METHODOLOGY for the TECHNICAL - ECONOMIC ANALYSIS of the FEASIBILITY OF ENERGY PROJECTS

(using the software Decidix)

Presented by Sergio Feitoza Costa

Cognitor – Consultancy R&D and Training

www.cognitor.com.br

e-mail: sergiofeitoza@cognitor.com.br

HOW TO GET A COMPLETE AND FREE COPY OF THE DECIDIX SOFTWARE

Click here to read in English

http://www.cognitor.com.br/c_Feasibily_Analysis.htm

Clique aqui para ler em Português

http://www.cognitor.com.br/c_ViabilidadeEnergiaEletrica.htm

Haga clic aquí para leer en Español

http://www.cognitor.com.br/c_Viabilidad.htm

Cliquez ici pour lire en Français

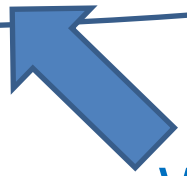
http://www.cognitor.com.br/c_Faisabilite.htm

The program of the course

1) General view of business and projects in the electric and energy sector (purchase and sales of energy, auctions for grants in generation, transmission and distribution, legislation, programs of incentives, risks of the business and others)

2) Technical fundaments related to technologies for power plants, transmission and distribution installations and lines. This include renewable and nonrenewable energy (small to big hydro power plants, thermal generation, cogeneration, wind , solar, distributed generation, fuel cells);

3) Methodology for the technical - economic analysis of the feasibility of energy projects (using Decidix)



We are here

4) Case studies

5) Advanced topics

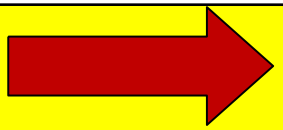
Minimum Revenue Requirement in 2005 - U$/MWh

	Pulverized Coal	Alternative Motor	**Gas turbine**	Combined Cycle	**Micro Turbine**	Fuel Celll	**SUN**	**WIND**
MW	**200 a 400**	0,008 a **10,0**	2 a **50,0**	**250** a 400	0,03 a **0,2**	0,003 a **2,0**	0,001 a **0,1**	0,7 a **5,0**
Efficiency %	**32,4** a 35	38 a **45**	21 a **42**	**46,7** a 60	22 a **30**	40 a >**60**	NA	NA
Installation cost **(U$/KW)**	900 a **1539**	300 a **900**	**650** a 900	350 a **566**	**500** a 1000	1500** a **4000**	1000 a **5000**	**1100** a 1400
O&M (U$/MWh)	5 a **8,1**	**5** a 15	**3** a 8	2 a **3,7**	**3** a 10	**5** a 10	8 a 12/ano	20 a 30/ano
Fuel	**Coal** a U$ 0,93 /MBTU e fc=0,85	**Diesel** a U$ 5,0 / MBTU e fc=0,85	**Natural Gas** U$ 2,3 /MBTU e fc=0,85	**Natural Gas** U$ 2,3 /MBTU e fc=0,85	**Natural Gas** U$ 3,3 /MBTU e fc=0,85	**Natural Gas** U$ 3,3 /MBTU e fc=0,85	Sun Fc=0,25	Wind Fc=0,35
U$/MWh at cmpc 12,9%	58,5	64,0	41,6	34,3	52,5	120,0	400,0	70,0

Electricity residential prices x taxes and tributes

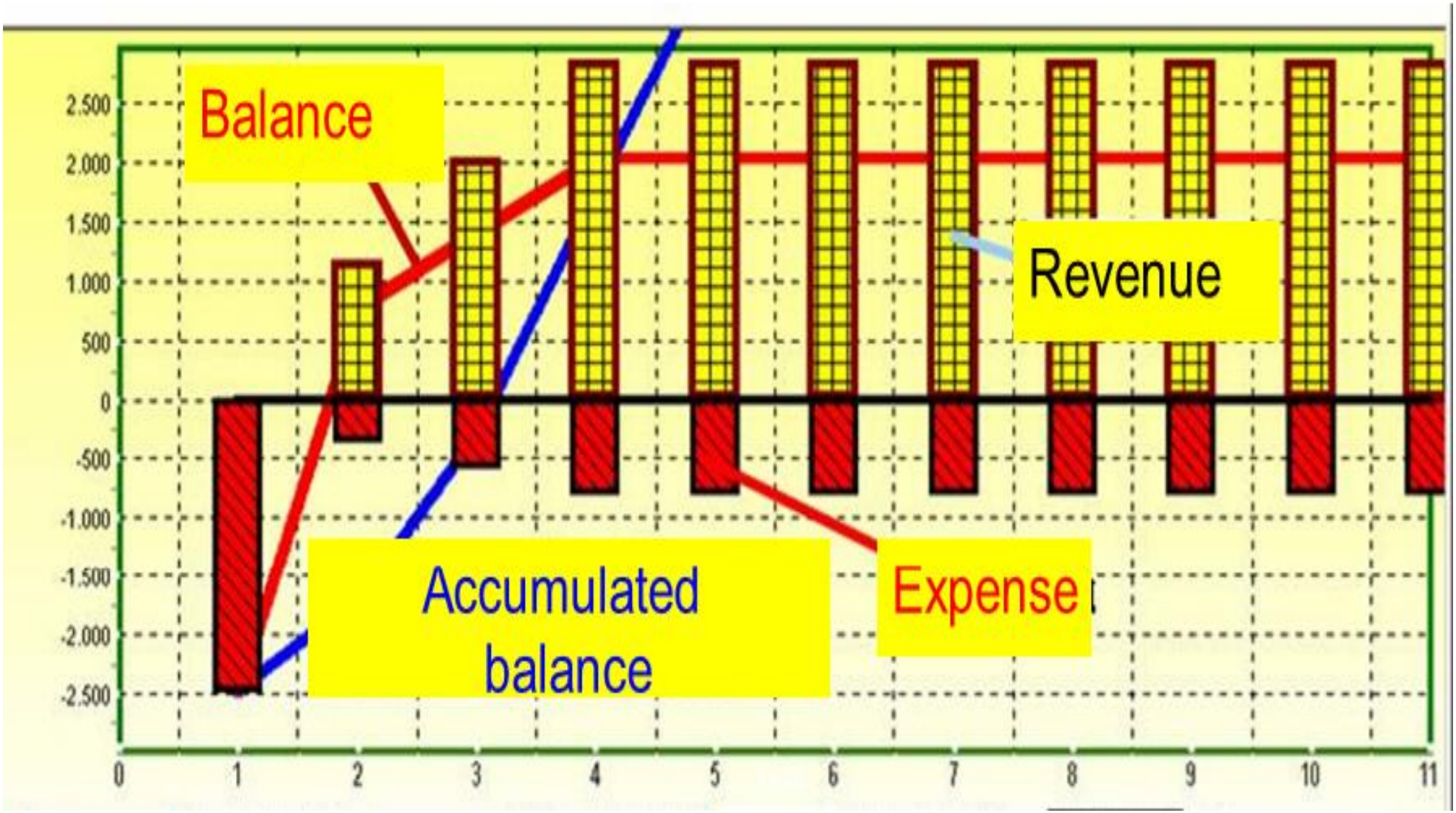
LOW LEVEL OF AVERAGE EDUCATION = HIGH TAXES + LOW PRODUCTIVITY + HIGH CORRUPTION

INVEST MOST OF THE COUNTRY MONEY IN EDUCATION FOR 7 YEARS

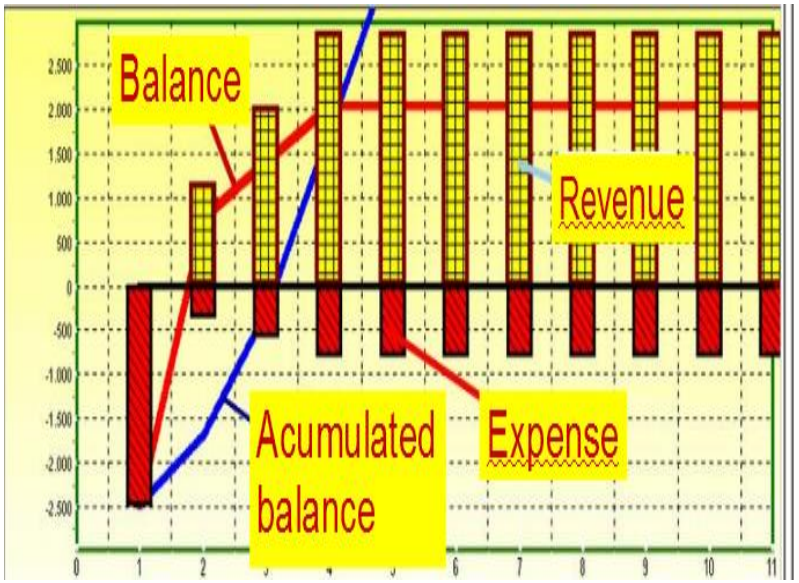
	Price (**) U$ / MWh	Taxes + tributes	%
Japan	187	9,1	4,9
USA	101 a 194	7,7 a 11,7	4,7 a 7,6
UK	92 a 106	4,4 a 5,6	4,8
Germany	134 a 141	18,5 a 19,5	13,8
France	115	6,0	5,2
Brazil	162		>40,0

(**) Participation: Generation – 47,8% Transmission 4,6% Distribution / Comercialization 17,9% Taxes 29,7%
(***) 2003: : Municipalities 1,5% States 68,8 % Federal Goverment 29,6%

Year by year Revenues and Expenses

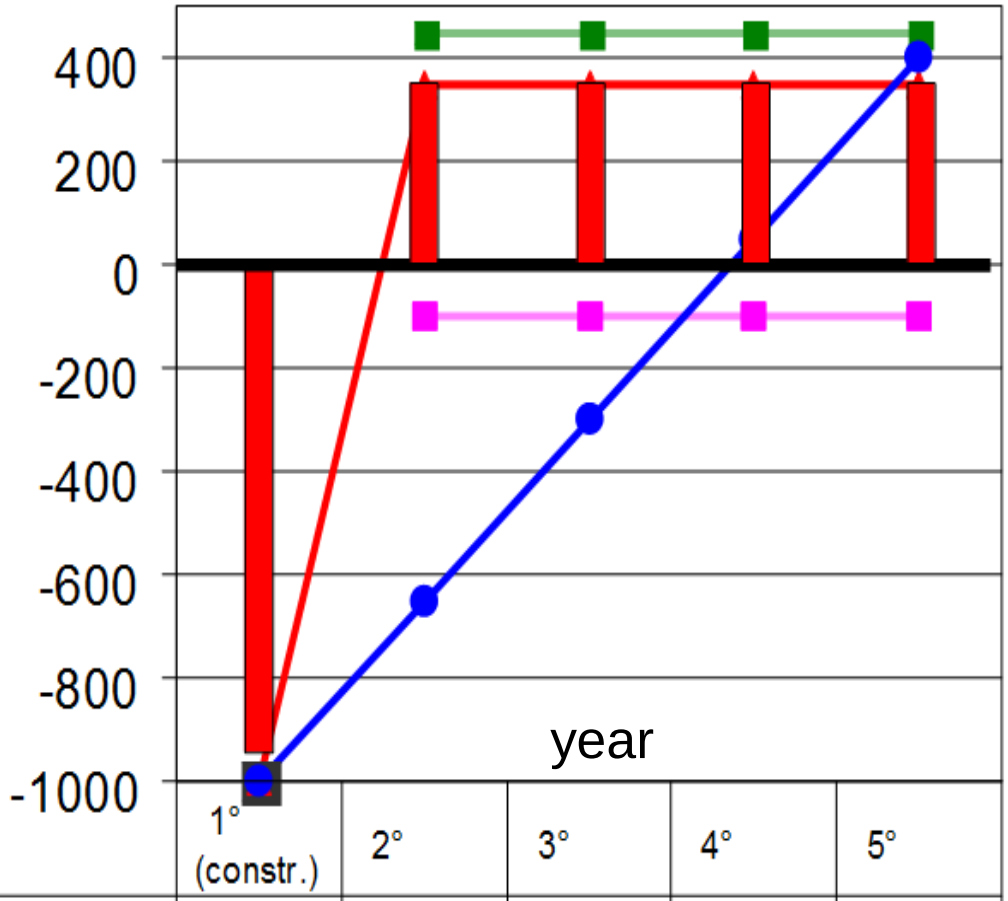


- “ Book life” of a project
- “ Life time” of a power plant
- Time period to calculate indicators: Return Tax, Net Present Value, Breakeven Point.

