Chimie/parachim	0.000	0.000	0.000	0.000	0.000
Autres manufact	0.000	0.000	0.000	0.000	0.000
Bat & trav publ	0.000	0.000	0.000	0.000	0.000
Transports	0.000	0.000	0.000	0.000	0.000
Communications	0.000	0.000	0.000	0.000	0.000
Autres serv mar	0.000	0.000	0.000	0.000	0.000
Serv non-march	0.000	0.000	0.000	0.000	0.000
Menages urbains	0.000	0.000	0.000	0.000	0.000
Menages ruraux	0.000	0.000	0.000	0.000	0.000

EXHIBIT 6

BASELINE DATA FOR ENERGY SUPPLY SYSTEM

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Les centrales thermiques

Numero: 1 Nombre d'unites: 3 a 5.50000E1 MW (Minimum technique: 4.00000E1 MW)
Combustible: Charbon (alternatif: Fuel oil)
Consommation specifique: 1.16400E4 GJ/GWh (1.29800E4 au min. tech.)
Taux de defaillance: 15.0%; indisponibilite programmee: 40 jours/an

Numero: 2 Nombre d'unites: 1 a 6.00000E1 MW (Minimum technique: 4.00000E1 MW)
Combustible: Charbon (alternatif: Fuel oil)
Consommation specifique: 1.04260E4 GJ/GWh (1.17240E4 au min. tech.)
Taux de defaillance: 15.0%; indisponibilite programmee: 30 jours/an

Numero: 3 Nombre d'unites: 1 a 6.00000E1 MW (Minimum technique: 1.00000E1 MW)
Combustible: Fuel oil (alternatif: Fuel oil)
Consommation specifique: 1.03420E4 GJ/GWh (1.19330E4 au min. tech.)
Taux de defaillance: 15.0%; indisponibilite programmee: 21 jours/an

Numero: 4 Nombre d'unites: 4 a 7.50000E1 MW (Minimum technique: 2.50000E1 MW)
Combustible: Fuel oil (alternatif: Fuel oil)
Consommation specifique: 1.04780E4 GJ/GWh (1.19330E4 au min. tech.)
Taux de defaillance: 15.0%; indisponibilite programmee: 21 jours/an

Numero: 5 Nombre d'unites: 2 a 1.50000E2 MW (Minimum technique: 4.50000E1 MW)
Combustible: Fuel oil (alternatif: Fuel oil)
Consommation specifique: 9.00200E3 GJ/GWh (1.02580E4 au min. tech.)
Taux de defaillance: 15.0%; indisponibilite programmee: 21 jours/an

Numero: 6 Nombre d'unites: 2 a 2.00000E1 MW (Minimum technique: 0.00000 MW)
Combustible: Fuel oil (alternatif: Fuel oil)
Consommation specifique: 1.34820E4 GJ/GWh (1.34820E4 au min. tech.)
Taux de defaillance: 20.0%; indisponibilite programmee: 12 jours/an

Numero: 7 Nombre d'unites: 2 a 2.00000E1 MW (Minimum technique: 0.00000 MW)
Combustible: Fuel oil (alternatif: Fuel oil)
Consommation specifique: 1.36710E4 GJ/GWh (1.36710E4 au min. tech.)
Taux de defaillance: 20.0%; indisponibilite programmee: 12 jours/an

Numero: 8 Nombre d'unites: 2 a 2.00000E1 MW (Minimum technique: 0.00000 MW)
Combustible: Fuel oil (alternatif: Fuel oil)
Consommation specifique: 1.37120E4 GJ/GWh (1.37120E4 au min. tech.)
Taux de defaillance: 20.0%; indisponibilite programmee: 12 jours/an

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Le systeme hydroelectrique:

Productibilite minimale: 1.82000E2 GWh; productibilite supplementaire: 4.00000E2
Parametres de la distribution hydraulique: (1) 0.000
(2) 50.000
(3) 100.000

Les raffineries

SAMIR: Capacite = 3.30000E6 t/an
Coefficients de la production (en %)

Propane	6.00000E-1%	Butane	3.80000%
Essence	8.50000%	Kerosene	6.60000%
Gasoil	2.87000E1%	Fuel oil	4.51000E1%

SCP : Capacite = 1.05000E6 t/an
Coefficients de la production (en %)

Propane	9.00000E-1%	Butane	4.50000%
Essence	1.02000E1%	Kerosene	3.50000%
Gasoil	3.65000E1%	Fuel oil	4.43000E1%

