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Prepared For:

**Natgas Company**
June 16, 2001
Cairo, Egypt

# Natural Gas-Based Energy Services Seminar: Business Development Tools

Prepared By:

NEXANT INC
A BECHTEL TECHNOLOGY & CONSULTING COMPANY

Under Contract To:
**United States Agency for International Development**
LAG-I-00-98-0006-00 Task 805
Egyptian Environmental Policy Program

**23865-805-0016**

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**Natural Gas Energy Services Seminar: Business Development Tools**
**June 16, 2001 at the Meridien Hotel**

| | |
|---|---|
| 9:00 - 9:15 | Opening Remarks |
| 9:15 - 10:15 | Cogeneration Basics and Principles |
| 10:15 - 10:30 | Break |
| 10:30 - 11:30 | Energy Auditing for Natural Gas-Based Energy Services Projects (Review of Energy Audit Survey) |
| 11:30 - 11:45 | Break |
| 11:45 - 12:45 | Financial Modeling and Project Evaluation |
| 12:45 - 2:00 | Lunch |
| 2:00 - 2:30 | Case Study Overview (Review of 2 Project Examples) |
| 2:30 - 3:30 | Working Group Session: Group Analysis of Case Studies Using the Financial Model Screening Tool |
| 3:30 - 3:45 | Break |
| 3:45 - 4:30 | Review of Case Study Scenario Analysis Results |
| 4:30 - 5:00 | Closing Remarks |

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Presentation To:

NATGAS Company

Cairo, Egypt

June 16, 2001

# Cogeneration
## Basics & Principles

Presented by:

NEXANT

A BECHTEL TECHNOLOGY AND CONSULTING COMPANY

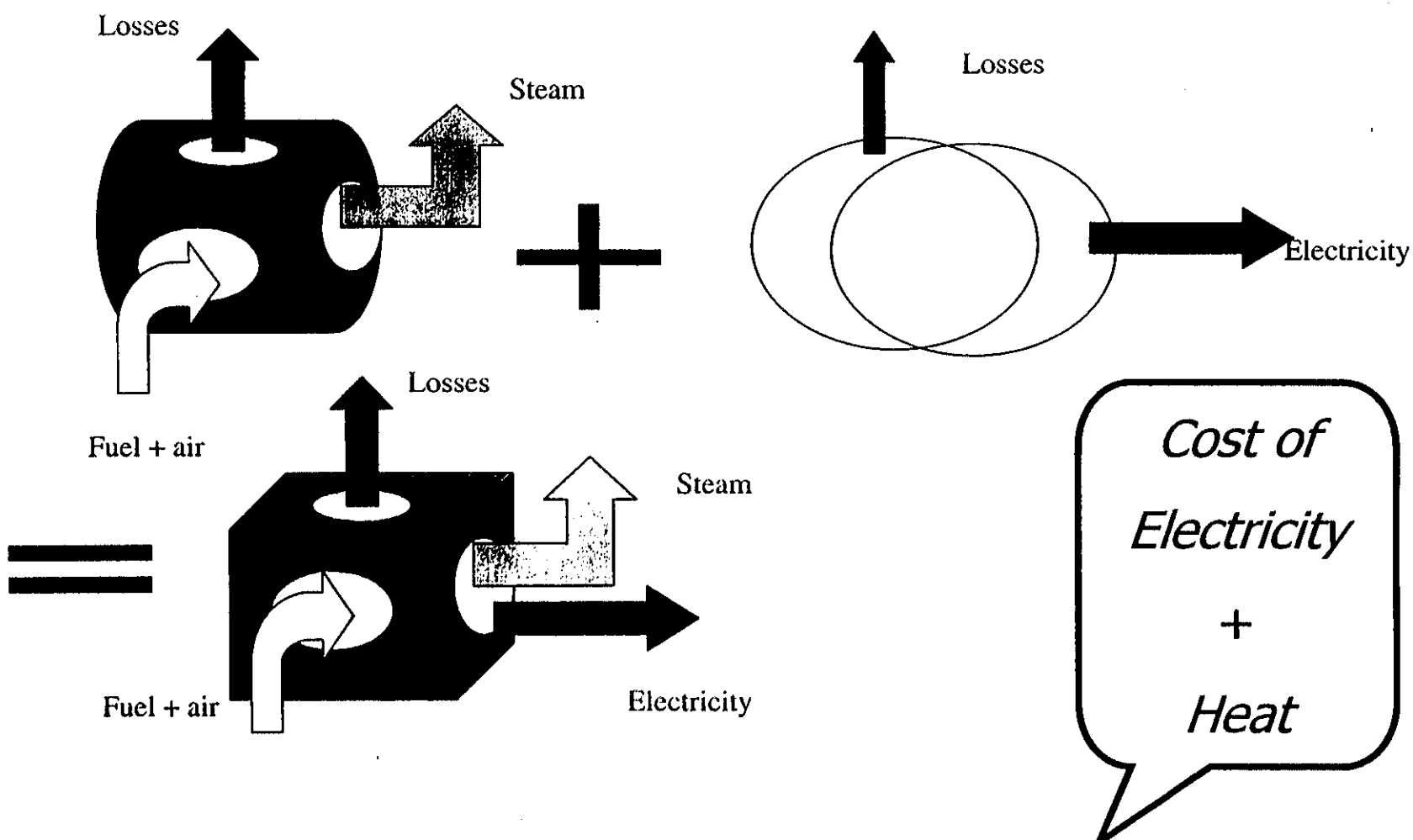
# Presentation Outline

- What is cogeneration
- Benefits of cogeneration
- When to consider using cogeneration
- Key definitions
- Cogeneration technology
- Criteria for selection of cogeneration
- Current Cogeneration activities

# 1. What Is Cogeneration?

Cogeneration *is the simultaneous generation of usable heat and power, usually electricity, in a single process from the same fuel.*

# Cogeneration Vs Conventional System

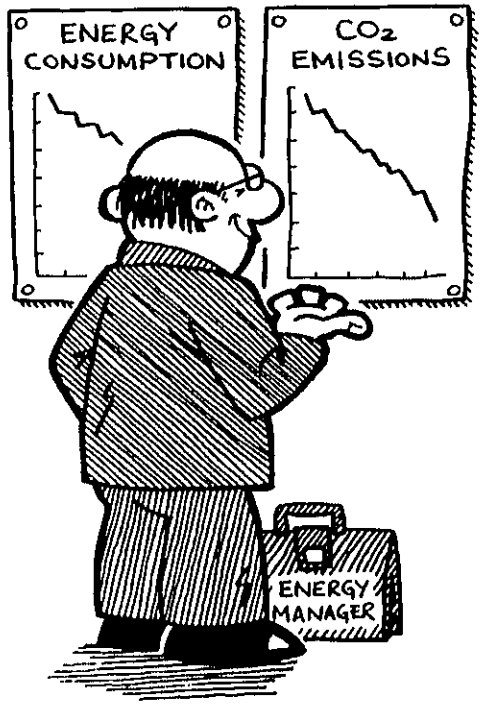


# 2. Benefits of Cogeneration

- Energy efficient
- Cogeneration system efficiency can reach up to 80%-90%.

- Economically advantageous
- Reduction in kWh and heat costs

- Environmentally beneficial
- Reduction in air emissions



# Gas Emissions

| Fuel | Ton of CO2 | Ton of SOx | Ton of Nox |
|---|---|---|---|
| 1 ton of Mazout | 3.22 | 0.08 | 0.004 |
| 1 ton of Solar | 3.22 | 0.04 | 0.004 |
| 1 ton of LPG | 3.02 | nil | nil |

# Emissions For gas fired cogen

| Typical emissions from gas engines | | | | |
|---|---|---|---|---|
| | $CO^2$ (g/kWh) | Nox (g/kWh) | CO (g/kWh) | $SO^2$ (g/kWh) |
| NG firing | 600_700 | 2_10 | 1_2 | nil |
| | | | | |
| NG firing | 700_800 | 0.2_0.5 | 0.1 | nil |

# 3. When to Consider Using Cogeneration

- ✓ Changes to a customer's facility
- ✓ Designing a new plant or plant expansion
- ✓ Installing new boiler plant

- ✓ Customer demand for electricity & heat
- ✓ Electricity & heat demands coincides
- ✓ High energy cost

# 4.Key Definitions
## Customer Profile

- Demand, maximum demand, demand profile: the rate at which energy is required, expressed in kW or MW. It is usually related to a time period. Maximum demand is the highest 15 minutes-average demand which electricity is required during a year. A graph of demand rate over a typical day, is the demand profile.
- Ton/hr: is the rate of steam production.
- Heat quality: A classification of heat source or requirement according to temperature. Up to 90$^0$C would generally be classed low grade. Typically, medium grade would be about 90 to 150$^0$C and high grade greater than 150$^0$C.
- Load factor: the ratio of average demand to the maximum demand.
- Thermal to electrical ratio (T/E): the ratio between the amount of heat energy to electrical energy.