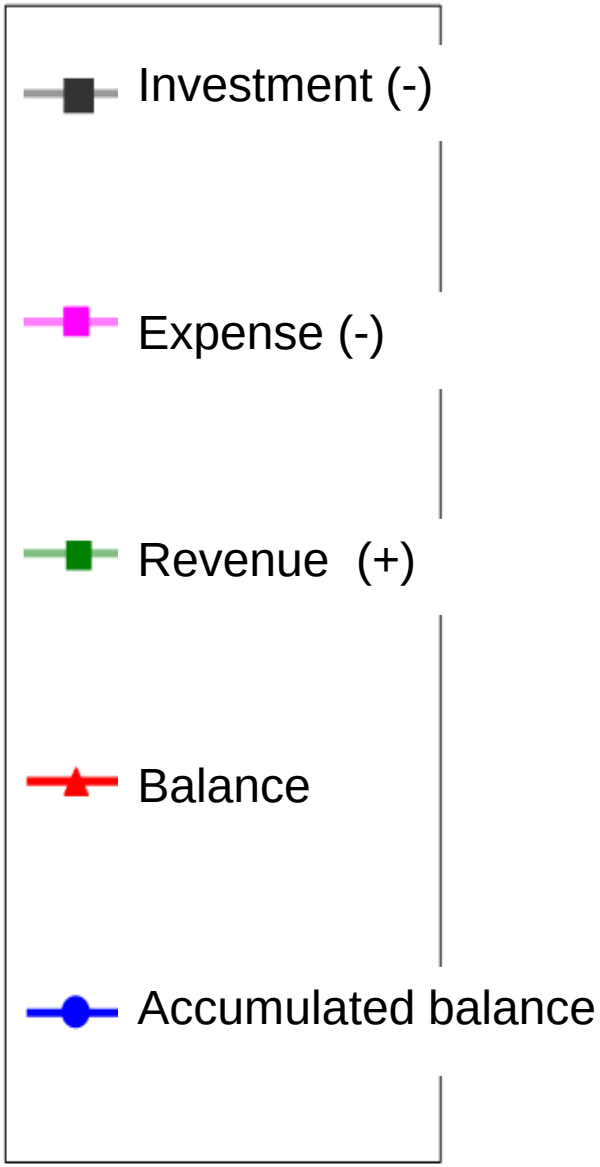


- 3 to 4 years on an independent power producer
- 4 to 8 years for an auto – producer
- 12 to 20 years for a government company

Site: www.cognitor.com.br



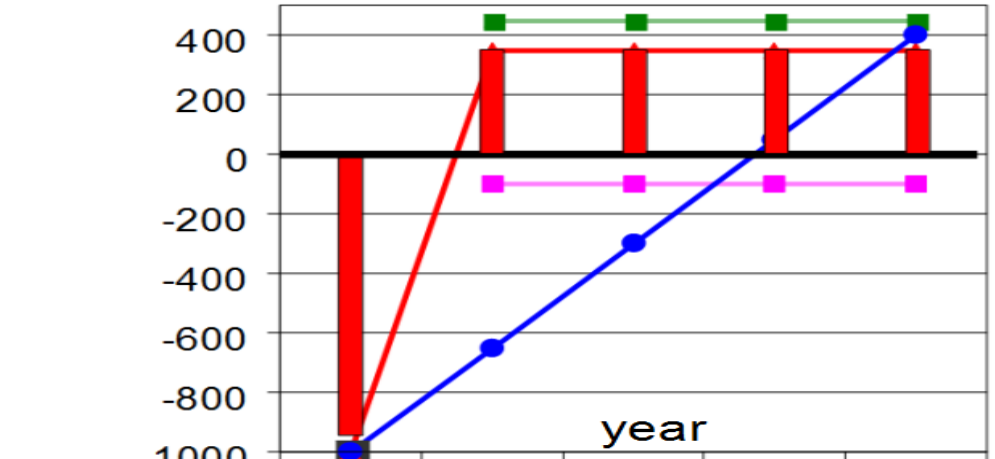
	1° (constr.)	2°	3°	4°	5°
Investiment (-)	-1000				
Expense (-)		-100	-100	-100	-100
Revenue (+)		450	450	450	450
Balance	-1000	350	350	350	350
Accumulated balance	-1000	-650	-300	50	400



Financial mathematics

Net Present Value

of the balance
for a discount tax
(cost of the money) of
10 % per year



	1° (constr.)	2°	3°	4°	5°
Investiment (-)	-1000				
Expense (-)		-100	-100	-100	-100
Revenue (+)		450	450	450	450
Balance	-1000	350	350	350	350
Accumulated balance	-1000	-650	-300	50	400

$$\frac{1000}{(1+0.1)^1} + \frac{350}{(1+0,1)^2} + \frac{350}{(1+0,1)^3} + \frac{350}{(1+0,1)^4} + \frac{350}{(1+0,1)^5}$$

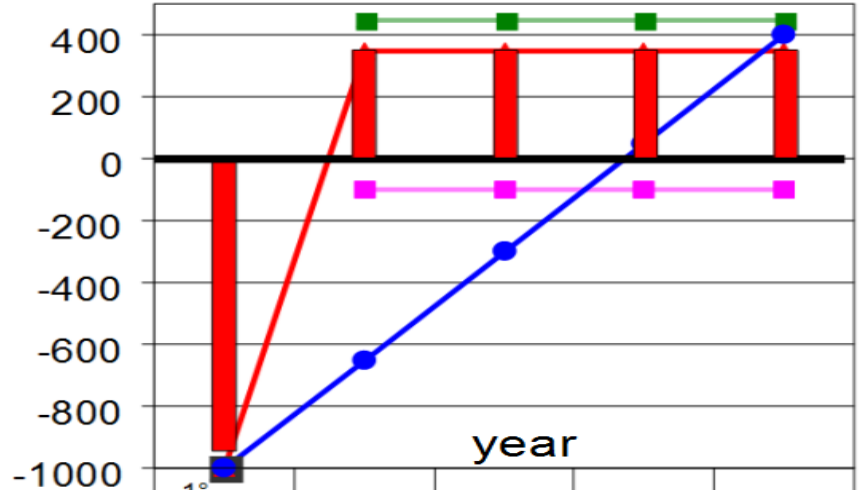
$$= -909 + 289 + 263 + 239 + 218$$

$$= +100$$

Site: www.cognitor.com.br

Internal Return Tax

Is the value of Y which makes the net present value calculated below equal to zero



	1° (constr.)	2°	3°	4°	5°
Investiment (-)	-1000				
Expense (-)		-100	-100	-100	-100
Revenue (+)		450	450	450	450
Balance	-1000	350	350	350	350
Accumulated balance	-1000	-650	-300	50	400

$$0 = \frac{1000}{(1+y)^1} + \frac{350}{(1+y)^2} + \frac{350}{(1+y)^3} + \frac{350}{(1+y)^4} + \frac{350}{(1+y)^5}$$

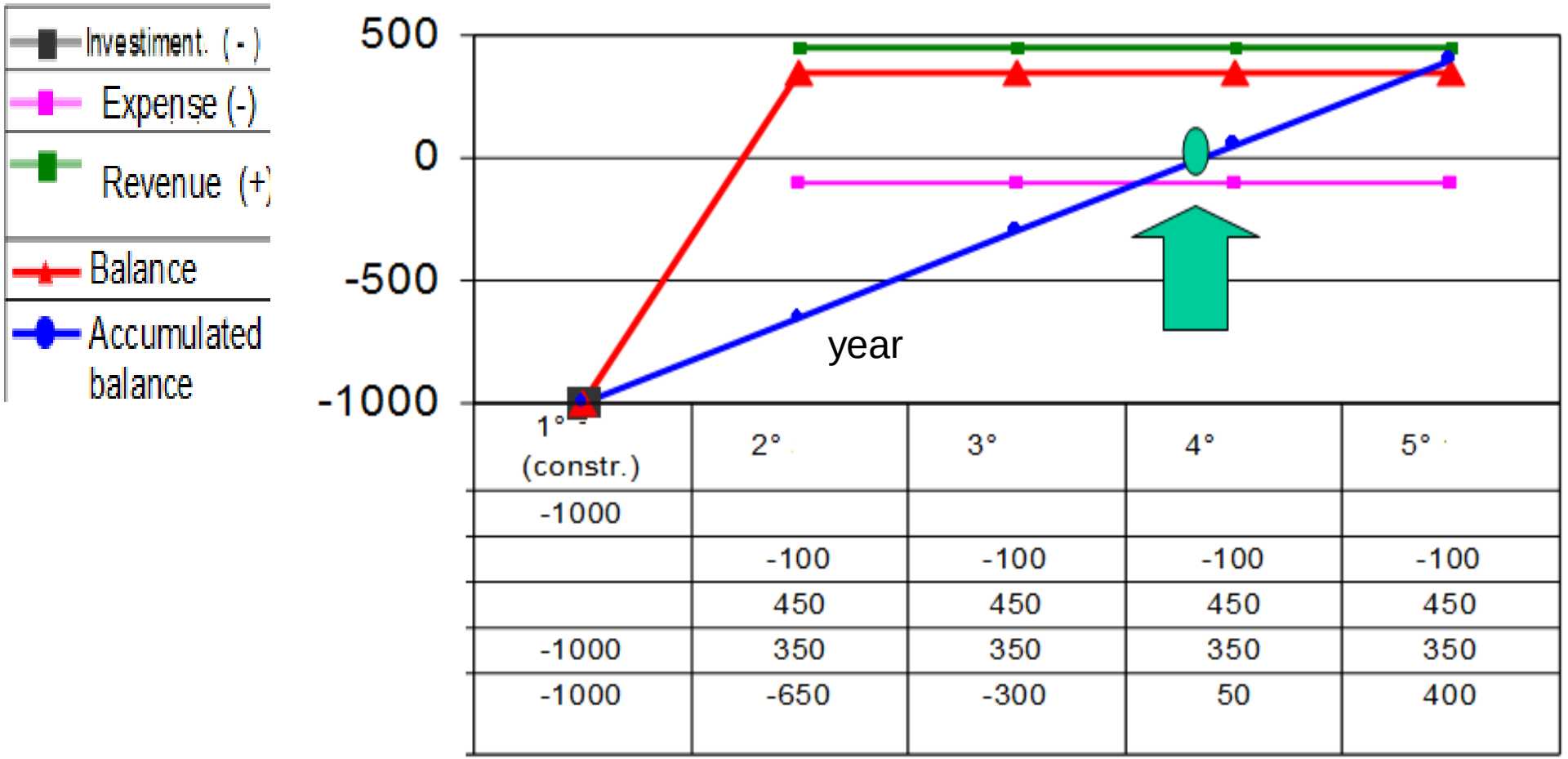
$$Y = 0{,}15 = \mathbf{15\ \%}$$

Site: www.cognitor.com.br

COST OF THE MONEY AND DISCOUNT TAX

Source	Share (%)	Annual cost (%)	Share x Anual cost (%)
Debt	70	12 (interests)	8,4
Equity	30	15 (return expected for own money)	4,5
Cost of the money	--	--	12,9

Site: www.cognitor.com.br

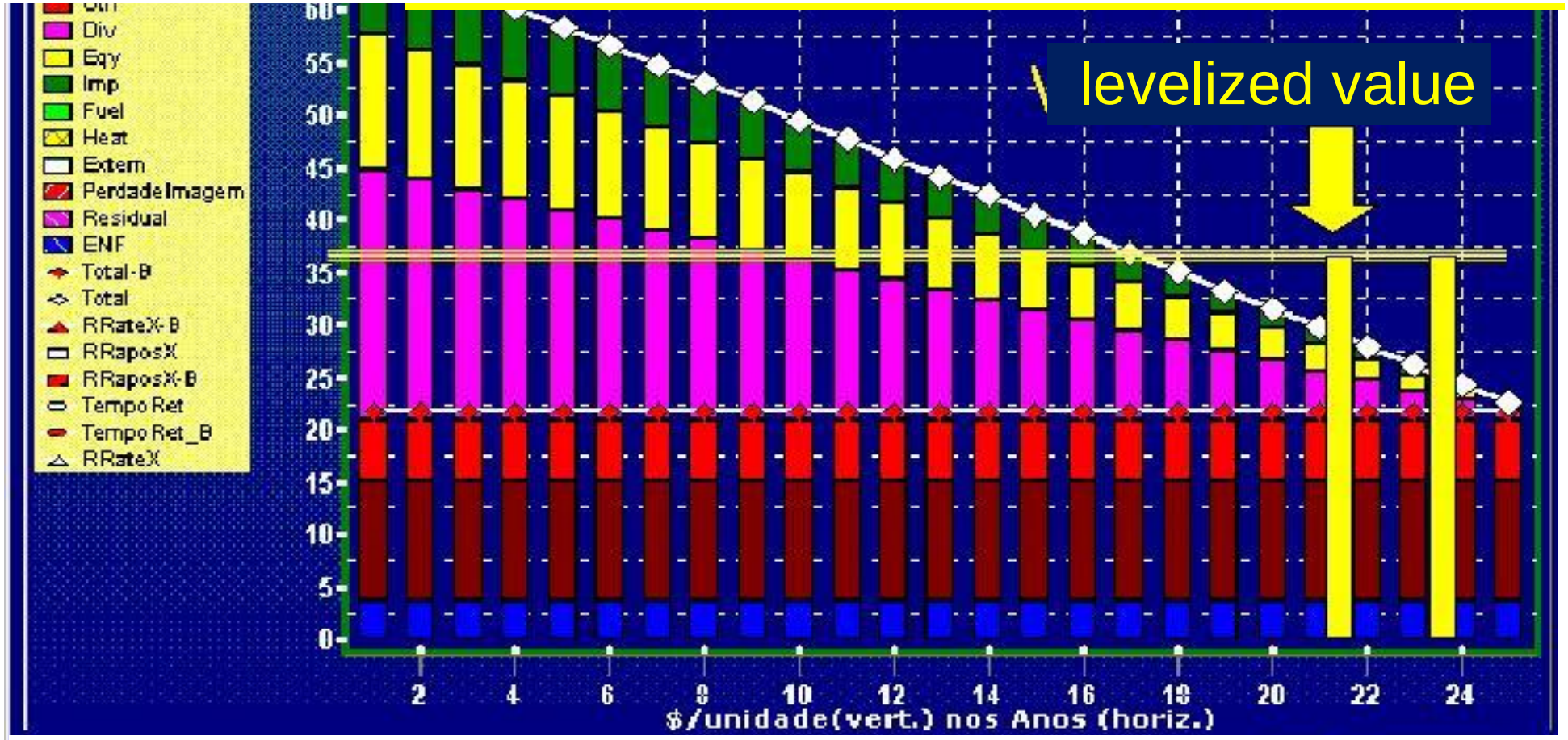


1° (constr.)	2°	3°	4°	5°
-1000				
	-100	-100	-100	-100
	450	450	450	450
-1000	350	350	350	350
-1000	-650	-300	50	400

Pay Back is the year in which the ACCUMULATED BALANCE reaches, by the first time, the value ZERO