Previsions de la Production de l'Energie Primaire

Annee	GPL	Charbon	Gaz naturel	Biomasse
1981	0	375,000	64,000	0
1982	0	375,000	64,000	0
1983	0	375,000	64,000	0
1984	0	375,000	64,000	0
1985	0	375,000	64,000	0
1986	0	375,000	64,000	0
1987	0	375,000	64,000	0
1988	0	375,000	64,000	0
1989	0	375,000	64,000	0
1990	0	375,000	64,000	0
1991	0	375,000	64,000	0
1992	0	375,000	64,000	0
1993	0	375,000	64,000	0
1994	0	375,000	64,000	0
1995	0	375,000	64,000	0
1996	0	375,000	64,000	0
1997	0	375,000	64,000	0
1998	0	375,000	64,000	0
1999	0	375,000	64,000	0
2000	0	375,000	64,000	0

Annee	Nucleaire	Schistes bit	Huile de sch	Petrole brut
1981	0	0	0	0
1982	0	0	0	0
1983	0	0	0	0
1984	0	0	0	0
1985	0	0	0	0
1986	0	0	0	0
1987	0	0	0	0
1988	0	0	0	0
1989	0	0	0	0
1990	0	0	0	0
1991	0	0	0	0
1992	0	0	0	0
1993	0	0	0	0
1994	0	0	0	0
1995	0	0	0	0
1996	0	0	0	0
1997	0	0	0	0
1998	0	0	0	0
1999	0	0	0	0

Previsions de la Production de l'Energie Primaire (cont)

Annee	Condensat
1981	0
1982	0
1983	0
1984	0
1985	0
1986	0
1987	0
1988	0
1989	0
1990	0
1991	0
1992	0
1993	0
1994	0
1995	0
1996	0
1997	0
1998	0
1999	0
2000	0

EXHIBIT 7

ECONOMIC APPRAISAL RESULTS PRINTOUT

MINISTERE DE L'ENERGIE ET DES MINES, ROYAUME DU MAROC
U.S. Agency for International Development/Development Sciences Inc.

TAUX DE RENDEMENT INTERNE
Projet: EXPANSION-SIEGE 5-production totale
Date: 30-Nov-84

de	a	Frequence	Pourcentage
16.0%	16.3%	1	3.3%
16.3%	16.6%	2	6.7%
16.6%	16.9%	3	10.0%
16.9%	17.2%	8	26.7%
17.2%	17.5%	9	30.0%
17.5%	17.8%	2	6.7%
17.8%	18.1%	3	10.0%
18.1%	18.4%	2	6.7%
18.4%	18.7%	0	0.0%
18.7%	19.0%	0	0.0%
T O T A L		30	100.0%

Moyenne: 17.3 % Ecart normal: 0.5

Description du scenario:
1. Scenario des prix: REEL0
2. Type des prix: Officiels
3. Autoregression: 1.00
4. Taux d'actualisation: 10.0%
5. Annee de demarrage: 1985
6. Nombre d'essais: 30

MINISTERE DE L'ENERGIE ET DES MINES, ROYAUME DU MAROC
U.S. Agency for International Development/Development Sciences Inc.

VALEUR ACTUALISEE NETTE (EN DH)
Projet: EXPANSION-SIEGE 5-production totale
Date: 30-Nov-84

de	a	Frequence	Pourcentage
1.50000E9	1.54000E9	0	0.0%
1.54000E9	1.58000E9	2	6.7%
1.58000E9	1.62000E9	7	23.3%
1.62000E9	1.66000E9	2	6.7%
1.66000E9	1.70000E9	8	26.7%
1.70000E9	1.74000E9	5	16.7%
1.74000E9	1.78000E9	4	13.3%
1.78000E9	1.82000E9	1	3.3%
1.82000E9	1.86000E9	1	3.3%
1.86000E9	1.90000E9	0	0.0%
T O T A L		30	100.0%

Moyenne: 1.6/888E9 Dh Ecart normal: 6.66440E7

Description du scenario:

1. Scenario des prix: REEL0
2. Type des prix: Officiels
3. Autoregression: 1.00
4. Taux d'actualisation: 10.0%
5. Annee de demarrage: 1985
6. Nombre d'essais: 30

MINISTERE DE L'ENERGIE ET DES MINES, ROYAUME DU MAROC
U.S. Agency for International Development/Development Sciences Inc.