# Important Equation

- $$T/E = \frac{\text{plant annual thermal energy use (kJ)}}{\text{Annual electricity use (kWh)} * 3600 \text{ kJ/kWh}}$$

# Key definitions - Cogeneration System

Average System cost: $/kW

Heat Rate: ratio of the heat energy used to produce electrical energy (kJ/kWh)

Diesel Engine: takes its name from the famous German engineer Rudolf Diesel. A generic term for compression-ignition reciprocating engines, for all fuels

Compression-ignition : it is a reciprocating engines whereby fuel is injected after compression of the air and is ignited by the increased temperature caused by compression.

Spark-ignition: A reciprocating engine which utilizes an electrical spark to ignite the compressed air/fuel mixture in the cylinders.

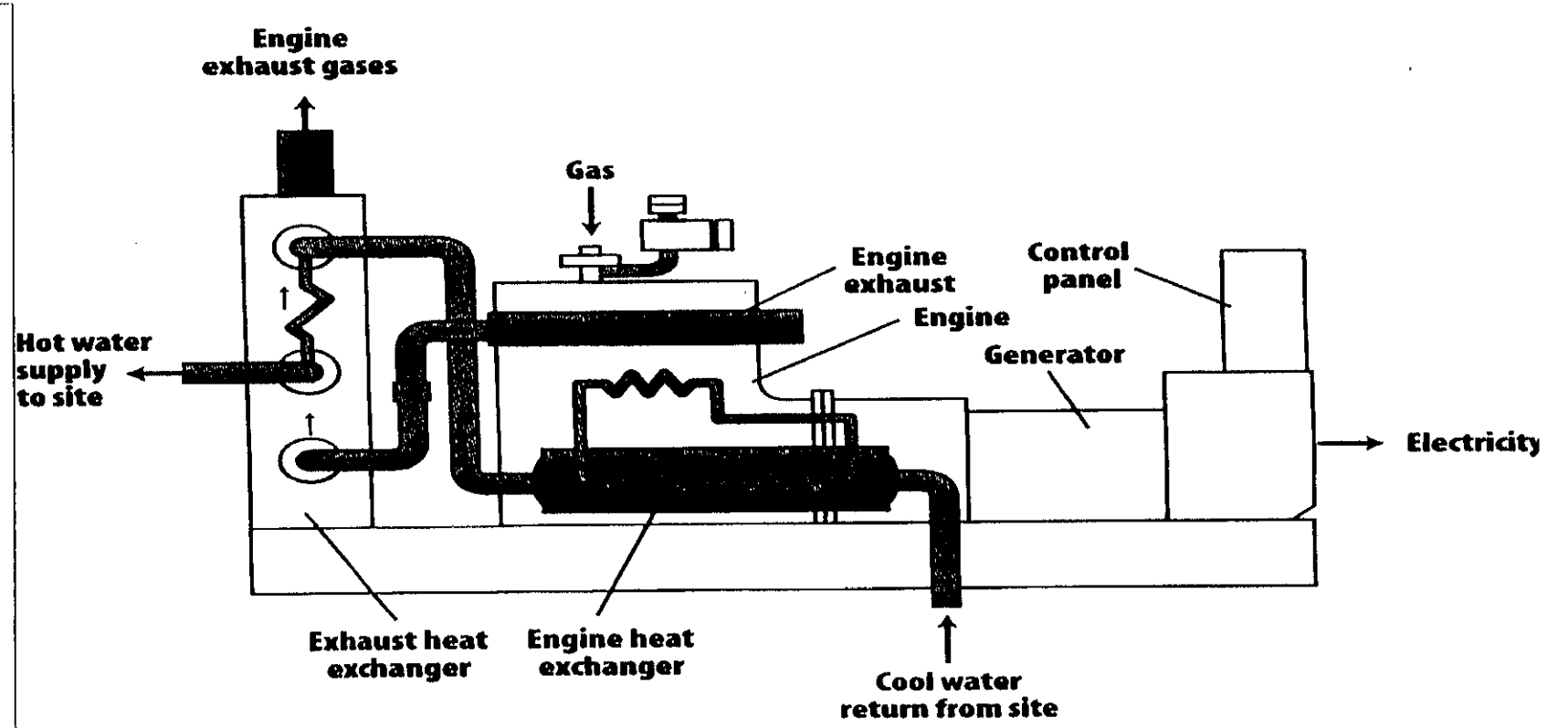
# 5. Cogeneration Technology

(Prime Movers)

- Small/medium scale cogeneration system
- Reciprocating engines (RE)
- Gas turbines (GT)

- Large scale cogeneration system
- Steam turbines
- Combined cycle

# Typical Cogeneration Packaged Unit



# Main Characteristics of RE

- Heat to power ratio: 0.8:1 to 2:1
- Heat Grade: 80 to 120C
- Size : 0.5 MW to 15 MW
- Cost : 400 to 500 $/kW
- Availability: 85% - 92%.
- Exhaust heat: high grade up to 400C. (500C)
- Other op c/c: Moderate lub. oil consumption
- Speed : low speed less maintenance

## RE/ Compression-ignition (diesel)

- Fuel - Solar, Mazout, NG
- Shaft efficiency ranges 35% - 45%.
- Cooling system temp. about 85C.

## RE/ Spark-ignition

- Fuel - NG, Bio (clean gases)
- Generally lower capital cost per kWe
- Lower shaft efficiency up to 35%.
- Cooling system temp. 70-80C.

# RE For & Against

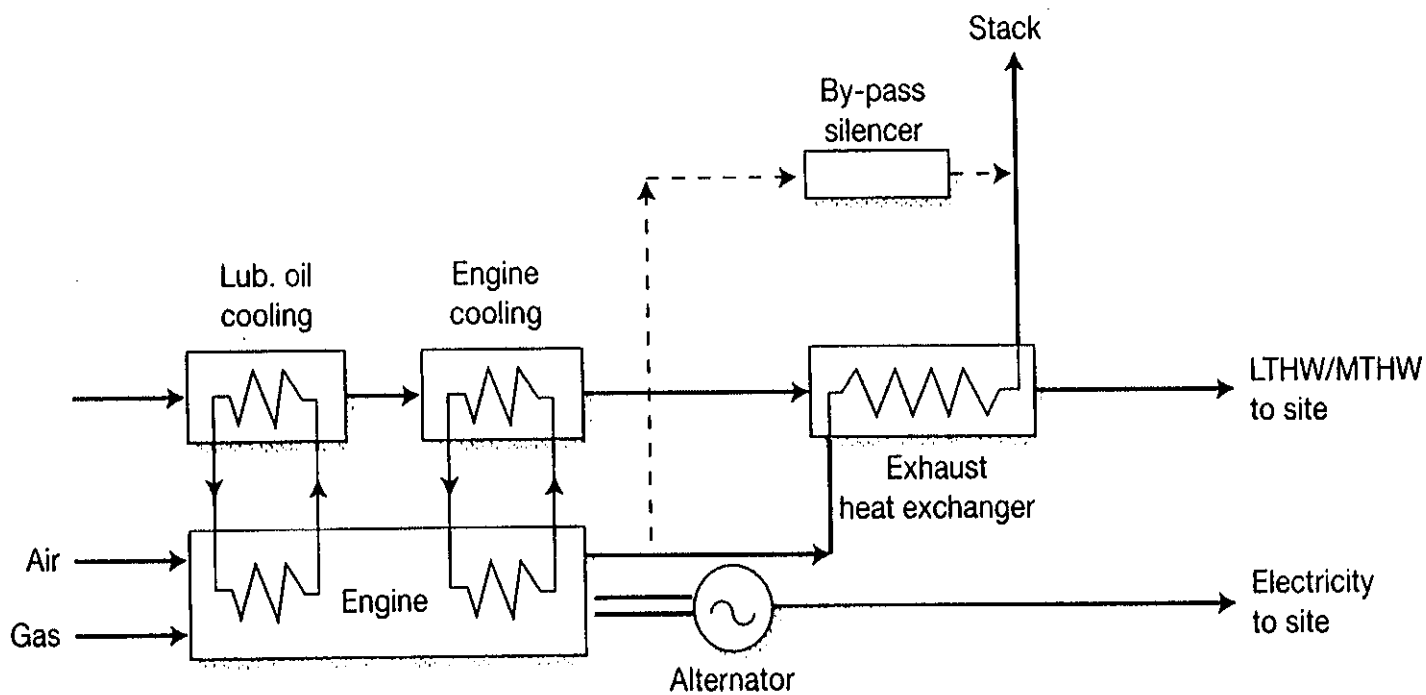
## For

- ✓ High power efficiency, achievable over a wide load range; &
- ✓ Wide range of unit sizes.