In the case above is ~4 years

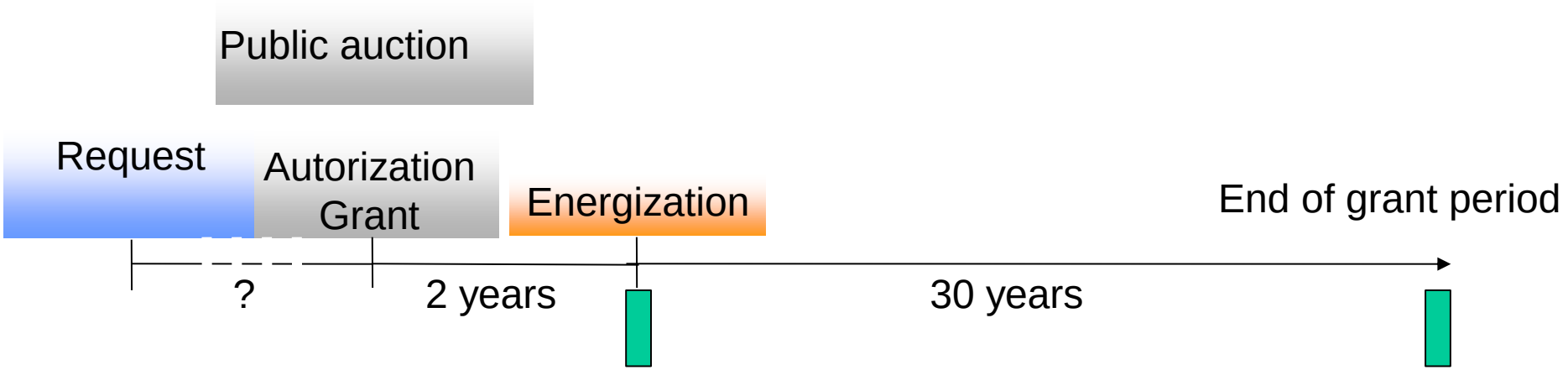
Revenue Requirement: levelized value of the "sales price" for which the "Internal Return Tax" is equal to the " Average weighted Cost of Money"



Book Life of the project

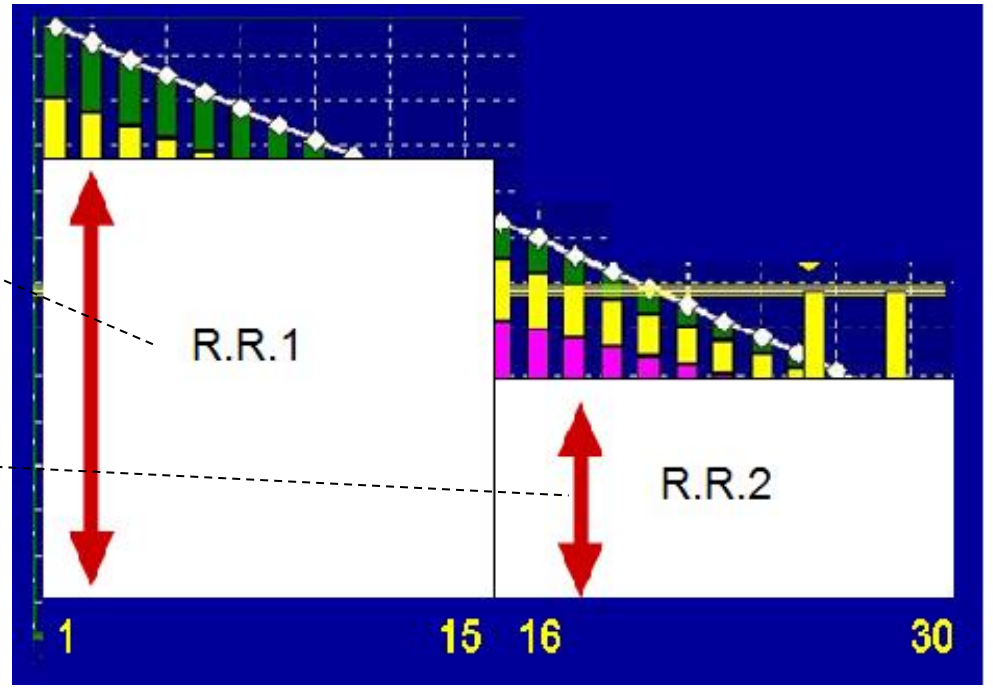
Revenue Requirement: :

Example for a transmission line public grant (30 years)



Revenue = 50 millions
per year
in the first 15 years

Revenue = 25 millions
per year
From year 16 to 30



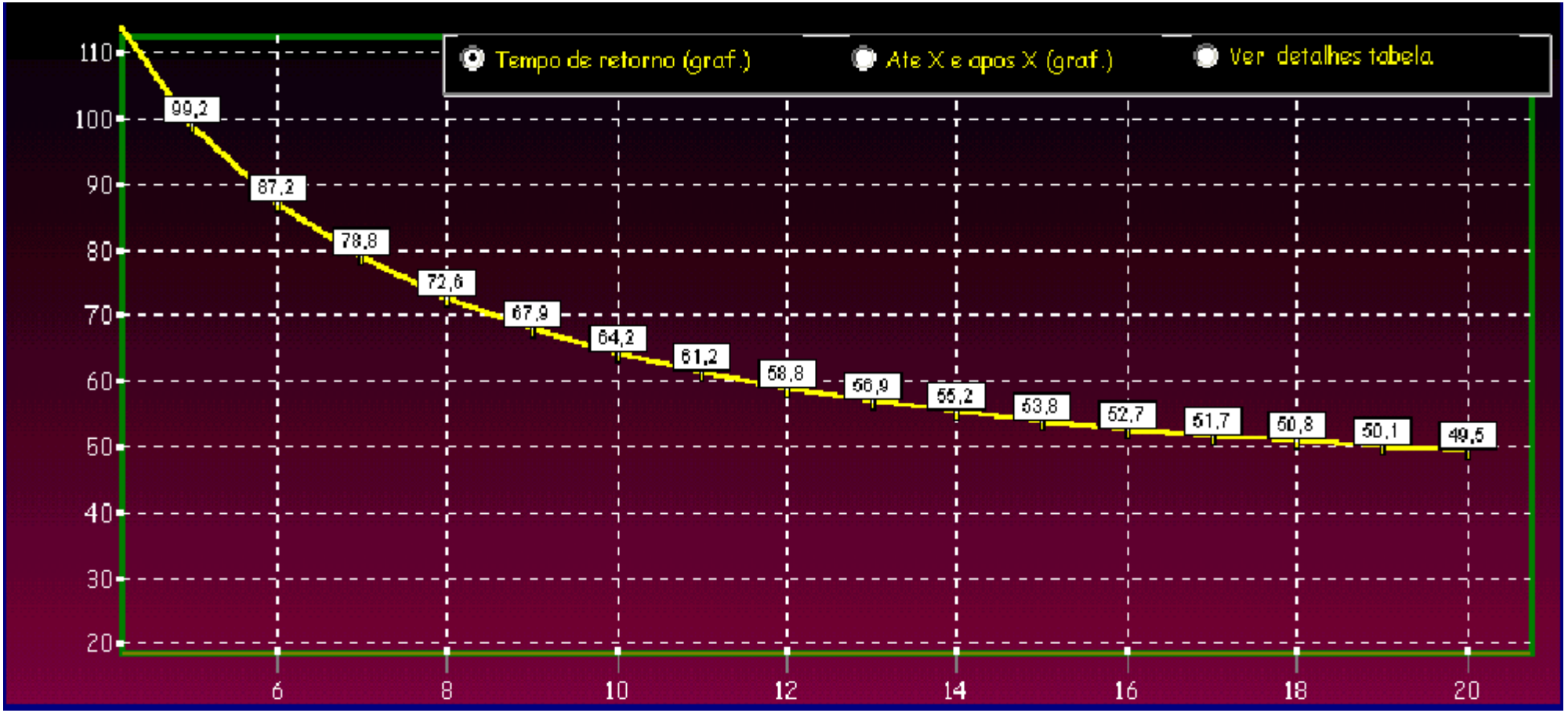
Site: www.cognitor.com.br

Equivalent time for Revenue Requirement (example)

Revenue requirement 87.2 U$ / MWh during 6 years

produce the same Present Value that

49.5 U$ / MWh during 20 years



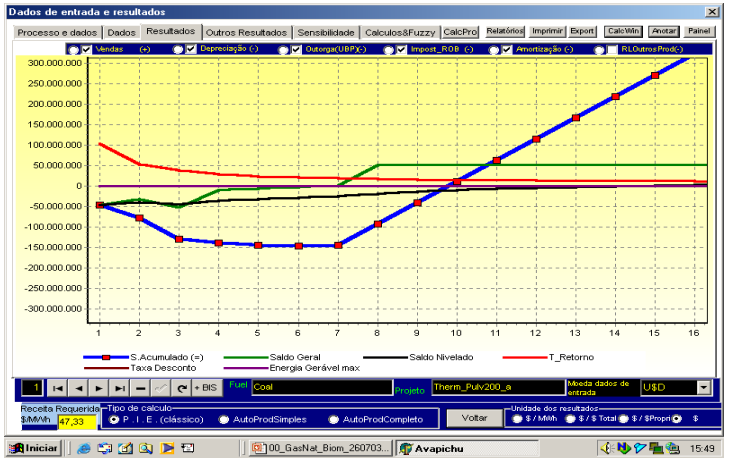
The year by year flux of revenues and expenses

Sales of the product or service (+)
Operational expenses (-)
Taxes over the sales **(-)**

Operational Revenue (=)

Taxes over the Operational Revenue (-)
Net Operational Revenue (=)
Other expenses **(-)**

Balance of the year **(=)**
Accumulated balance **(=)**



Typical Expenses

Always included

- Interests and and main debt
- Depreciation and similar (in + out)
- Taxes
- Insurance and property taxes
- Operation and maintenance
- Expenses with fuels
- Transmission and distribution transport and connection costs + Use od Public Good

Sometimes included

- ENERGY NOT SUPPLIED
- FINES BY NON AVAILABILITY

Rarely included

- Environmental Externalities
- Value of Employmnt Generation

Typical Revenues

Electric energy sales

Heat or cooling sales (cogeneration)

Sub-products sales

Installation and Screens of the free Decidix Software

After having the installation file (file size is approximately 4.5 MB) save it in some directory of your computer.

To install Decidix just click on the file and give OK to all the questions.

The installer will create in your computer only one directory named c://SergioFeitoza

If it was not created please create a short cut in the desktop for the file C:\SergioFeitoza\Decidix.exe

The *.exe file , the tables with the database and all the few files will be installed in this directory. No other file or directory will be created anywhere

It is not expected to occur but if you have any problems with the installation please send me an email from your private email to the email sergiofeitoza@cognitor.com.br informing what happened.

Please do not use the LinkedIn group for this or for questions about Decidix. Unfortunately we cannot provide free support but for the installation I can help

Select the project type in the right side box. After this select the box below. Then Click in the Start button

Finish

Decidix www.cognitor.com.br

COGNITOR

High power testing simulations, development of switchgear and other equipment for substations, design of testing laboratories, R&D and high level training .

This version is complete and there is no function locked. For some functions, data entry wrongly written can generate error messages
The functions that let you do sensitivity analyses, to create scenarios for trends in time and decisions based on Knowledge Rules should not be used by people who have not had training
On the screen that appears after pressing the Start button it is possible to make most of the analyses required in daily life

We apply In Company trainings about the concepts and use of the software. Ask for the program and prices by email sergiofeitoza@cognitor.com.br .
Training may be applied in English, Spanish and Portuguese. We can communicate also in French

For COMPANIES: we can adapt and customize this software to your specific usages
it is possible to acquire the complete SOURCE CODE in Delphi but only associated to a specific training

INTERPRETATION OF RESULTS: to do this the user need to have good understanding of the concepts and methods used.
RESPONSIBILITY: the program was not formally validated and may be used at your own risk and we are not responsible for any results or for any use which may be given to the results
OPERATION MANUAL: the program does not have a book of instructions but putting the mouse over the data entry boxes you can read some basic instructions on how to use them

☑ Read the text inside the white box above and, if you accept the use conditions, uncheck this box to continue.

After clicking in the file C:\SergioFeitoza\Decidix.exe this screen will appear. Read the text and uncheck the box

This is a free version of the Decidix software developed by Sergio Feitoza Costa for the technical economic analysis of feasibility for projects of generation, transmission and distribution of electric power

Select the project type in the right side box. After this select the box below. Then Click in the Start button

Finish

Decidix www.cognitor.com.br

COGNITOR

High power testing simulations, development of switchgear and other equipment for substations, design of testing laboratories, R&D and high level training .