INDICE DE RENTABILITE
Projet: EXPANSION-SIEGE 5-production totale
Date: 30-Nov-84

de	a	Frequence	Pourcentage
3.0	3.2	0	0.0%
3.2	3.4	0	0.0%
3.4	3.6	2	6.7%
3.6	3.8	5	16.7%
3.8	4.0	8	26.7%
4.0	4.2	12	40.0%
4.2	4.4	3	10.0%
4.4	4.6	0	0.0%
4.6	4.8	0	0.0%
4.8	5.0	0	0.0%
T O T A L		30	100.0%

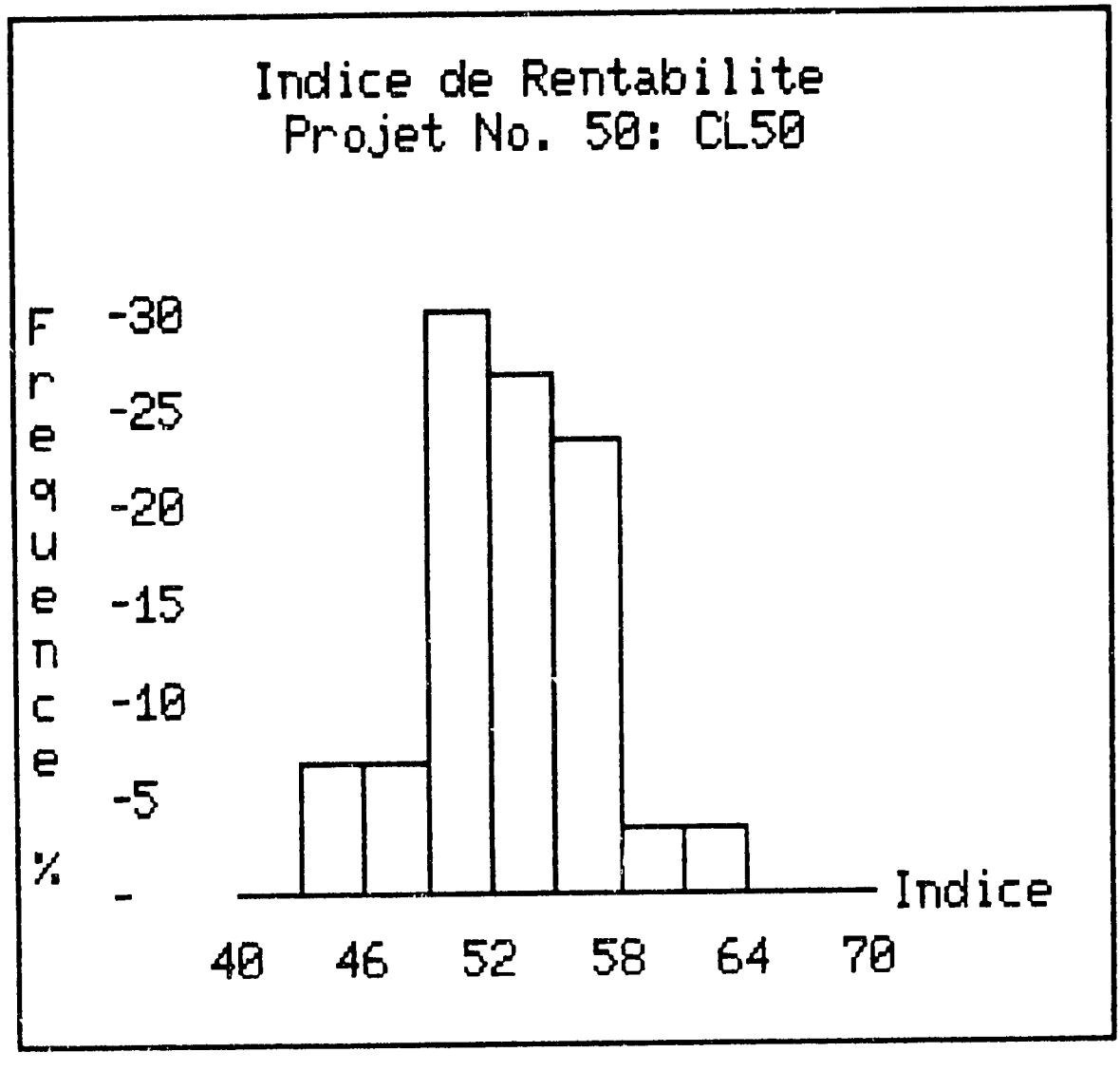
Moyenne: 3.94779 Ecart normal: 2.69794E-1