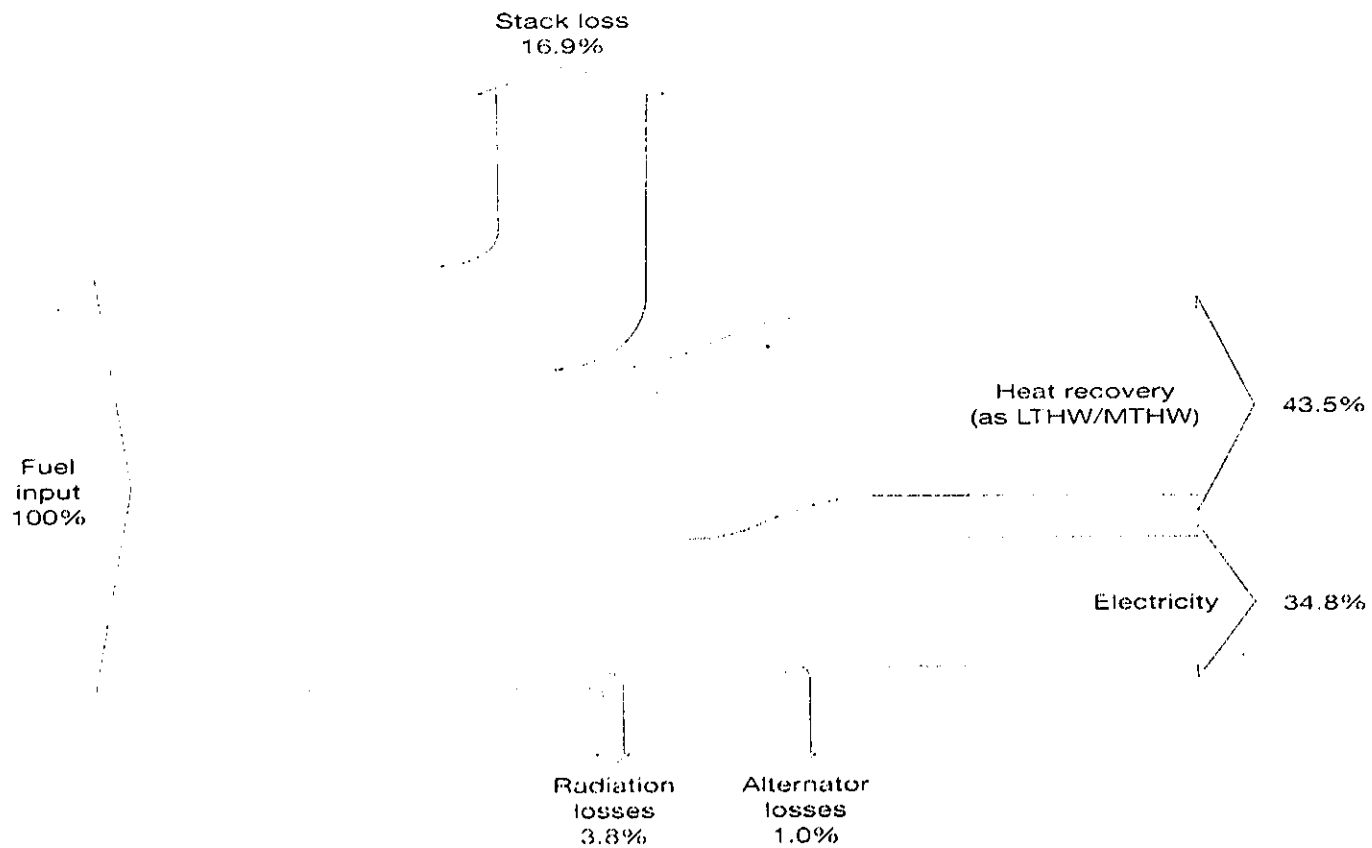
## Against

- ✓ Must be cooled, even if the heat recovered is not reusable;
- ✓ A large proportion of the heat output is low or medium grade heat from the jacket & lubrication oil cooling; &
- ✓ Low power to weight ratio and output of balance forces requiring substantial foundation.

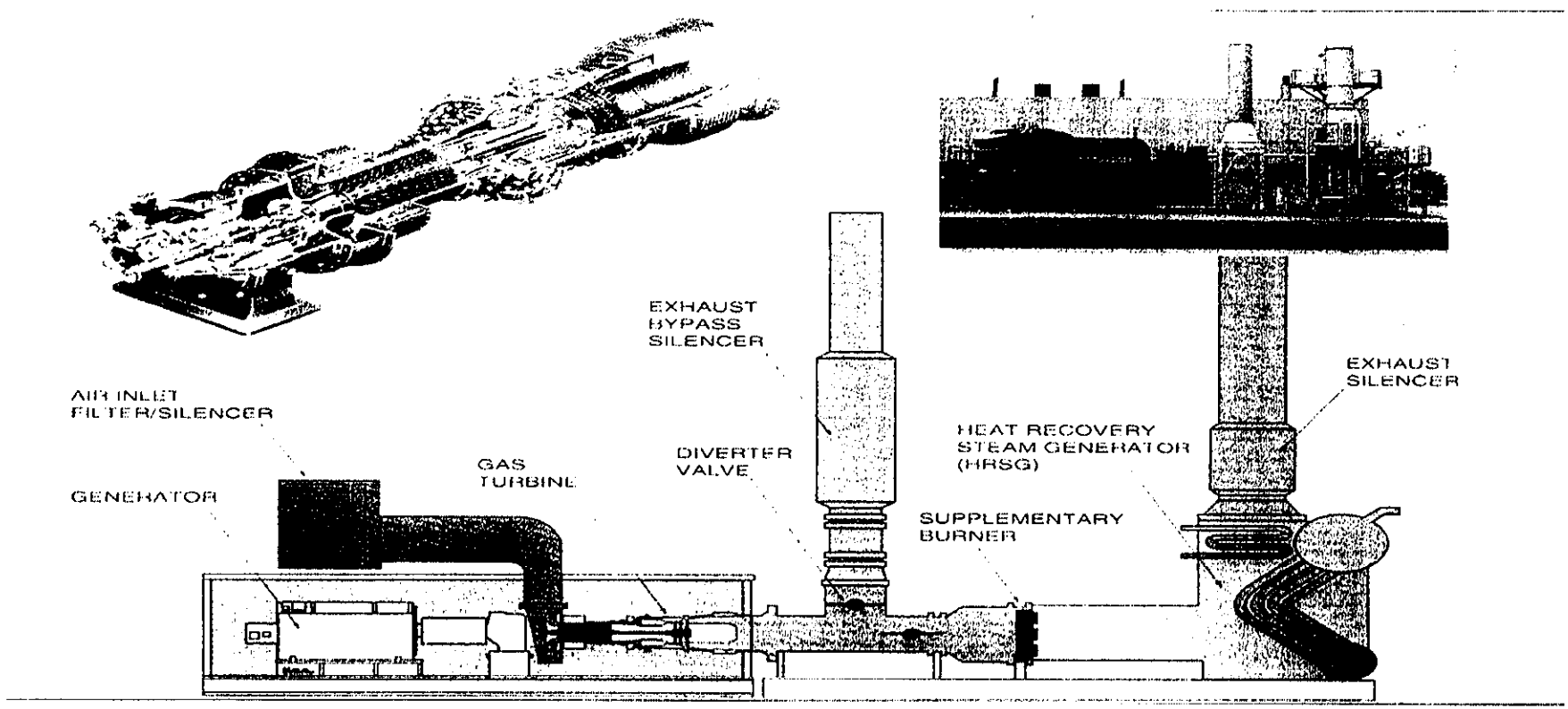
# Spark Ignition - cogeneration



# Spark Ignition - Energy Balance



# Gas Turbine (GT)



# Main Characteristics of GT

- Heat to power ratio: 1.2:1 to 4:1
- Available process Heat: 120 to 500 C
- Size : 0.5 MW to hundreds MW
- Cost : 500 to 600 $/kW
- Availability: 94% to 98%
- Exhaust heat: high grade up to 500C.
- Other op c/c: Moderate lub. oil consumption
- Speed : higher speed