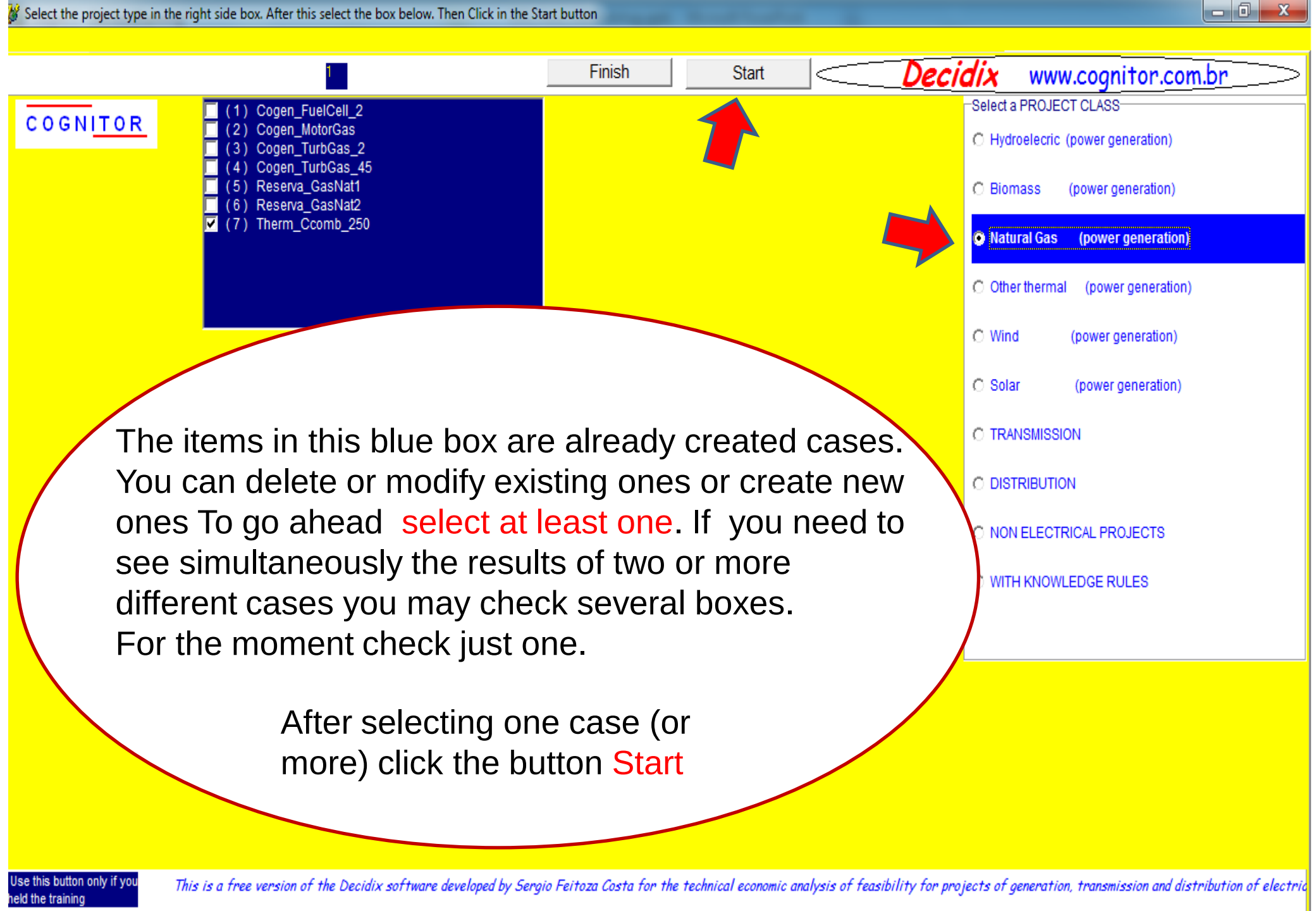
The right side white box will appear. The items are the types or classes of projects. Check one of them, for example natural gas, and you will see, in a blue box which will appear, some existing “test cases”

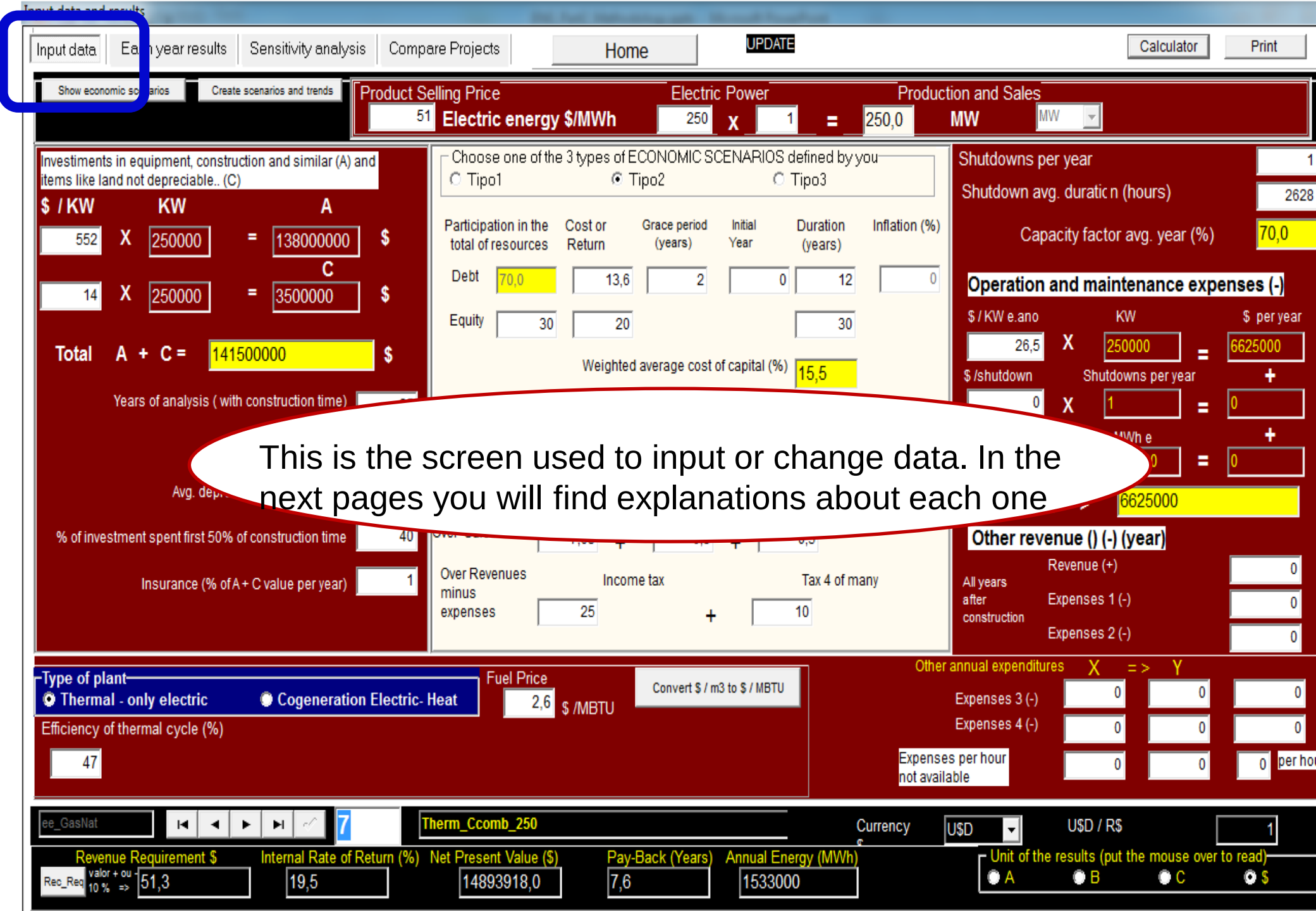
Select a project class in the right side, mark one or more projects (blue boxes) and click the START button

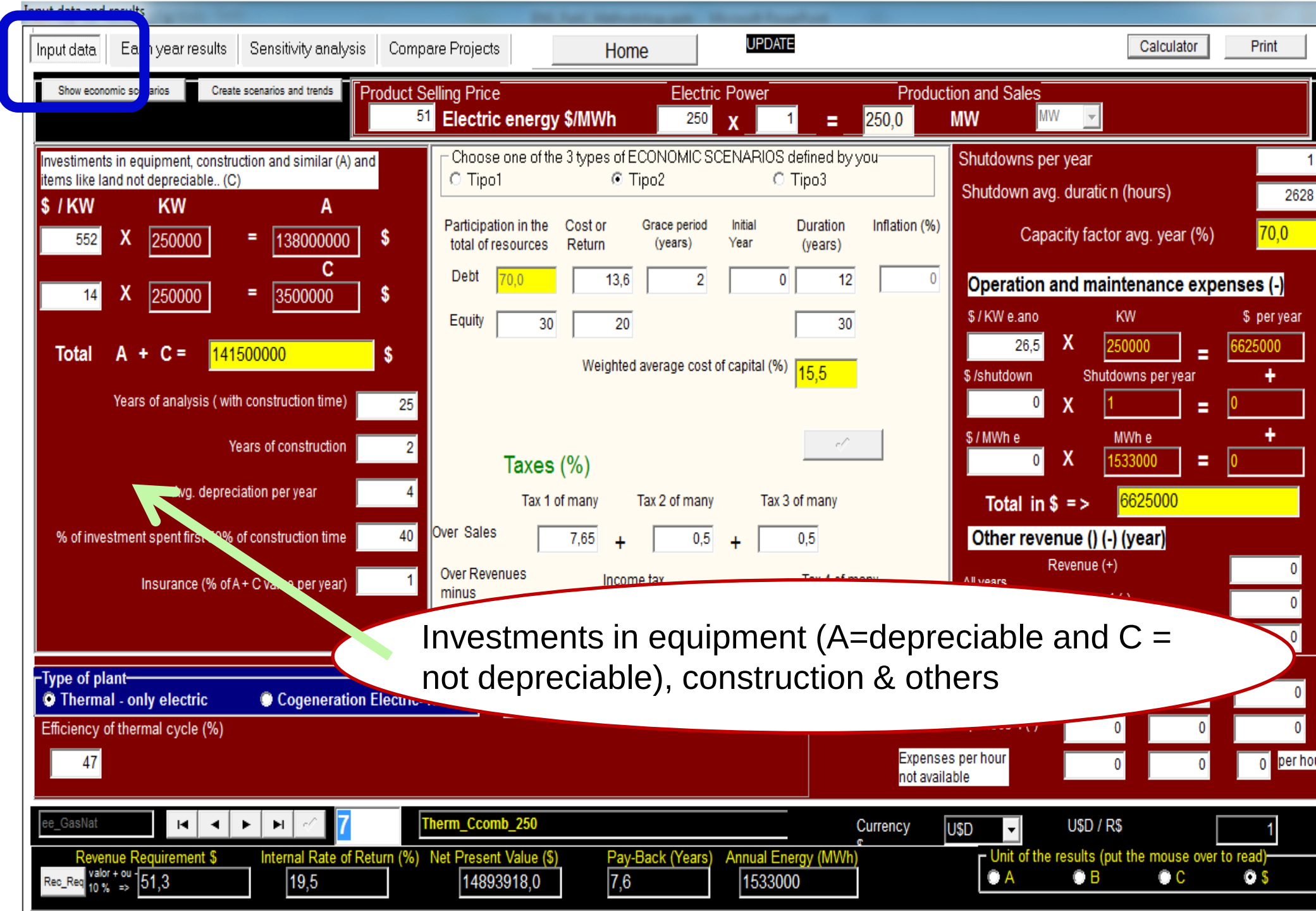
Select a PROJECT CLASS

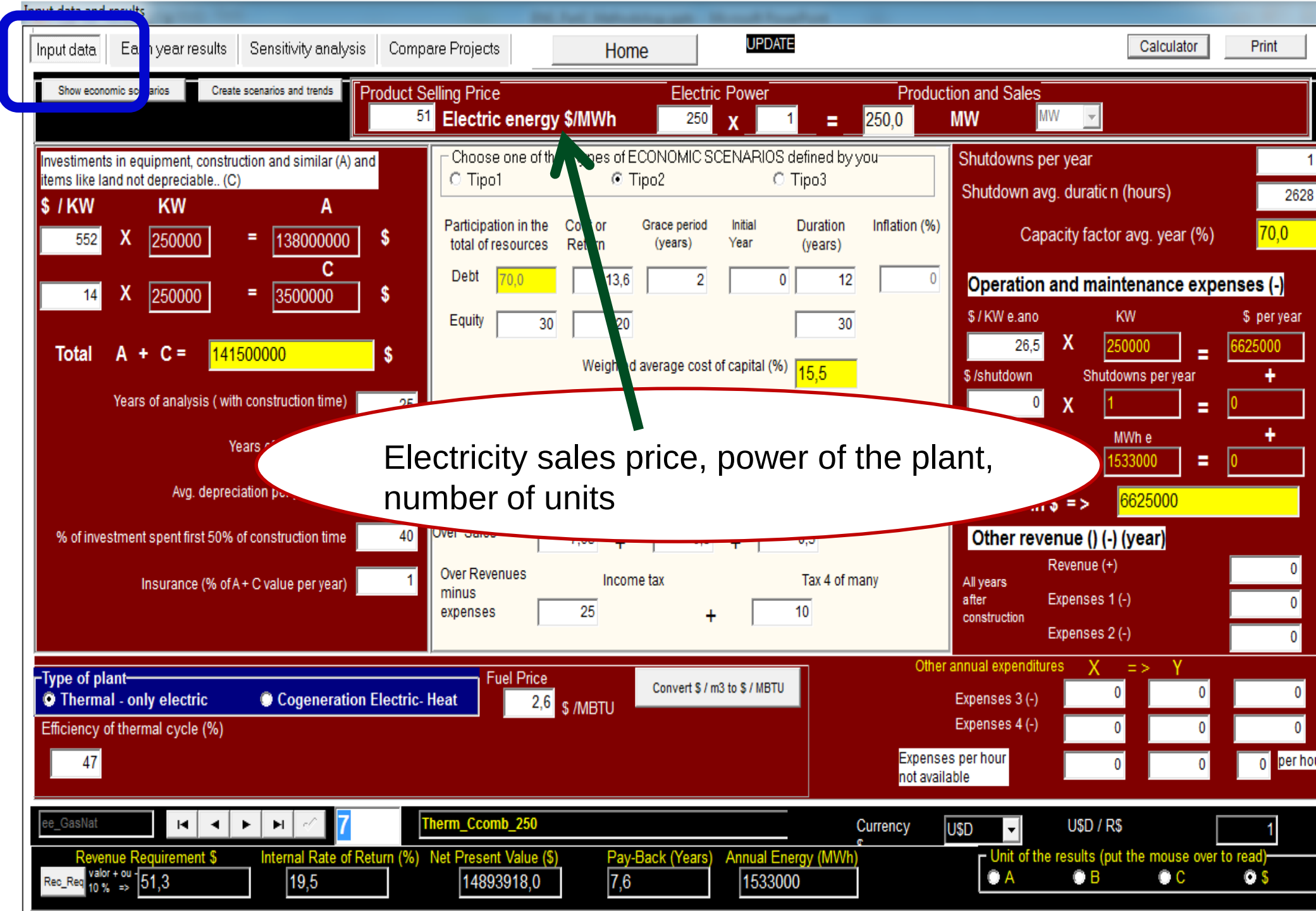
- Hydroelecric (power generation)
- Biomass (power generation)
- Natural Gas (power generation)
- Other thermal (power generation)
- Wind (power generation)
- Solar (power generation)
- TRANSMISSION
- DISTRIBUTION
- NON ELECTRICAL PROJECTS
- WITH KNOWLEDGE RULES
- OTHERS