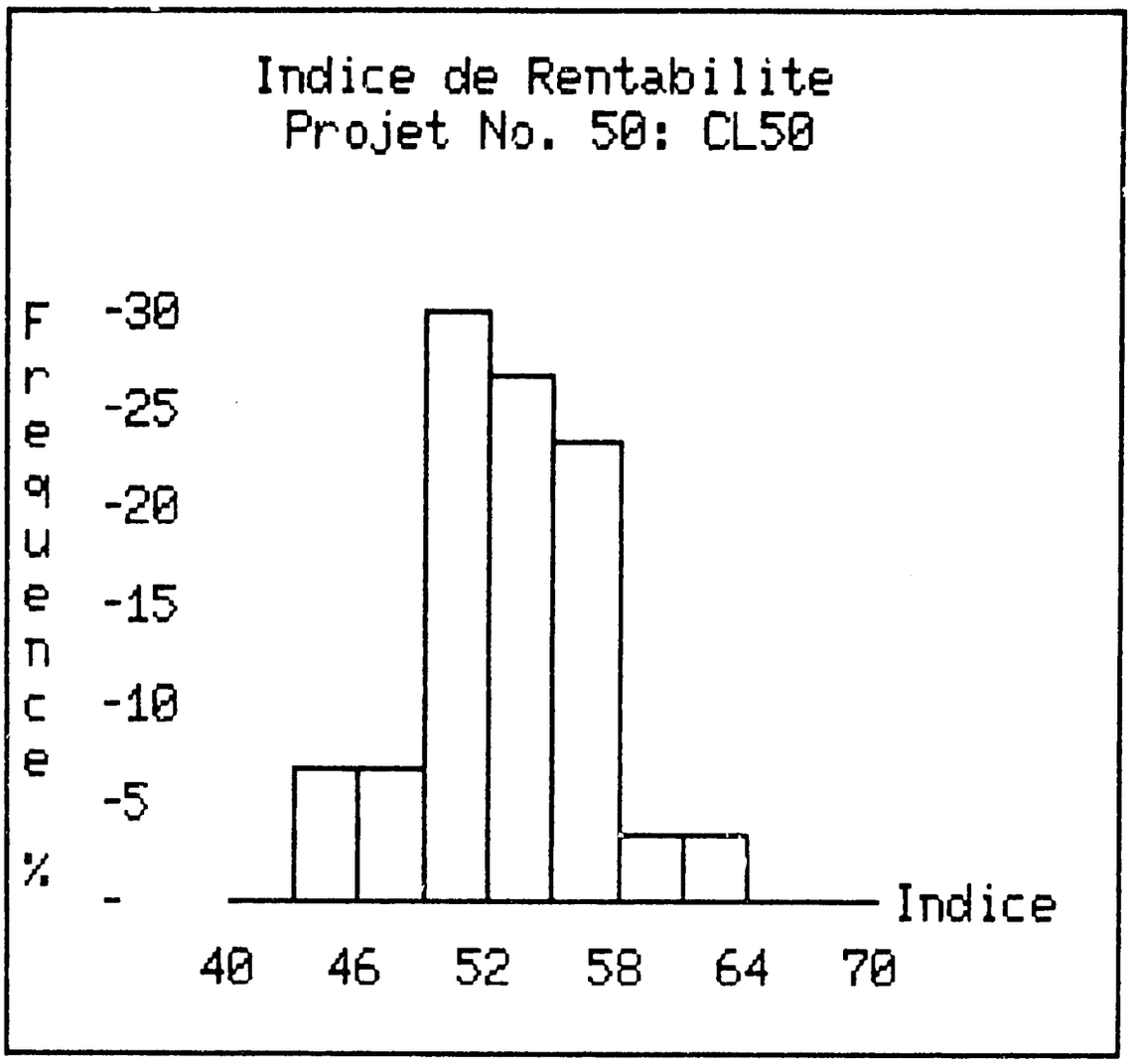
Description du scenario:

1. Scenario des prix: REEL0
2. Type des prix: Officiels
3. Autoregression: 1.00
4. Taux d'actualisation: 10.0%
5. Annee de demarrage: 1985
6. Nombre d'essais: 30

EXHIBIT 8

HISTOGRAM


Indice de Rentabilite
Projet No. 50: CL50
Frequence %
-30
-25
-20
-15
-10
-5
-
Indice
40
46
52
58
64
70


Indice de Rentabilite
Projet No. 50: CL50
Frequence %
-30
-25
-20
-15
-10
-5
-
Indice
40
46
52
58
64
70