# GT For & Against

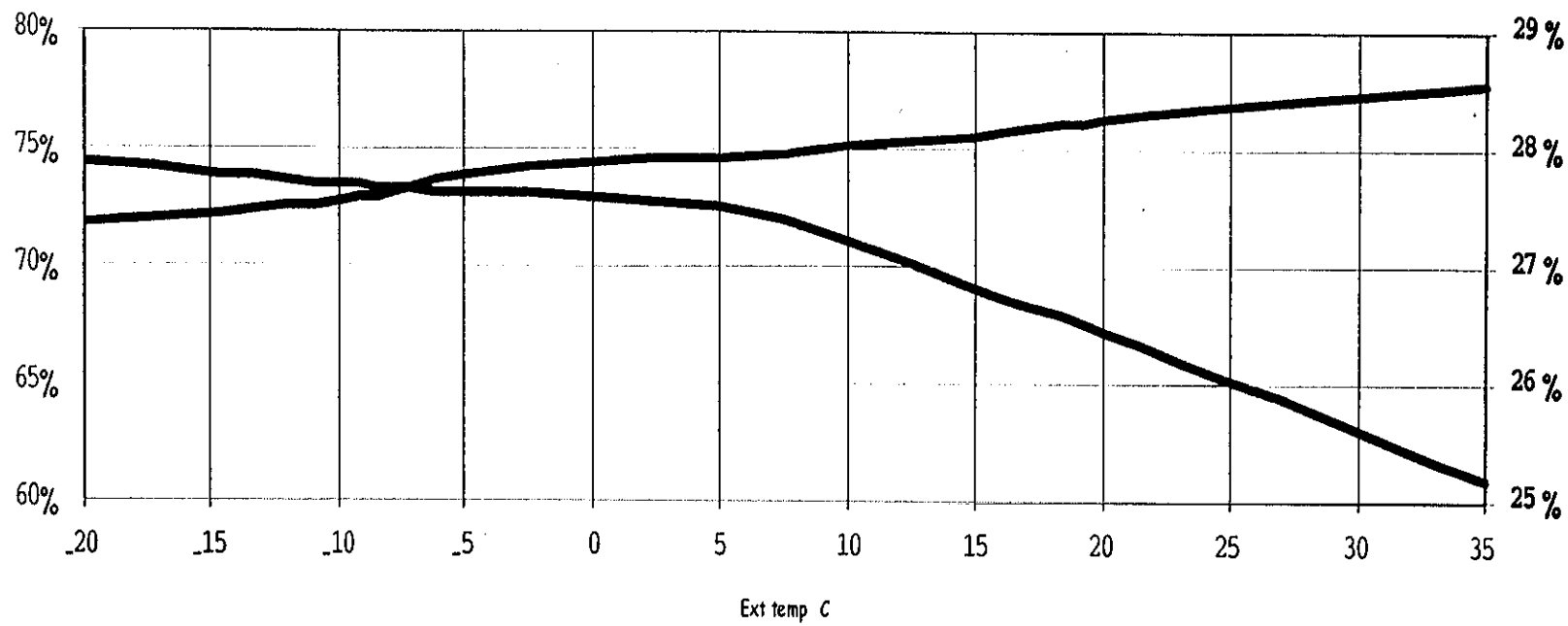
## For

- ✓ Most widely prime mover.
- ✓ Smaller in size.
- ✓ Higher reliability & easy to maintain.
- ✓ High-grade heat
- ✓ High power:weight ratio
- ✓ Low cooling water req.
- ✓ Immediate power.

## Against

- ✓ Limited no of unit sizes
- ✓ Lower mechanical eff. Than rec. engines
- ✓ High pressure NG supply
- ✓ Poor eff. At low loading

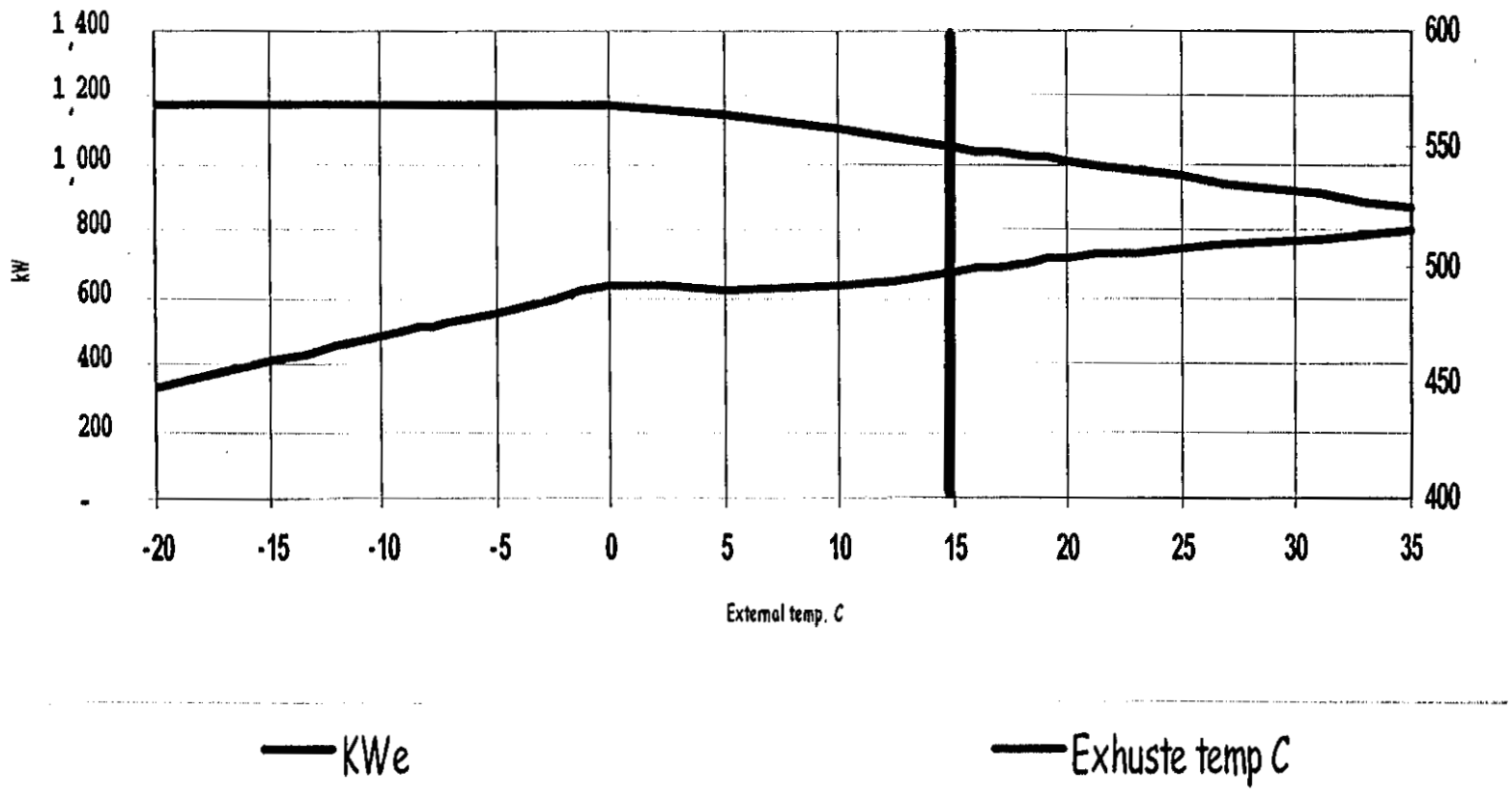
# GT efficiency




overall eff. %

Elec eff. %

# GT Electrical output & Exhuste Temp. Vs Amb. Temp



# 6.Criteria for Selection of Cogeneration

- Customer operation needs
  - Thermal to electrical ratio
  - Customer energy profile

- Cogeneration system C/C
  - Heat rate
  - Reliability & availability
  - Cost

# Customer Operation Needs

- Thermal to electrical ratio

This should be calculated based on field measurements

- Customer energy profile

Heat and electricity profile should be developed

# Cogeneration System C/C

- Heat rate.

  This is a very important when comparing different alternatives.

- Reliability & availability.

  These two factors are extremely important. Cogeneration system must operate over extended periods and in many cases continuously, in order to be economic.

$$\text{Reliability \%} = \frac{T - (S + U)}{T - s} \times 100$$

$$\text{Availability \%} = \frac{T - (S + U)}{T} \times 100$$

T : time period when plant is required to be in service

S : scheduled maintenance shutdown

U : unscheduled shutdown

# 7. Current Cogeneration activities

- *Interconnection requirements for parallel grid connections with small producers;*
- *Infrastructure for electricity companies to purchase electricity from small producers.*

Presentation To:

NATGAS Company

Cairo, Egypt

June 16, 2001

# Energy Auditing for Natural Gas-based Energy Service Projects

Presented by:

NEXANT

A BECHTEL TECHNOLOGY AND CONSULTING COMPANY

# Presentation Outline

1. Why is Energy auditing important?
2. Energy Audit & Project Evaluation Cycle
3. Energy Audit Survey Tool
4. Energy Cost & Key Calculations
5. Energy Services Report