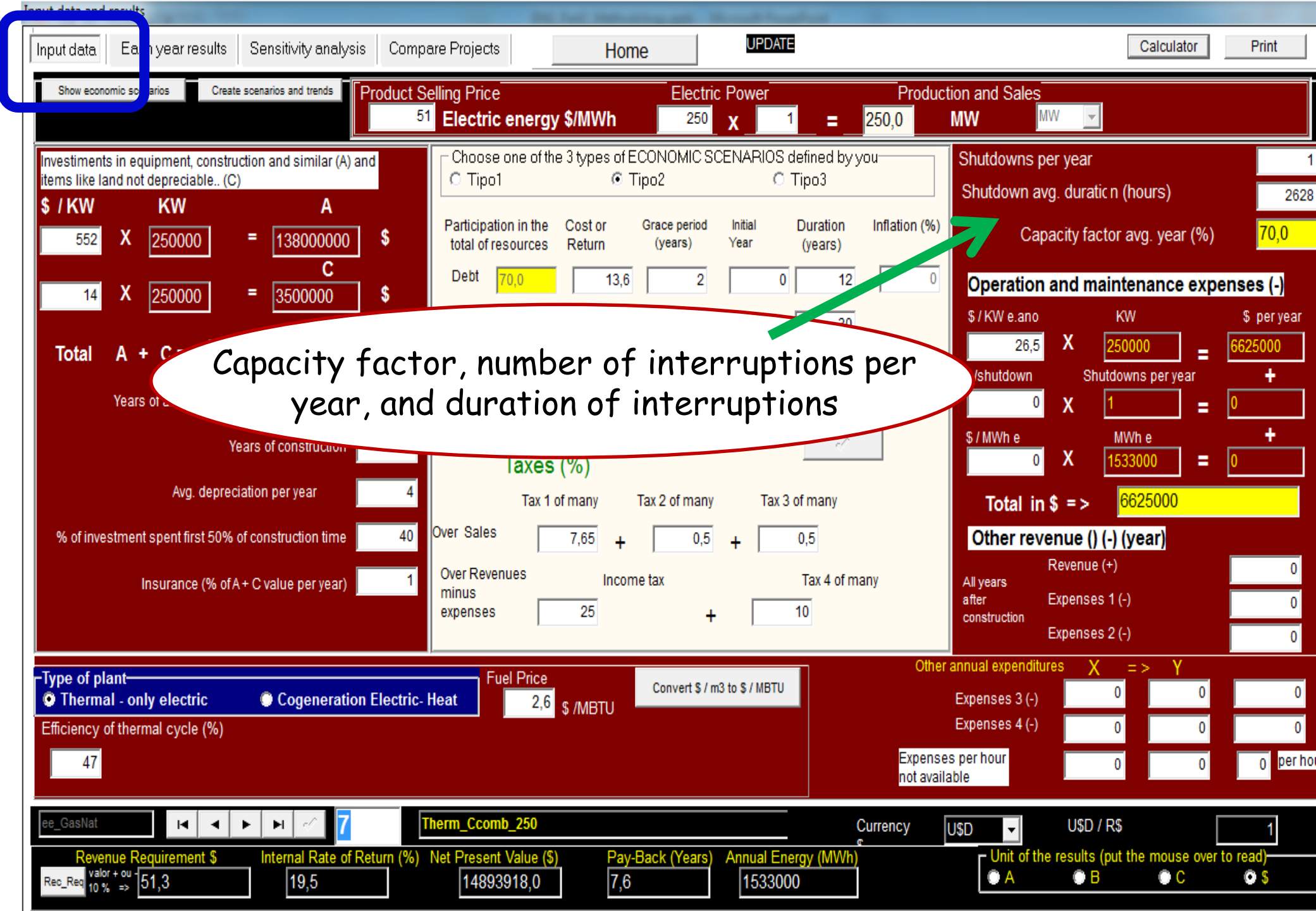
This is a free version of the Decidix software developed by Sergio Feitoza Costa for the technical economic analysis of feasibility for projects of generation, transmission and distribution of electric powe

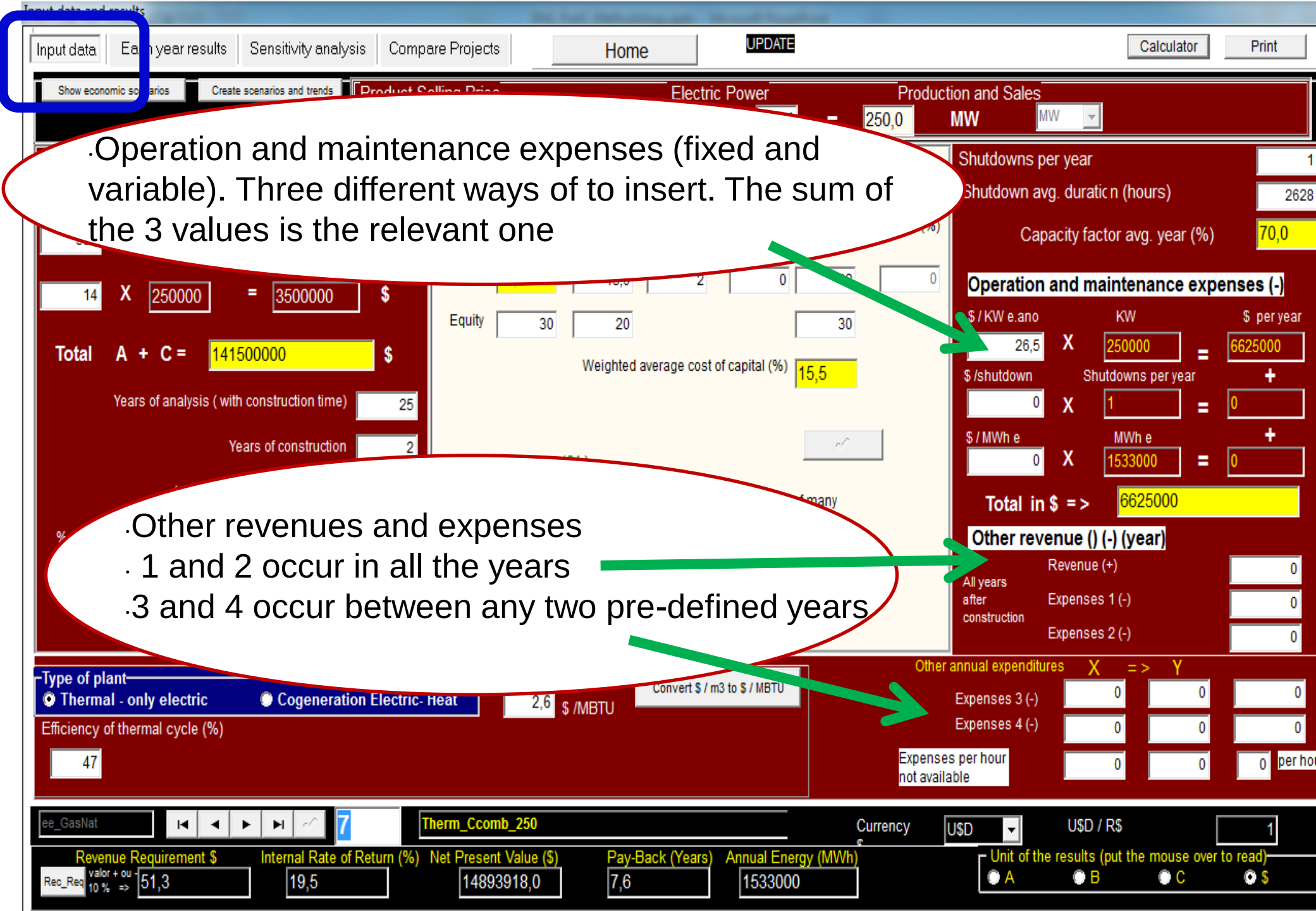

Select the project type in the right side box. After this select the box below. Then Click in the Start button
1
Finish
Start
Decidix
www.cognitor.com.br
COGNITOR
(1) Cogen_FuelCell_2
(2) Cogen_MotorGas
(3) Cogen_TurbGas_2
(4) Cogen_TurbGas_45
(5) Reserva_GasNat1
(6) Reserva_GasNat2
(7) Therm_Ccomb_250
Select a PROJECT CLASS
Hydroelecric (power generation)
Biomass (power generation)
Natural Gas (power generation)
Other thermal (power generation)
Wind (power generation)
Solar (power generation)
TRANSMISSION
DISTRIBUTION
NON ELECTRICAL PROJECTS
WITH KNOWLEDGE RULES
The items in this blue box are already created cases. You can delete or modify existing ones or create new ones To go ahead select at least one. If you need to see simultaneously the results of two or more different cases you may check several boxes.
For the moment check just one.
After selecting one case (or more) click the button Start
Use this button only if you held the training
This is a free version of the Decidix software developed by Sergio Feitoza Costa for the technical economic analysis of feasibility for projects of generation, transmission and distribution of electric


Input data
Each year results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Show economic scenarios
Create scenarios and trends
Product Selling Price
51
Electric energy $/MWh
Electric Power
250
X
1
=
250,0
MW
Production and Sales
MW
Investments in equipment, construction and similar (A) and items like land not depreciable.. (C)
$ / KW
KW
A
552
X
250000
=
138000000
$
C
14
X
250000
=
3500000
$
Total A + C =
141500000
$
Years of analysis (with construction time)
Avg. depr
% of investment spent first 50% of construction time
40
Insurance (% of A + C value per year)
1
Choose one of the 3 types of ECONOMIC SCENARIOS defined by you
Tipo1
Tipo2
Tipo3
Participation in the total of resources
Cost or Return
Grace period (years)
Initial Year
Duration (years)
Inflation (%)
Debt
70,0
13,6
2
0
12
0
Equity
30
20
30
Weighted average cost of capital (%)
15,5
Over Revenues minus expenses
25
Income tax
+
Tax 4 of many
10
Shutdowns per year
1
Shutdown avg. duratic n (hours)
2628
Capacity factor avg. year (%)
70,0
Operation and maintenance expenses (-)
$ / KW e.ano
KW
$ per year
26,5
X
250000
=
6625000
$ /shutdown
Shutdowns per year
+
0
X
1
=
0
MWh e
+
0
=
0
6625000
Other revenue () (-) (year)
All years after construction
Revenue (+)
0
Expenses 1 (-)
0
Expenses 2 (-)
0
This is the screen used to input or change data. In the next pages you will find explanations about each one
Type of plant
Thermal - only electric
Cogeneration Electric- Heat
Fuel Price
2,6
$ /MBTU
Convert $ / m3 to $ / MBTU
Efficiency of thermal cycle (%)
47
Other annual expenditures
X
=>
Y
Expenses 3 (-)
0
0
0
Expenses 4 (-)
0
0
0
Expenses per hour not available
0
0
0
per hou
ee_GasNat
7
Therm_Ccomb_250
Currency
U$D
UD / R
1
Revenue Requirement $
Rec_Req
valor + ou - 10 % =>
51,3
Internal Rate of Return (%)
19,5
Net Present Value ($)
14893918,0
Pay-Back (Years)
7,6
Annual Energy (MWh)
1533000
Unit of the results (put the mouse over to read)
A
B
C
$


Input data
Each year results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Show economic scenarios
Create scenarios and trends
Product Selling Price
51
Electric energy $/MWh
Electric Power
250
X
1
=
250,0
MW
Production and Sales
MW
Investments in equipment, construction and similar (A) and items like land not depreciable.. (C)
$ / KW
KW
A
552
X
250000
=
138000000
$
C
14
X
250000
=
3500000
$
Total A + C =
141500000
$
Years of analysis (with construction time)
25
Years of construction
2
Avg. depreciation per year
4
% of investment spent first 10% of construction time
40
Insurance (% of A+C value per year)
1
Choose one of the 3 types of ECONOMIC SCENARIOS defined by you
Tipo1
Tipo2
Tipo3
Participation in the total of resources
Cost or Return
Grace period (years)
Initial Year
Duration (years)
Inflation (%)
Debt
70,0
13,6
2
0
12
0
Equity
30
20
30
Weighted average cost of capital (%)
15,5
Taxes (%)
Tax 1 of many
Tax 2 of many
Tax 3 of many
Over Sales
7,65
+
0,5
+
0,5
Over Revenues minus
Income tax
Shutdowns per year
1
Shutdown avg. duration (hours)
2628
Capacity factor avg. year (%)
70,0
Operation and maintenance expenses (-)
$ / KW e.ano
KW
$ per year
26,5
X
250000
=
6625000
$ /shutdown
Shutdowns per year
+
0
X
1
=
0
$ / MWh e
MWh e
+
0
X
1533000
=
0
Total in $ =>
6625000
Other revenue () (-) (year)
Revenue (+)
All years
Type of plant
Thermal - only electric
Cogeneration Electric
Efficiency of thermal cycle (%)
47
Expenses per hour not available
per hou
Investments in equipment (A=depreciable and C = not depreciable), construction & others
ee_GasNat
7
Therm_Ccomb_250
Currency
U$D
UD / R
1
Revenue Requirement $
Rec_Req
valor + ou - 10 % =>
51,3
Internal Rate of Return (%)
19,5
Net Present Value ($)
14893918,0
Pay-Back (Years)
7,6
Annual Energy (MWh)
1533000
Unit of the results (put the mouse over to read)
A
B
C
$