# 1. Why is Energy Auditing Important?

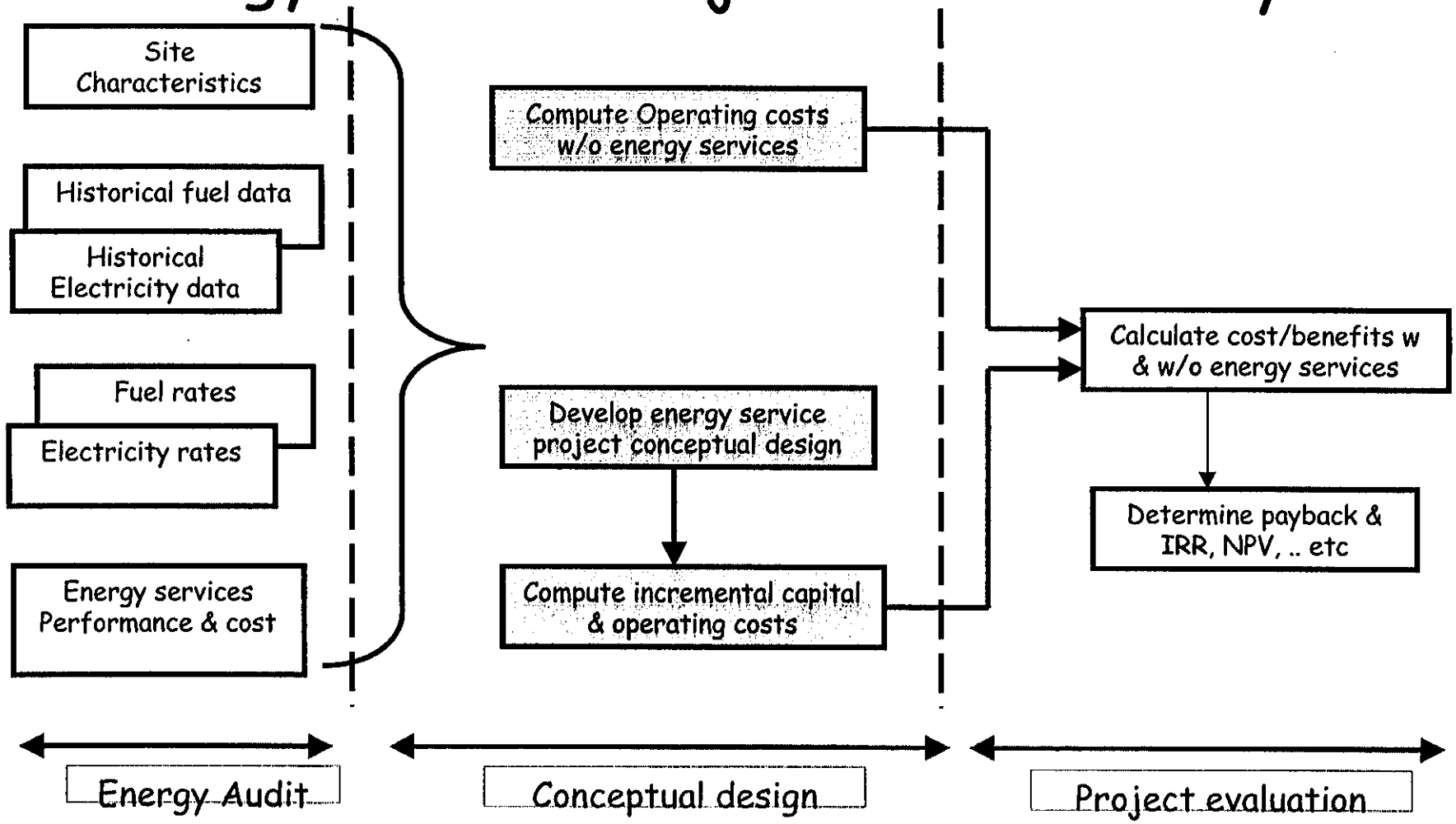
## 1. For A Customer

* *Energy can be a large part of a company's operating cost.*
* *Identification of Savings opportunities.*

## 2. For an ESCO

* *Project identification*
* *Screening of projects*
* *Facilitates discussion with customers*
* *Technical & Financial analysis*
* *Measurements & Verifications*

# 2. Energy Audit & Project Evaluation Cycle



# 3. Energy Audit Survey Tool

Energy audit was designed to collect the following information:

- Technical and engineering data
- Economic and financial data
- Customer preferences on project development models

# COMPANY IDENTIFICATION

NAME _____

ADDRESS _____

_____

_____

Phone Number: _____

Fax Number: _____

e-mail: _____

| CONTACTS: | 1) | 2) | 3) |
|---|---|---|---|
| Name | | | |
| Title | | | |
| Ph. # | | | |
| Fax # | | | |
| e-mail | | | |

## PRODUCTION

| PRODUCTS | 1) _____ | 2) _____ | 3) _____ | 4) _____ |
|---|---|---|---|---|
| Annual Production | _____ | _____ | _____ | _____ |
| Average Daily Production | _____ | _____ | _____ | _____ |

Briefly describe the process used to produce the final product _____

_____

_____

_____

## OPERATION

Shifts per day _____

Working days per week _____

Working days per year _____

Seasonal variations _____

_____

_____

Do you program down time for maintenance? When and for how long?

_____

_____

_____



35

## ENERGY USE

| Source | Annual Consumption | Daily Max Consumption | Daily Min Consumption | Price |
|---|---|---|---|---|
| Mazout | | | | |
| Solar | | | | |
| Natural Gas | | | | |
| LPG | | | | |
| Electricity (kWh) | | | | |

Are there separate power meters for different sections of the plant? please take meters readings

_____

What is the plant's Peak and average Electricity Demand (in kW)? Daily _____ Annual _____

### Steam Requirement

average _____ tons/hr @ _____ psi

max _____ tons/hr @ _____ psi

min _____ tons/hr @ _____ psi

What percentage of your total production cost is represented by energy cost? _____ %

List the main energy consuming equipment and systems, in order of magnitude:

| Equipment/System | Demand (as % of plant total) | Daily Time of Operation (hours) |
|---|---|---|
| 1) _____ | _____ | _____ |
| 2) _____ | _____ | _____ |
| 3) _____ | _____ | _____ |
| 4) _____ | _____ | _____ |

### Supporting Documentation (request that the customer provide you with this information)

1) Copy of the plant's electricity and fuel bill for the last 12 months
2) Copy of the electrical single line diagram for the plant

# PRODUCTION EQUIPMENT DATA SHEET (major equipment)

Equipment Type: _____

Describe role in the production process: _____

_____

_____

_____

_____

Production Rate (or Rating): Average _____ Max _____ Min _____

Energy source: _____ Consumption Rate: Average _____ Max _____ Min _____

Maker: _____ Age: _____ Number: _____

Type of operation: Continuous _____ Batch _____ Stand-by _____

Other characteristics:

- Number of Burners _____ Type _____ (N/A _____)
- Production Temperature _____ Centigrade (N/A _____)
- Automatic Combustion Control system Y ____ N ____ (N/A _____)
- Variable speed drive Y ____ N ____ (N/A _____)
- Replacement being considered Y ____ N ____ (N/A _____)

Additional Information: _____

_____

_____

_____

# SELF GENERATION

Does the plant use a stand-by generator for electricity? (If NO, go to the next page)

If YES, what percent of electricity demand does the Plant generate internally? ____ %

Please fill out the following information for each generator unit:

| | | | | | |
|---|---|---|---|---|---|
| Capacity in kW | _____ | Capacity in kW | _____ | Capacity in kW | _____ |
| Manufacturer | _____ | Manufacturer | _____ | Manufacturer | _____ |
| Year of Production | _____ | Year of Production | _____ | Year of Production | _____ |
| Fuel type | _____ | Fuel type | _____ | Fuel type | _____ |

What is the operating schedule of the plant's generators?

## Supporting Documentation(request that the customer provide you with this information)

1) A single line diagram showing the connection between the generator and the plant's electrical system

2) Generators technical catalogue

## FUEL SWITCHING ISSUES

What improvement, if any, would switching to a cleaner fuel generate in terms of production?

What, if any, potential problems does the Plant's Management perceive in switching to natural gas ?

## WASTE HEAT RECOVERY POTENTIAL

Is there a source of waste heat in the Plant? Y ____ N ____

Describe and quantify: _____

_____

_____

_____

_____

_____

Is waste heat being recovered presently ? Y ____ N ____

Is condensate being recirculated? Y ____ N ____

Would there be use for (additional) recovered waste heat? Y ____ N ____

Describe and quantify: _____

_____

_____

_____

_____

_____

_____

_____

ENERGY SERVICES BUSINESS ISSUES

- Would environmental compliance be a major driver for your Company to invest in an energy services project?

_____

_____

_____

- Please indicate what you perceive as the major obstacles to implementing energy services projects (operational, technical, financial, etc

_____

_____

_____

- How is your company most likely to finance an investment in energy services?