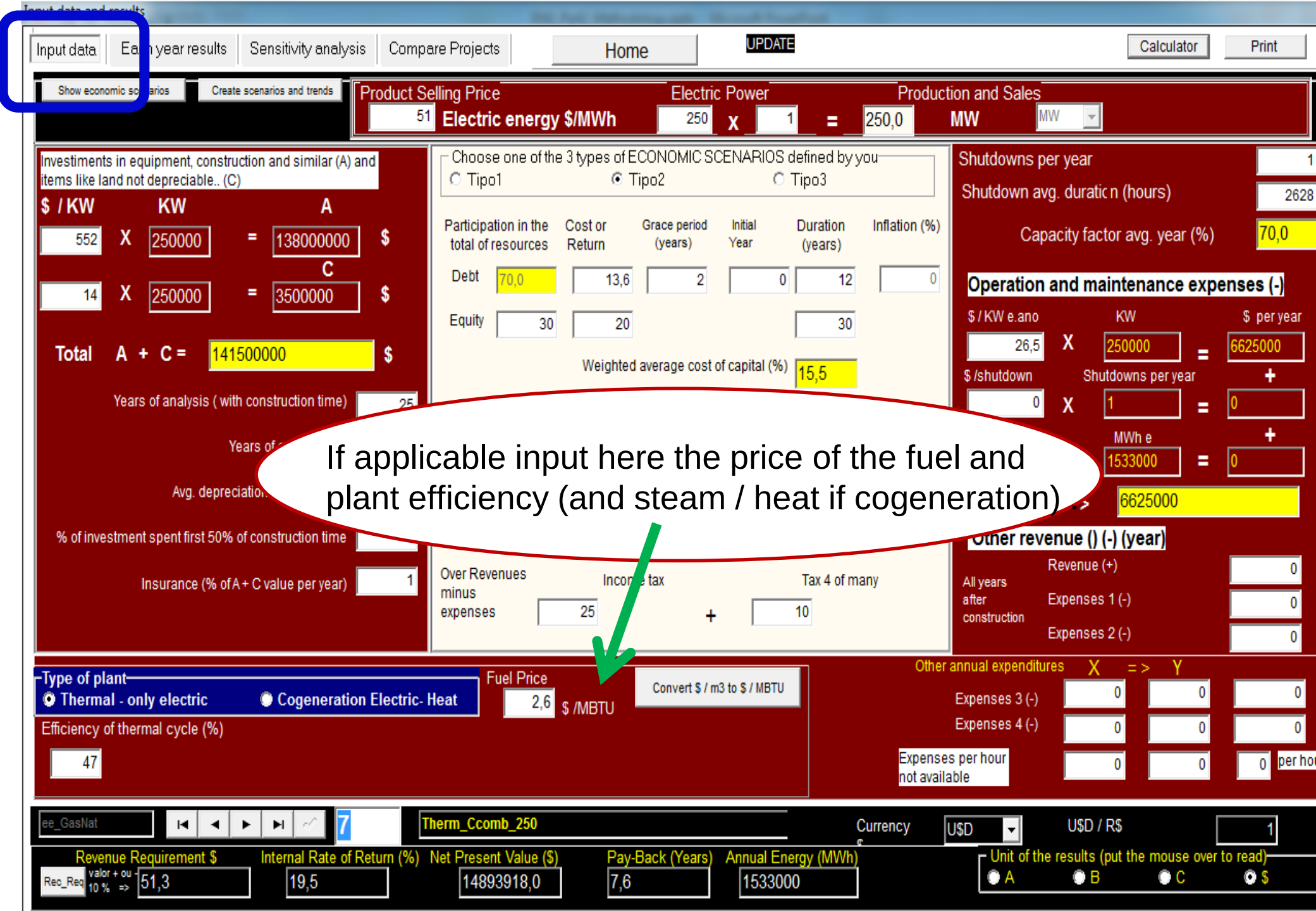

Input data
Each year results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Show economic scenarios
Create scenarios and trends
Product Selling Price
51
Electric energy $/MWh
Electric Power
250
X
1
=
250,0
MW
Production and Sales
MW
Investments in equipment, construction and similar (A) and items like land not depreciable.. (C)
$ / KW
KW
A
552
X
250000
=
138000000
$
C
14
X
250000
=
3500000
$
Total A + C =
141500000
$
Years of analysis (with construction time)
% of investment spent first 50% of construction time
40
Insurance (% of A + C value per year)
1
Choose one of the types of ECONOMIC SCENARIOS defined by you
Tipo1
Tipo2
Tipo3
Participation in the total of resources
Cost or Return
Grace period (years)
Initial Year
Duration (years)
Inflation (%)
Debt
70,0
13,6
2
0
12
0
Equity
30
20
30
Weighted average cost of capital (%)
15,5
Over Revenues minus expenses
25
Income tax
+
Tax 4 of many
10
Shutdowns per year
1
Shutdown avg. duration (hours)
2628
Capacity factor avg. year (%)
70,0
Operation and maintenance expenses (-)
$ / KW e.ano
KW
$ per year
26,5
X
250000
=
6625000
$ /shutdown
Shutdowns per year
+
0
X
1
=
0
MWh e
+
1533000
=
0
=>
6625000
Other revenue () (-) (year)
All years after construction
Revenue (+)
0
Expenses 1 (-)
0
Expenses 2 (-)
0
Type of plant
Thermal - only electric
Cogeneration Electric- Heat
Fuel Price
2,6
$ /MBTU
Convert $ / m3 to $ / MBTU
Efficiency of thermal cycle (%)
47
Other annual expenditures
X
=>
Y
Expenses 3 (-)
0
0
0
Expenses 4 (-)
0
0
0
Expenses per hour not available
0
0
0
per hou
Electricity sales price, power of the plant, number of units
ee_GasNat
7
Therm_Ccomb_250
Currency
U$D
UD / R
1
Revenue Requirement $
Rec_Req
valor + ou - 10 % =>
51,3
Internal Rate of Return (%)
19,5
Net Present Value ($)
14893918,0
Pay-Back (Years)
7,6
Annual Energy (MWh)
1533000
Unit of the results (put the mouse over to read)
A
B
C
$

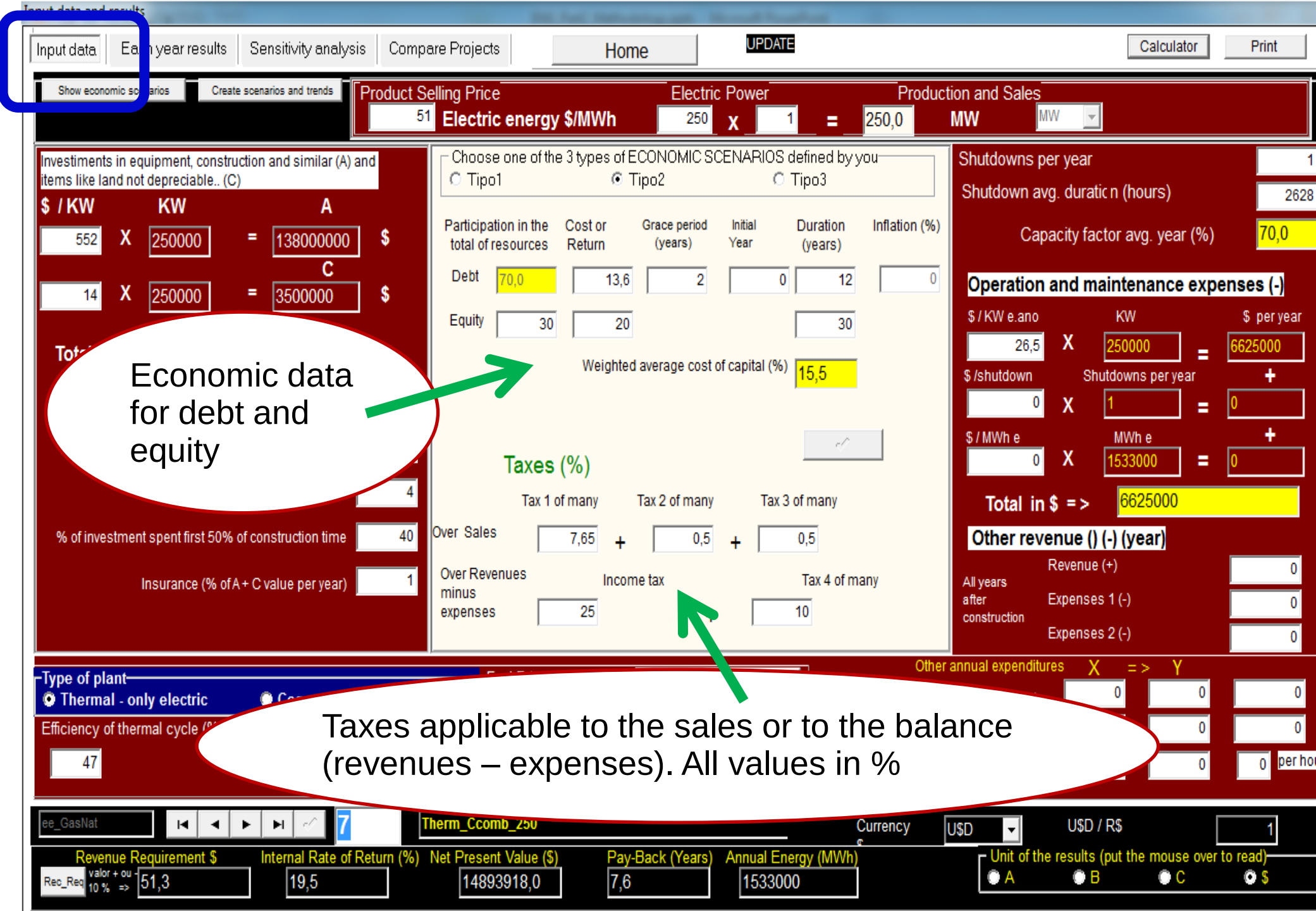

Input data
Each year results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Show economic scenarios
Create scenarios and trends
Product Selling Price
51
Electric energy $/MWh
Electric Power
250
X
1
=
250,0
MW
Production and Sales
MW
Investments in equipment, construction and similar (A) and items like land not depreciable.. (C)
$ / KW
KW
A
552
X
250000
=
138000000
$
C
14
X
250000
=
3500000
$
Total A + C
Years of construction
Avg. depreciation per year
4
% of investment spent first 50% of construction time
40
Insurance (% of A + C value per year)
1
Choose one of the 3 types of ECONOMIC SCENARIOS defined by you
Tipo1
Tipo2
Tipo3
Participation in the total of resources
Cost or Return
Grace period (years)
Initial Year
Duration (years)
Inflation (%)
Debt
70,0
13,6
2
0
12
0
Taxes (%)
Tax 1 of many
Tax 2 of many
Tax 3 of many
Over Sales
7,65
+
0,5
+
0,5
Over Revenues minus expenses
Income tax
Tax 4 of many
25
+
10
Shutdowns per year
1
Shutdown avg. duration (hours)
2628
Capacity factor avg. year (%)
70,0
Operation and maintenance expenses (-)
$ / KW e.ano
KW
$ per year
26,5
X
250000
=
6625000
/shutdown
Shutdowns per year
+
0
X
1
=
0
$ / MWh e
MWh e
+
0
X
1533000
=
0
Total in $ =>
6625000
Other revenue () (-) (year)
All years after construction
Revenue (+)
0
Expenses 1 (-)
0
Expenses 2 (-)
0
Capacity factor, number of interruptions per year, and duration of interruptions
Type of plant
Thermal - only electric
Cogeneration Electric- Heat
Fuel Price
2,6
$ /MBTU
Convert $ / m3 to $ / MBTU
Efficiency of thermal cycle (%)
47
Other annual expenditures
X
=>
Y
Expenses 3 (-)
0
0
0
Expenses 4 (-)
0
0
0
Expenses per hour not available
0
0
0
per hou
ee_GasNat
7
Therm_Ccomb_250
Currency
U$D
UD / R
1
Revenue Requirement $
Rec_Req
valor + ou - 10 % =>
51,3
Internal Rate of Return (%)
19,5
Net Present Value ($)
14893918,0
Pay-Back (Years)
7,6
Annual Energy (MWh)
1533000
Unit of the results (put the mouse over to read)
A
B
C
$

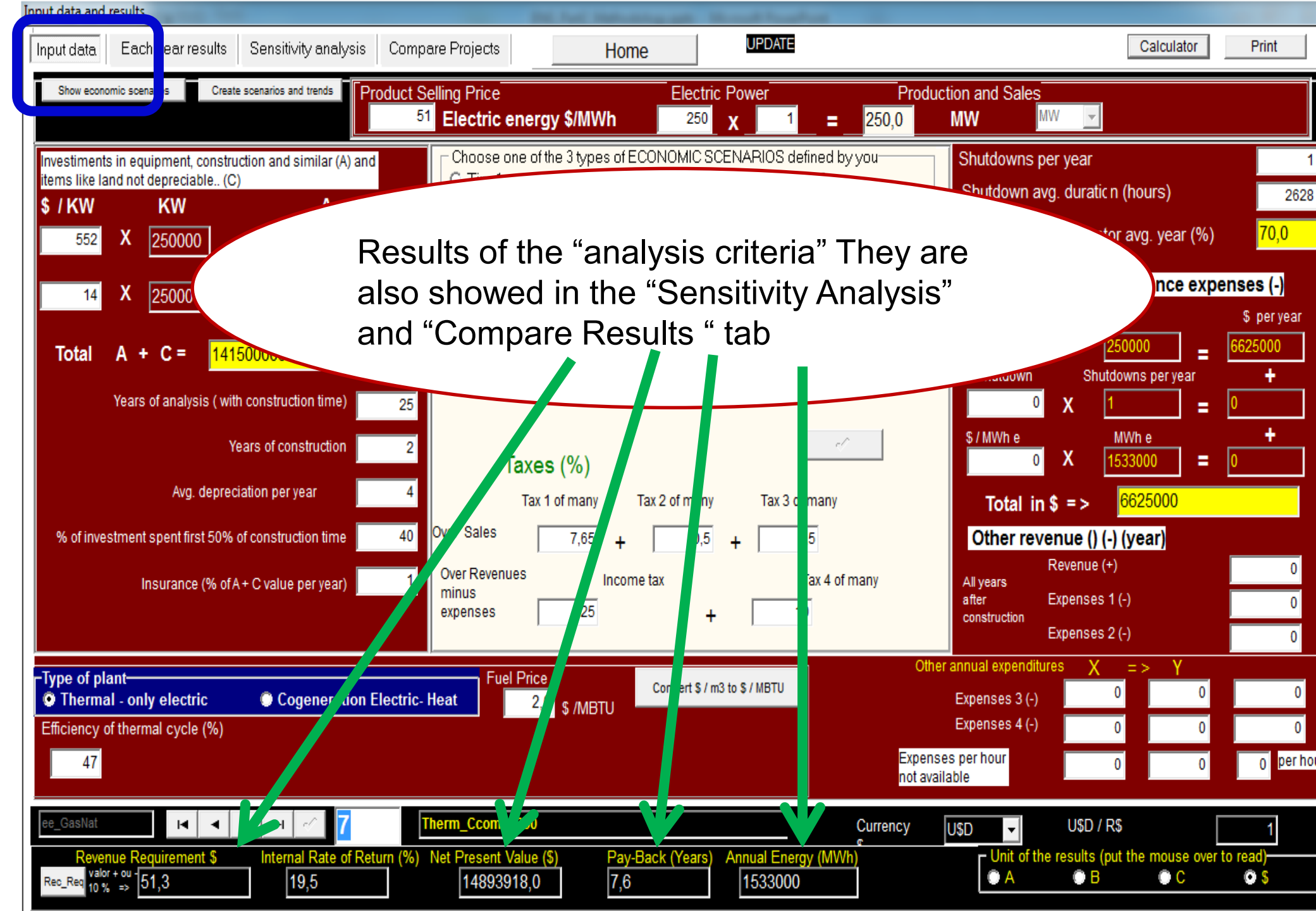


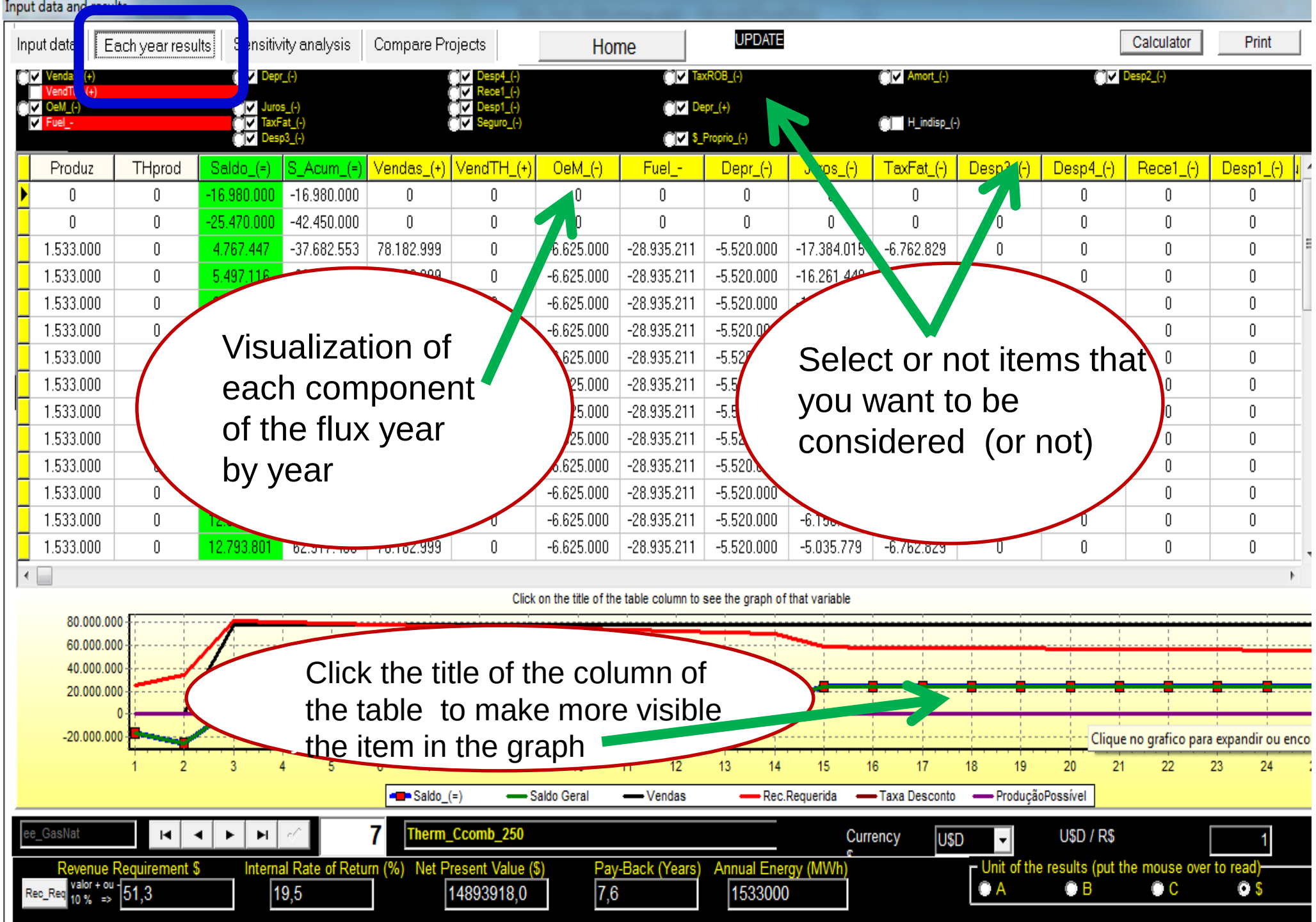
·Operation and maintenance expenses (fixed and variable). Three different ways of to insert. The sum of the 3 values is the relevant one

·Other revenues and expenses
· 1 and 2 occur in all the years
·3 and 4 occur between any two pre-defined years


Input data
Ea year results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Show economic sc arios
Create scenarios and trends
Product Selling Price
51
Electric energy $/MWh
Electric Power
250
X
1
=
250,0
MW
Production and Sales
MW
Investiments in equipment, construction and similar (A) and items like land not depreciable.. (C)
$ / KW
KW
A
552
X
250000
=
138000000
$
C
14
X
250000
=
3500000
$
Total A + C =
141500000
$
Years of analysis (with construction time)
25
Years of
Avg. depreciation
% of investment spent first 50% of construction time
Insurance (% of A + C value per year)
1
Choose one of the 3 types of ECONOMIC SCENARIOS defined by you
Tipo1
Tipo2
Tipo3
Participation in the total of resources
Cost or Return
Grace period (years)
Initial Year
Duration (years)
Inflation (%)
Debt
70,0
13,6
2
0
12
0
Equity
30
20
30
Weighted average cost of capital (%)
15,5
Over Revenues minus expenses
25
Income tax
+
Tax 4 of many
10
Shutdowns per year
1
Shutdown avg. duratic n (hours)
2628
Capacity factor avg. year (%)
70,0
Operation and maintenance expenses (-)
$ / KW e.ano
KW
$ per year
26,5
X
250000
=
6625000
$ /shutdown
Shutdowns per year
+
0
X
1
=
0
MWh e
+
1533000
=
0
=>
6625000
Other revenue () (-) (year)
All years after construction
Revenue (+)
0
Expenses 1 (-)
0
Expenses 2 (-)
0
If applicable input here the price of the fuel and plant efficiency (and steam / heat if cogeneration) ..
Type of plant
Thermal - only electric
Cogeneration Electric- Heat
Fuel Price
2,6
$ /MBTU
Convert $ / m3 to $ / MBTU
Efficiency of thermal cycle (%)
47
Other annual expenditures
X
=>
Y
Expenses 3 (-)
0
0
0
Expenses 4 (-)
0
0
0
Expenses per hour not available
0
0
0
per hou
ee_GasNat
7
Therm_Ccomb_250
Currency
U$D
UD / R
1
Revenue Requirement $
Rec_Req
valor + ou - 10 % =>
51,3
Internal Rate of Return (%)
19,5
Net Present Value ($)
14893918,0
Pay-Back (Years)
7,6
Annual Energy (MWh)
1533000
Unit of the results (put the mouse over to read)
A
B
C
$


Input data
Each year results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Show economic scenarios
Create scenarios and trends
Product Selling Price
51
Electric energy $/MWh
Electric Power
250
X
1
=
250,0
MW
Production and Sales
MW
Investments in equipment, construction and similar (A) and items like land not depreciable.. (C)
$ / KW
KW
A
552
X
250000
=
138000000
$
C
14
X
250000
=
3500000
$
Economic data for debt and equity
Choose one of the 3 types of ECONOMIC SCENARIOS defined by you
Tipo1
Tipo2
Tipo3
Participation in the total of resources
Cost or Return
Grace period (years)
Initial Year
Duration (years)
Inflation (%)
Debt
70,0
13,6
2
0
12
0
Equity
30
20
30
Weighted average cost of capital (%)
15,5
Taxes (%)
Tax 1 of many
Tax 2 of many
Tax 3 of many
Over Sales
7,65
+
0,5
+
0,5
Over Revenues minus expenses
Income tax
Tax 4 of many
25
10
Shutdowns per year
1
Shutdown avg. duration (hours)
2628
Capacity factor avg. year (%)
70,0
Operation and maintenance expenses (-)
$ / KW e.ano
KW
$ per year
26,5
X
250000
=
6625000
$ /shutdown
Shutdowns per year
+
0
X
1
=
0
$ / MWh e
MWh e
+
0
X
1533000
=
0
Total in $ =>
6625000
Other revenue () (-) (year)
All years after construction
Revenue (+)
0
Expenses 1 (-)
0
Expenses 2 (-)
0
4
% of investment spent first 50% of construction time
40
Insurance (% of A + C value per year)
1
Type of plant
Thermal - only electric
Efficiency of thermal cycle
47
Other annual expenditures
X
=>
Y
Taxes applicable to the sales or to the balance (revenues – expenses). All values in %
ee_GasNat
7
Therm_Ccomb_250
Currency
U$D
UD / R
1
Revenue Requirement $
Rec_Req
valor + ou - 10 % =>
51,3
Internal Rate of Return (%)
19,5
Net Present Value ($)
14893918,0
Pay-Back (Years)
7,6
Annual Energy (MWh)
1533000
Unit of the results (put the mouse over to read)
A
B
C
$


Input data and results
Input data
Each ear results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Show economic scena s
Create scenarios and trends
Product Selling Price
51
Electric energy $/MWh
Electric Power
250
X
1
=
250,0
MW
Production and Sales
MW
Investiments in equipment, construction and similar (A) and items like land not depreciable.. (C)
$ / KW
KW
552
X
250000
14
X
25000
Total A + C =
Years of analysis (with construction time)
25
Years of construction
2
Avg. depreciation per year
4
% of investment spent first 50% of construction time
40
Insurance (% of A + C value per year)
1
Choose one of the 3 types of ECONOMIC SCENARIOS defined by you
Taxes (%)
Tax 1 of many
Tax 2 of many
Tax 3 of many
Over Sales
7,65
+
,5
+
5
Over Revenues minus expenses
Income tax
25
+
Tax 4 of many
Shutdowns per year
1
Shutdown avg. duratic n (hours)
2628
or avg. year (%)
70,0
nce expenses (-)
$ per year
250000
=
6625000
Shutdowns per year
+
0
X
1
=
0
$ / MWh e
MWh e
+
0
X
1533000
=
0
Total in $ =>
6625000
Other revenue () (-) (year)
All years after construction
Revenue (+)
0
Expenses 1 (-)
0
Expenses 2 (-)
0
Type of plant
Thermal - only electric
Cogener ion Electric- Heat
Fuel Price
2
$ /MBTU
Con ert $ / m3 to $ / MBTU
Efficiency of thermal cycle (%)
47
Other annual expenditures
X
=>
Y
Expenses 3 (-)
0
0
0
Expenses 4 (-)
0
0
0
Expenses per hour not available
0
0
0
per hou
Results of the “analysis criteria” They are also showed in the “Sensitivity Analysis” and “Compare Results “ tab
ee_GasNat
7
Therm_Ccom
Currency
U$D
UD / R
1
Revenue Requirement $
Rec_Req
valor + ou - 10 % =>
51,3
Internal Rate of Return (%)
19,5
Net Present Value ($)
14893918,0
Pay-Back (Years)
7,6
Annual Energy (MWh)
1533000
Unit of the results (put the mouse over to read)
A
B
C
$


Input data and results
Input data
Each year results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Venda (+)
VendT (+)
OeM_(-)
Fuel_-
Depr_(-)
Juros_(-)
TaxFat_(-)
Desp3_(-)
Desp4_(-)
Rece1_(-)
Desp1_(-)
Seguro_(-)
TaxROB_(-)
Depr_(+)
$_Proprio_(-)
Amort_(-)
H_indisp_(-)
Desp2_(-)
Produz
THprod
Saldo_(=)
S_Acum_(=)
Vendas_(+)
VendTH_(+)
OeM_(-)
Fuel_-
Depr_(-)
Juros_(-)
TaxFat_(-)
Desp3_(-)
Desp4_(-)
Rece1_(-)
Desp1_(-)
0 0 -16.980.000 -16.980.000 0 0 0 0 0 0 0 0 0 0 0
0 0 -25.470.000 -42.450.000 0 0 0 0 0 0 0 0 0 0 0
1.533.000 0 4.767.447 -37.682.553 78.182.999 0 -6.625.000 -28.935.211 -5.520.000 -17.384.015 -6.762.829 0 0 0 0
1.533.000 0 5.497.116 0 -6.625.000 -28.935.211 -5.520.000 -16.261.448 0 0 0 0
1.533.000 0 -6.625.000 -28.935.211 -5.520.000 0 0 0 0
1.533.000 0 -6.625.000 -28.935.211 -5.520.0 0 0 0 0
1.533.000 -6.625.000 -28.935.211 -5.52 0 0 0 0
1.533.000 25.000 -28.935.211 -5.5 0 0 0 0
1.533.000 25.000 -28.935.211 -5.5 0 0 0 0
1.533.000 25.000 -28.935.211 -5.52 0 0 0 0
1.533.000 .625.000 -28.935.211 -5.520.0 0 0 0 0
1.533.000 0 -6.625.000 -28.935.211 -5.520.000 0 0 0 0
1.533.000 0 -6.625.000 -28.935.211 -5.520.000 -6.15 0 0 0 0
1.533.000 0 12.793.801 -6.625.000 -28.935.211 -5.520.000 -5.035.779 -6.762.829 0 0 0 0
Visualization of each component of the flux year by year
Select or not items that you want to be considered (or not)
Click on the title of the table column to see the graph of that variable
80.000.000
60.000.000
40.000.000
20.000.000
0
-20.000.000
1 2 3 4 5 12 13 14 15 16 17 18 19 20 21 22 23 24
Clique no grafico para expandir ou enco
Click the title of the column of the table to make more visible the item in the graph
Saldo_(=)
Saldo Geral
Vendas
Rec.Requerida
Taxa Desconto
ProduçãoPossível
ee_GasNat
7
Therm_Ccomb_250
Currency
U$D
UD / R
1
Revenue Requirement $
Rec_Req
valor + ou 10 % =>
51,3
Internal Rate of Return (%)
19,5
Net Present Value ($)
14893918,0
Pay-Back (Years)
7,6
Annual Energy (MWh)
1533000
Unit of the results (put the mouse over to read)
A
B
C
$