_____

_____

_____

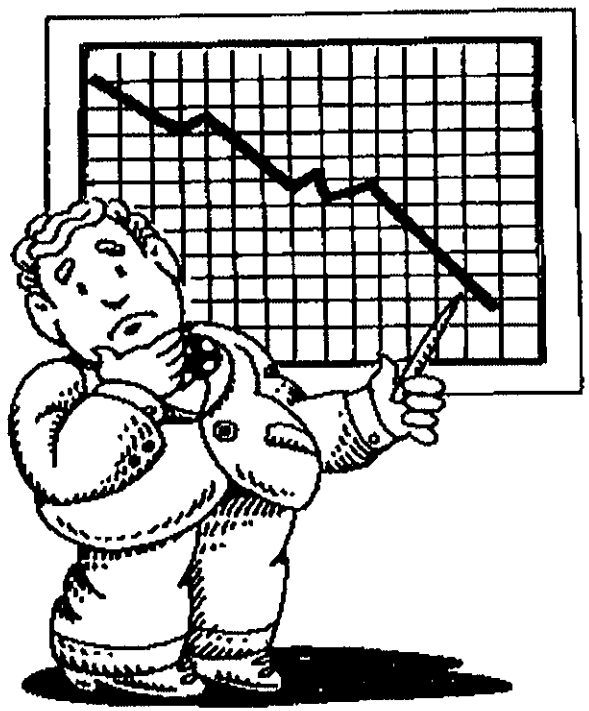
ENERGY SERVICES BUSINESS ISSUES (continued)

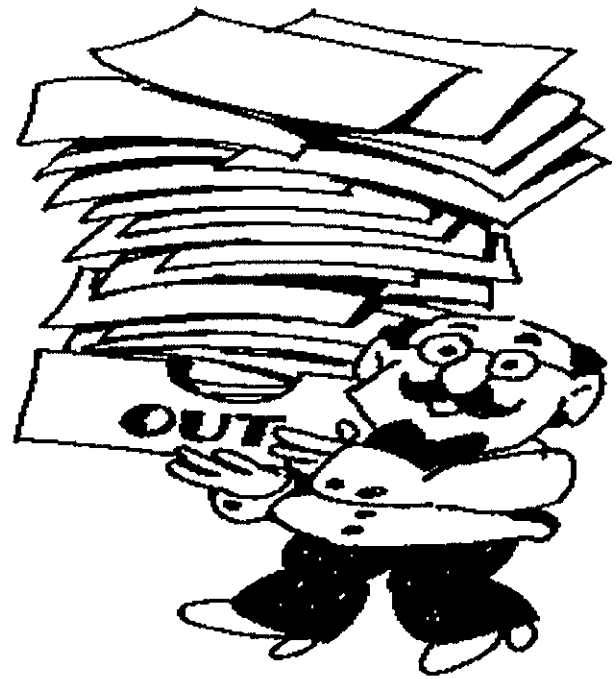
- Would your company consider purchasing electricity and/or steam from a private supplier of energy services?

- Would your company be more likely to invest in a project if a private energy services company provided you with a performance guarai

- Would your company be more likely to invest in a project if an energy services company provided you with a performance guarantee ar

# *The Key*
# Monitoring & Developing Database





# Energy Cost & Key Calculations

## Fuel cost

| | | |
|---|---|---|
| ■ Mazout | 185 LE/ton | 4.1 LE/GJ |
| ■ Solar | 463 LE/ton | 10.6 LE/GJ |
| ■ LPG | 320 LE/ton | 6.7 LE/GJ |
| ■ NG | 0.14 LE/m3 | 3.8 LE/GJ |

# Fuel Cost & Characteristics

| Fuel & Lub oil | LE/liter | LE/m$^3$ | LE/ton | kJ/kg | GJ/m$^3$ | kWh/m$^3$ | kWh/kg | LE/MBTU | LE/GJ | LE/kWh |
|---|---|---|---|---|---|---|---|---|---|---|
| Solar (Fuel # 2) | 0.4000 | 400.000 | 462.963 | 43,700 | 37.757 | 10,488 | 12.14 | 11.177 | 10.59 | 0.038 |
| LPG | 0.0007 | 0.694 | 320.000 | 48,000 | 0.104 | 28.92 | 13.33 | 7.034 | 6.67 | 0.024 |
| Mazout (Fuel # 6) | 0.1745 | 174.548 | 185.000 | 44,700 | 42.174 | 11,715 | 12.42 | 4.367 | 4.14 | 0.015 |
| NG | 0.0001 | 0.141 | 158.748 | 41,657 | 0.037 | 10.28 | 11.57 | 4.021 | 3.81 | 0.014 |

## Conversion factors for energy (multiply by)

| | BTU | Joule | kWh | therm |
|---|---|---|---|---|
| BTU | 1 | 1.06E+03 | 2.93E-04 | 1.00E-05 |
| Joule | 9.48E-04 | 1 | 2.78E-07 | 9.48E-09 |
| kWh | 3.41E+03 | 3.60E+06 | 1 | 3.41E-02 |
| therm | 1.00E+05 | 1.06E+08 | 29.31 | 1 |

| | | | |
|---|---|---|---|
| k | 10^3 | T | 10^12 |
| M | 10^6 | P | 10^15 |
| G | 10^9 | E | 10^18 |

# Electricity

| | |
|---|---|
| **1-VERY HIGH VOLTAGE** | 6.8 PT/kWh |
| **2- HIGH VOLTAGE** | 11.34 PT/kWh |

More than 105% demand penalty 8 LE/kW

## 5- MEDUIM & LOW VOLTAGE

### 5-1More than 500 kW

| | |
|---|---|
| Demand charge | 7.3 LE/kW/month |
| Energy charge | 15.35 Pt/kWh |

### 5-2 Less than 500 kW

| | |
|---|---|
| Agriculture | 7 PT/kWh |
| Other purposes | 18 PT/kWh |

# 5. Energy Services Report

- Brief technical description of project
- Summary of potential savings & costs
- Preliminary results of the technical analysis of energy audit data
- Marketing document

Presentation To:
**Natgas Company:**
Cairo, Egypt
June 16, 2001

# Energy Services Seminar: Financial Modeling and Project Evaluation

Presented by:

NEXANT
A BECHTEL TECHNOLOGY AND CONSULTING COMPANY

**June 2001**

# Presentation Objectives

- Discuss the role that financial modeling plays in evaluating and developing energy service projects
- Provide an overview of investment decision criteria that are calculated by using a financial model
- Outline the characteristics of a financial model designed to evaluate natural gas-based energy service projects

# Financial Models are a Tool Used to Conduct Multiple Scenario Analysis of Projects

- Financial models are designed to enable a user to easily change technical, economic, and financial data and assumptions
- Energy service companies can use financial models to rank the profitability of different investment options
- Financial models can calculate key investment decision criteria, including:
  - Net Present Value
  - Internal Rate of Return
  - Simple Payback Period

# Financial Modeling Can Play a Key Role in the Development of Energy Service Projects

- Project Identification: assessing the technical and financial feasibility of a project
- Sales & Marketing: calculating the economic benefits of a project for an industrial/commercial customer
- Project Design: determining the impact on a project's performance from using different types of technology and equipment
- Contract Negotiation: evaluating the terms of an energy services agreement (for example, % split of project savings with a customer)
- Project Financing: preparing a cash flow statement that illustrates a project's ability to make debt service payments

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52

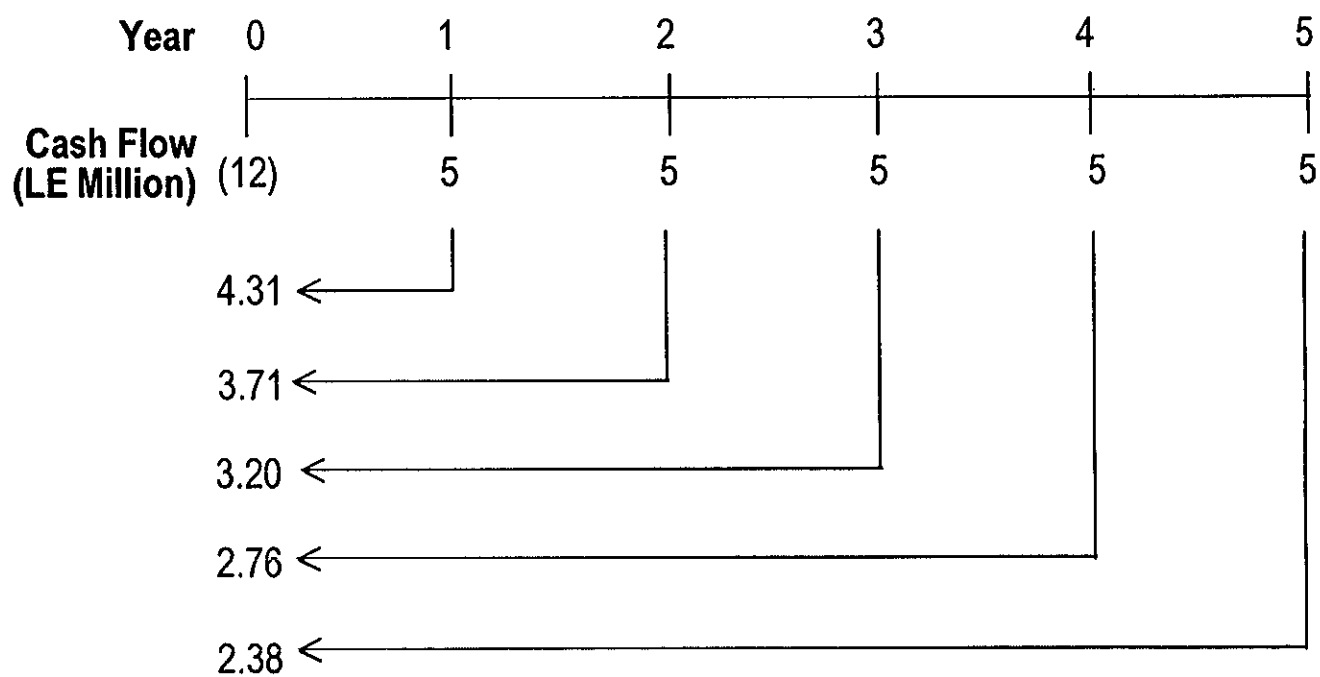
*Investment Criteria*

# 1. Net Present Value (NPV)

- Definition: The NPV for an investment equals the present value (PV) of cash inflows minus the PV of cash outflows over the project's life
- Calculation: NPV = PV of cash Inflows - PV of cash outflows
- Decision Rule:
  - Accept projects with a NPV > 0
  - Reject projects with a NPV < 0
  - An investment is marginal with a NPV = 0
- Advantages: Allows for a direct comparison of different projects by incorporating the time value of money into investment decisions
- Disadvantages: NPV estimates are only as accurate as the discount rate and cash flow estimates used to calculate the PV of a project