Input data and results

Input data | Each year results | Sensitivity analysis | Compare Projects | Home | UPDATE | Calculator | Print

#	Projeto	T I R (%)	a Requerida ($ / MWh ou	PayBack (anos)	V P L (1000 $)	Opiniao	TIR_esp
1	Cogen_FuelCell_2	20,1	79,7	7,69	284	10	21,4
2	Cogen_MotorGas	21,5	60,5	6,22	15,1	10	35,3
3	Cogen_TurbGas_2	19,6	59,9	7,2	149	10	23,5
4	Cogen_TurbGas_45	19,9	61,8	7,87	2,92E3	10	23,6

See the results of several projects in just one screen

Receita requerida = Revenue requirement

Valor Presente Líquido = Present Value ($)

Opinião = Expert Opinion

Legend

Taxa Interna de retorno = Internal Return Tax (%)

Pay-Back (Years)

TIR_esp = Mathematical hope of the Internal Return Tax

ee_GasNat | 1 | Cogen_FuelCell_2 | Currency U$D | U$D / R$ 1

Revenue Requirement $ | Internal Rate of Return (%) | Net Present Value ($) | Pay-Back (Years) | Annual Energy (MWh)

Rec_Req valor + ou - 10 % => 79,7 | 20,1 | 284301,3 | 7,7 | 12264

Unit of the results (put the mouse over to read) A B C $

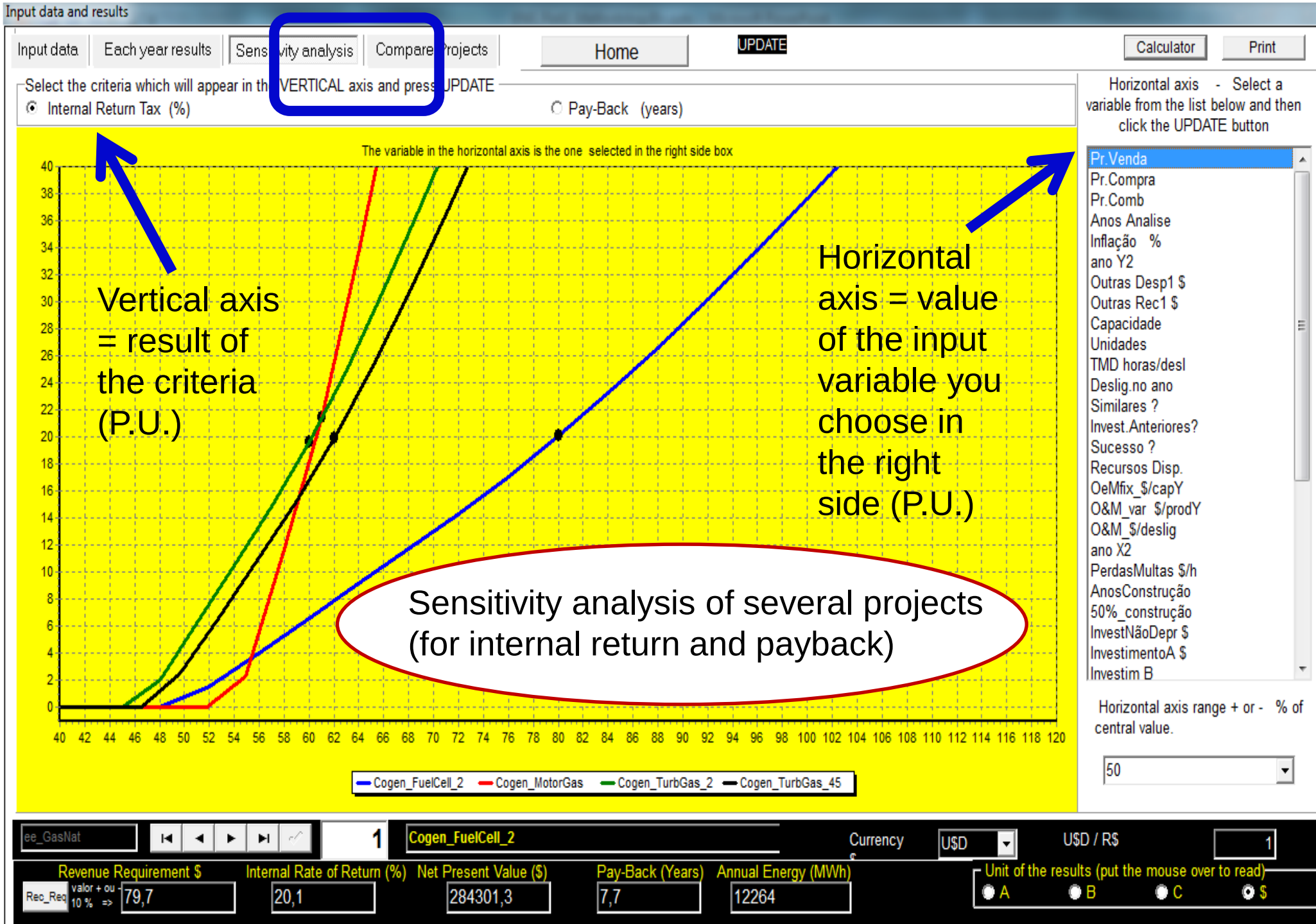
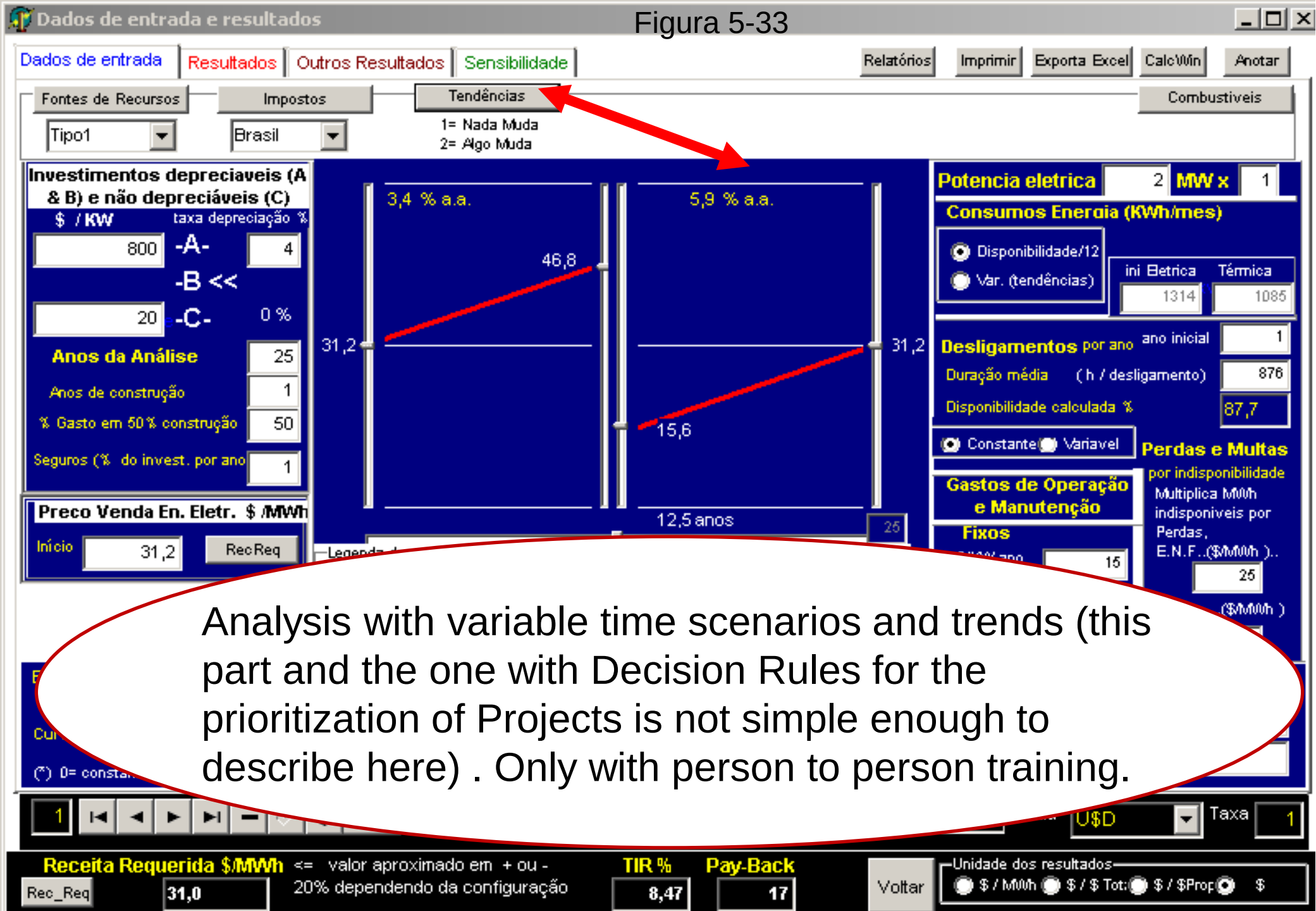

Input data and results
Input data
Each year results
Sensitivity analysis
Compare Projects
Home
UPDATE
Calculator
Print
Select the criteria which will appear in the VERTICAL axis and press UPDATE
Internal Return Tax (%)
Pay-Back (years)
The variable in the horizontal axis is the one selected in the right side box
Vertical axis = result of the criteria (P.U.)
Horizontal axis = value of the input variable you choose in the right side (P.U.)
Sensitivity analysis of several projects (for internal return and payback)
Horizontal axis - Select a variable from the list below and then click the UPDATE button
Pr.Venda
Pr.Compra
Pr.Comb
Anos Analise
Inflação %
ano Y2
Outras Desp1 $
Outras Rec1 $
Capacidade
Unidades
TMD horas/desl
Deslig.no ano
Similares ?
Invest.Anteriores?
Sucesso ?
Recursos Disp.
OeMfix_$/capY
O&M_var $/prodY
O&M_$/deslig
ano X2
PerdasMultas $/h
AnosConstrução
50%_construção
InvestNãoDepr $
InvestimentoA $
Investim B
Horizontal axis range + or - % of central value.
50
Cogen_FuelCell_2
Cogen_MotorGas
Cogen_TurbGas_2
Cogen_TurbGas_45
ee_GasNat
1
Cogen_FuelCell_2
Currency
U$D
UD / R
1
Revenue Requirement $
Internal Rate of Return (%)
Net Present Value ($)
Pay-Back (Years)
Annual Energy (MWh)
Rec_Req
valor + ou - 10 % =>
79,7
20,1
284301,3
7,7
12264
Unit of the results (put the mouse over to read)
A
B
C
$

Figura 5-33



Analysis with variable time scenarios and trends (this part and the one with Decision Rules for the prioritization of Projects is not simple enough to describe here) . Only with person to person training.

Visit the FORUM Switchgear (MV & LV): A proposal for an IEC Guide for testing simulation

Some recent publications by Sergio Feitoza Costa

1) VALIDATION OF SIMULATIONS OF ELECTRODYNAMICAL FORCES, TEMPERATURE-RISE AND INTERNAL ARC TESTS IN SWITCHGEAR (and main parts of a code to do them)

http://www.cognitor.com.br/Validation_Simulations_English.pdf

2) SWITCHGEAR , BUSBAR SYSTEMS and ITS BUILT-IN COMPONENTS: SOMETHING IS MISSING IN IEC and IEEE STANDARDS
http://www.cognitor.com.br/Switchgear_Busbar_Standards_Review_English.pdf

3) SIMULATION, IEC STANDARDS AND TESTING LABORATORIES: joining pieces for high quality substations
Paper published PS1-06 in the CIGRÈ International Technical Colloquium - Rio de Janeiro - September 2007

http://www.cognitor.com.br/Artigo_Cigre_SergioFeitozaCosta_Cognitor.pdf

4) Simulations and Calculations as Verification Tools for Design and Performance of High-Voltage Equipment (with several co-authors)
http://www.cognitor.com.br/Cigre_Paris_A3_210_2008.pdf

5) Recent proposal to IEC about the use of simulations min technical standards

Paper: A "Standard Guide" for the use of calculations and simulation of laboratory tests for increasing the competitiveness of the electric industry.

Experience of Sergio Feitoza Costa

CV at http://www.cognitor.com.br/en_curriculum.htm

•Design team of the high power and high voltage testing laboratories, testing engineer and manager of 14 big testing laboratories of CEPEL - Brazil.

• Chairman IEC- International Electrotechnical Commission – Technical Committee TC 32 - Fuses (1990-1994)

•Member of IEC WG SC 17 C / WG31: Guidelines for extending the validity of tests in metal-enclosed switchgear

•Member of the CIGRÈ WG A3. 24 : Tools for Simulating Internal Arc and Current Withstand Testing

•Consultant for manufacturers of equipment for substations and development of customized software for equipment design and testing simulations (high and low voltage).

•He also chaired groups the area of generation and cogeneration from renewable and non renewable

•Training and consultancy in equipment and substations design and specification and others

•In the free time Sergio is a musician, composer and singer (here you can hear are the songs of his 2nd CD http://palcomp3.com/sergiofeitoza/ clicking in the titles of the songs in the right side)

For contacts with Sergio Feitoza Costa

Cognitor – Consultancy , R&D and Training Ltd

Phone: (55) (21) 2465 3689 -- 3393 4600 – 8887 4600

E-mail: sergiofeitoza@cognitor.com.br Site www.cognitor.com.br