# NPV Calculation Example

- NPV cash flow diagram for a LE 12 million investment that earns LE 5 million per year over a 5 year period at a 16% discount rate




**NPV = 4.36 Million**

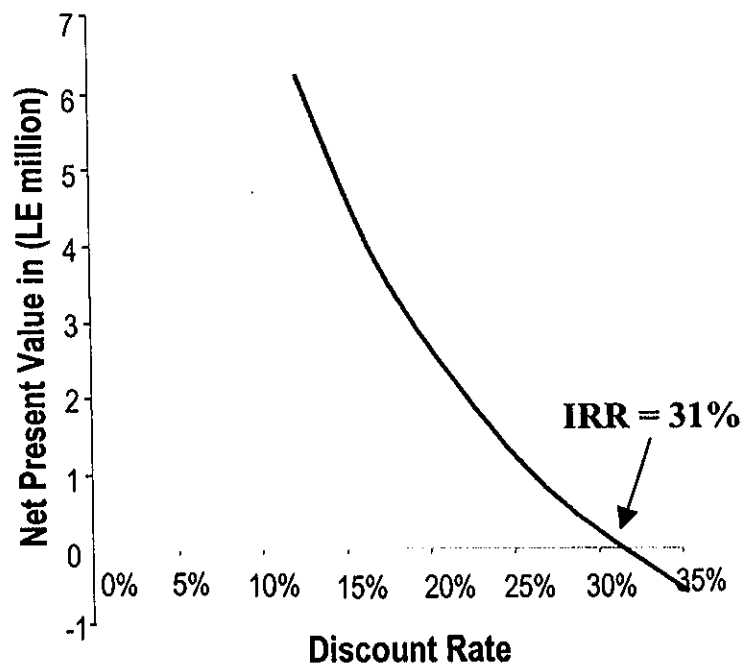
## Investment Criteria

# 2. Internal Rate of Return (IRR)

- Definition: An investment's internal rate of return (IRR) is equal to the discount rate at which the investment's NPV equals zero
- Calculation: An iterative process is used to determine the discount rate that generates an NPV equal to zero
- Decision Rule:
  - Accept projects with an IRR > k (where k = the cost of capital)
  - Reject projects with an IRR < k
  - An investment is marginal with a IRR = k
- Advantages: The IRR can be easily compared to a company's cost of capital. It represents the break-even point on an investment
- Disadvantages: For mutually exclusive investments, IRR can provide an inaccurate ranking of projects

# IRR Calculation Example

- The IRR for a LE 12 million investment that earns LE 5 million per year over a 5 year period = 31%
- Graphing the NPV vs. the discount rate shows the break-even point (see the cross-over point on the graph at 31%)



## Investment Criteria

# 3. Simple Payback Period

- Definition: The payback period is the number of years required to recover the investment in a project
- Calculation: Payback Period = Initial investment/Annual cash flow
- Decision Rule:
  - Accept projects that have a payback period that is within an acceptable period of time (for example, 3-4 years)
  - Reject projects with a payback period greater than the acceptable time period
- Advantages: The payback period can be easily conveyed to potential investors and/or customers
- Disadvantages: The payback period does not incorporate the time value of money

# Simple Payback Period Calculation

- The simple payback period for a LE 12 million investment that has an annual cash flow of LE 5 million per year

$$\frac{\text{LE 12 million (Initial Investment)}}{\text{LE 5 million (Annual Cash Flow)}} = \text{2.4 Years}$$



58

# "NewCo" Financial Model Characteristics

- A natural gas-focused energy services model that includes the following general project inputs:
  - Economic (e.g., capital costs, O&M costs, and fuel prices)
  - Financial (e.g., capital structure and loan terms)
  - Engineering (e.g., cogeneration plant characteristics)
- Energy services agreement inputs, including:
  - Percentage of annual project savings shared with the customer
  - Length of contract with the customer
- Project-specific results are calculated in the model: investment criteria, natural gas use, and environmental benefits

# NewCo Financial Model: Outline

***Input Sheet***

- Economic and Technical Assumptions
- Project Costs and Savings Estimates
- Customer Energy Profile
- Energy Service Agreement Assumptions

→

***Supporting Analysis Sheets***

- Project Revenues
- Project Expenses
- Financing Sheet
- Interest During Construction
- Escalation Sheet

↓

***Project Cash Flow Statement***

- Summary of Project Cash Flows
- NewCo Perspective
- Customer Perspective

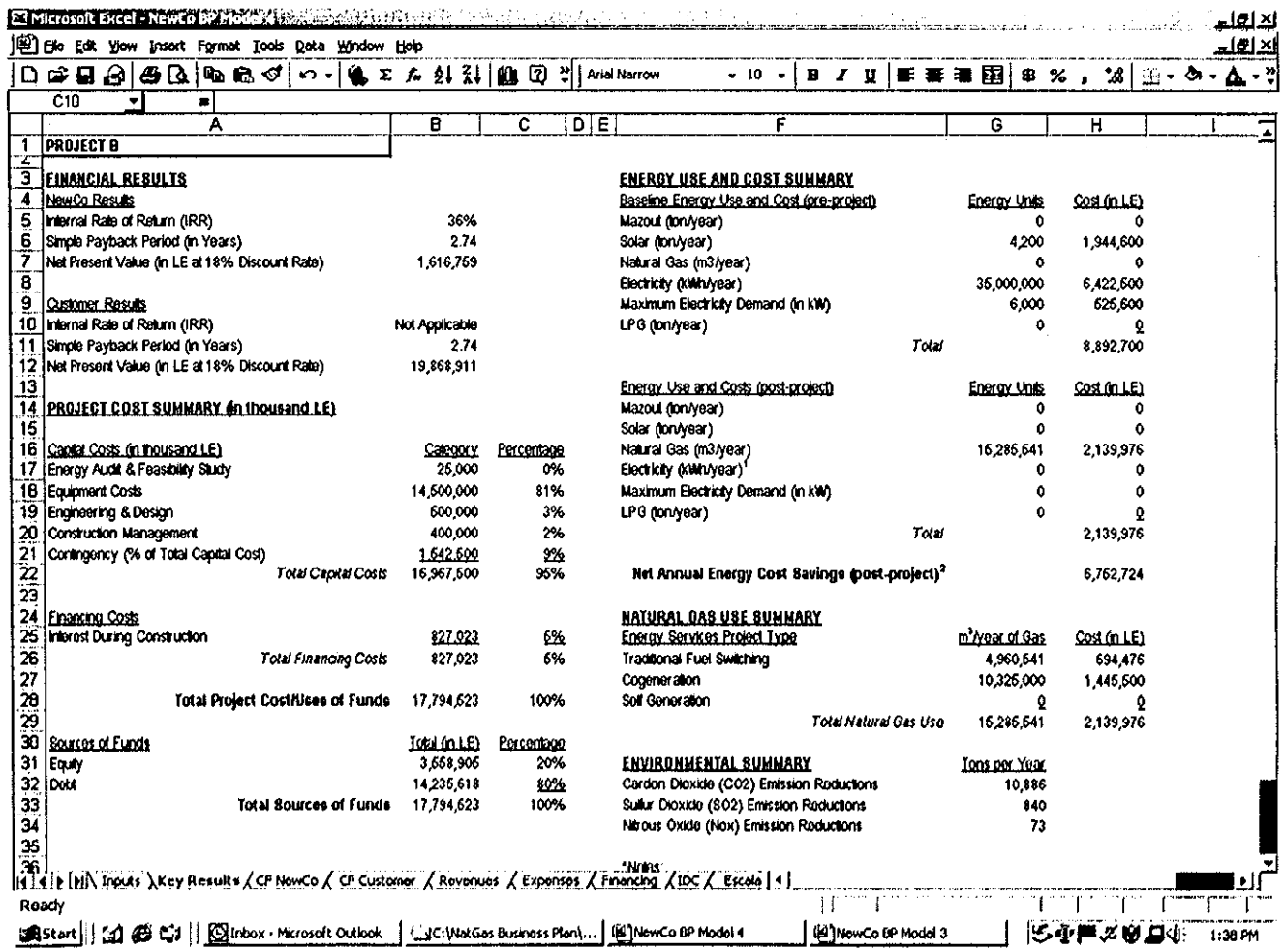
↓

***Key Project Results***

- Financial Results (NewCo and Customer)
- Project Cost Summary
- Natural Gas Consumption
- Environmental Summary

# Financial Model Format

- The model contains nine worksheets, including a Key Results sheet that summarizes the overall performance of a project



| | A | B | C |
|---|---|---|---|
| 1 | PROJECT B | | |
| 3 | FINANCIAL RESULTS | | |
| 4 | NewCo Results | | |
| 5 | Internal Rate of Return (IRR) | 36% | |
| 6 | Simple Payback Period (in Years) | 2.74 | |
| 7 | Net Present Value (in LE at 18% Discount Rate) | 1,616,759 | |
| 8 | | | |
| 9 | Customer Results | | |
| 10 | Internal Rate of Return (IRR) | Not Applicable | |
| 11 | Simple Payback Period (in Years) | 2.74 | |
| 12 | Net Present Value (in LE at 18% Discount Rate) | 19,868,911 | |
| 13 | | | |
| 14 | PROJECT COST SUMMARY (in thousand LE) | | |
| 15 | | | |
| 16 | Capital Costs (in thousand LE) | Category | Percentage |
| 17 | Energy Audit & Feasibility Study | 25,000 | 0% |
| 18 | Equipment Costs | 14,500,000 | 81% |
| 19 | Engineering & Design | 600,000 | 3% |
| 20 | Construction Management | 400,000 | 2% |
| 21 | Contingency (% of Total Capital Cost) | 1,642,500 | 9% |
| 22 | *Total Capital Costs* | 16,967,500 | 95% |
| 23 | | | |
| 24 | Financing Costs | | |
| 25 | Interest During Construction | 827,023 | 5% |
| 26 | *Total Financing Costs* | 827,023 | 5% |
| 27 | | | |
| 28 | Total Project Cost/Uses of Funds | 17,794,523 | 100% |
| 29 | | | |
| 30 | Sources of Funds | Total (in LE) | Percentage |
| 31 | Equity | 3,558,905 | 20% |
| 32 | Debt | 14,235,618 | 80% |
| 33 | Total Sources of Funds | 17,794,523 | 100% |
| 34 | | | |
| 35 | | | |
| 36 | | | |

| | F | G | H |
|---|---|---|---|
| 3 | ENERGY USE AND COST SUMMARY | | |
| 4 | Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
| 5 | Mazout (ton/year) | 0 | 0 |
| 6 | Solar (ton/year) | 4,200 | 1,944,600 |
| 7 | Natural Gas (m3/year) | 0 | 0 |
| 8 | Electricity (kWh/year) | 35,000,000 | 6,422,600 |
| 9 | Maximum Electricity Demand (in kW) | 6,000 | 525,600 |
| 10 | LPG (ton/year) | 0 | 0 |
| 11 | *Total* | | 8,892,700 |
| 13 | Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
| 14 | Mazout (ton/year) | 0 | 0 |
| 15 | Solar (ton/year) | 0 | 0 |
| 16 | Natural Gas (m3/year) | 16,286,641 | 2,139,976 |
| 17 | Electricity (kWh/year)[1] | 0 | 0 |
| 18 | Maximum Electricity Demand (in kW) | 0 | 0 |
| 19 | LPG (ton/year) | 0 | 0 |
| 20 | *Total* | | 2,139,976 |
| 21 | | | |
| 22 | **Net Annual Energy Cost Savings (post-project)[2]** | | 6,752,724 |
| 23 | | | |
| 24 | NATURAL GAS USE SUMMARY | | |
| 25 | Energy Services Project Type | m³/year of Gas | Cost (in LE) |
| 26 | Traditional Fuel Switching | 4,960,641 | 694,476 |
| 27 | Cogeneration | 10,326,000 | 1,445,500 |
| 28 | Self Generation | 0 | 0 |
| 29 | *Total Natural Gas Use* | 16,286,641 | 2,139,976 |
| 30 | | | |
| 31 | ENVIRONMENTAL SUMMARY | Tons per Year | |
| 32 | Carbon Dioxide (CO2) Emission Reductions | 10,886 | |
| 33 | Sulfur Dioxide (SO2) Emission Reductions | 840 | |
| 34 | Nitrous Oxide (Nox) Emission Reductions | 73 | |
| 35 | | | |
| 36 | *Notes* | | |

# Model Use Across Business Functions

- Engineering and Technical: Input of data collected during energy audits and the technical characteristics of specific equipment
- Finance: Based on technical inputs, estimate cash inflows and outflows over the life of a project. Calculate the investment criteria that summarize the economic value of an investment opportunity
- Project Management: Compare the investment criteria results for a potential project to internal company hurdle rates
- Throughout project development, the model will be a tool to facilitate communication and feedback between different business functions

## CASE STUDY #1: PROJECT A
## FUEL SWITCHING INVESTMENT EXAMPLE: FOOD & BEVERAGES INDUSTRY

### Project Background

Based on the results of an initial energy audit conducted by an energy services company (NewCo) at a food & beverage company, there is the potential for a fuel switching project. Specifically, the fuel switching project would involve converting all of the food & beverage company's energy-consuming equipment from Solar (fuel oil #2) to natural gas. The company presently consumes 3,400 tons of Solar per year to operate both boilers and ovens (the company also consumes 4,560,000 kWh/year of electricity). If the company's oil-consuming equipment is converted to natural gas, then the company will consume approximately 4.0 million cubic meters ($m^3$) of natural gas per year. The company operates 7,800 hours per year.

### Equipment

Assuming that natural gas is delivered to the border of the company's factory (at the standard 7 bars of pressure), the equipment that is needed for this fuel switching investment includes a pressure reduction station, piping & valves, and several medium-sized burners.

### Total Investment Cost

The natural gas system for this project must be capable of replacing 3,400 tons of Solar per year (the company's annual fuel oil consumption). Given the factory's current schedule (16 hours per day, 6 days per week), the natural gas system must be capable of delivering 1,000 $m^3$/hour to meet peak demand periods. The estimated construction period for this project is 3 months. The investment cost (in Egyptian Pounds) for this example project includes:

| | |
|---|---|
| Energy Audit & Feasibility Study | 25,000 |
| Equipment Cost | 1,300,000 |
| Engineering & Design | 100,000 |
| Construction Management | 50,000 |
| Contingency | 147,500 |
| Interest During Construction | 34,766 |
| TOTAL | 1,657,266 LE |

### Annual Savings (Project Revenues)

The food & beverage company's annual cost for Solar is LE 1,574,200. If the company switches to natural gas, their annual energy cost will be LE 562,195 (the cost to meet the same level of energy demand using natural gas instead of fuel oil). This translates into an estimated annual energy cost savings of LE 1,012,005 for this project.

### Project Operating Expenses (Non-fuel Costs)

The project will have operation and maintenance (O&M) and monitoring and verification (M&V) costs. It is assumed that the O&M costs for the project are equal to 2% of the company's annual cost of natural gas. The project will also incur some M&V in order to determine the annual savings from the project. In this example, it is assumed that M&V costs are LE 50,000 per year for an initial three year period (the length of NewCo's contract with the customer).

### Energy Services Agreement

It is assumed that the energy services company (NewCo) finances 100% of the total project cost as well provides all of the technical and engineering services required to develop the project. It is also assumed that NewCo guarantees the customer that the project will achieve an agreed upon level of technical and/or economic performance. In return for their technical and

financial services, it is assumed that NewCo will receive a 50% share of the annual savings from the project during the first three years of its operation. After the initial three year period, 100% of the project savings will go to the customer.

**Financing Assumptions**
In this case study example, it is assumed that NewCo will finance the project using a capital structure of 20% equity and 80% debt (commercial bank loan). The commercial bank loan term is assumed to be for 3 years at a 16% interest rate.

**Data and Inputs for the Financial Model**
See the attached "Input Sheets" at the end of this case study summary section.

## PROJECT-SPECIFIC ASSUMPTIONS

| | | |
|---|---|---|
| **PROJECT INFORMATION** | | **Data Input Check** |
| Primary Energy Services Measure: Cogen, Fuel Switch, or Self-Gen | Fuel Switch | OK |
| Project Name/Scenario | PROJECT A | |
| Company Name | Company A | |
| Company Location | 6th of October City | |
| | | |
| **FINANCING ASSUMPTIONS** | | |
| **Capital Structure** | | |
| Debt | 80% | |
| Equity | 20% | |
| **Loan Terms** | | |
| Interest Rate | 16% | |
| Loan Repayment Period (in years) | 3 | |
| **Financing Sponsors** | | **Data Input Check** |
| Equity Investment: NewCo or Customer | NewCo | OK |
| Debt: NewCo or Customer | NewCo | OK |
| | | |
| **ENERGY SERVICES AGREEMENT ASSUMPTIONS** | | |
| % of Savings Received by NewCo | 50% | |
| Term of NewCo's share of savings (in Years) | 3 | |
| | | |
| **BASELINE (PRE-PROJECT) ENERGY CONSUMPTION** | | |
| **Type** | **Unit** | |
| Mazout (ton/year) | 0 | |
| Solar (ton/year) | 3,400 | |
| Natural Gas (m3/year) | 0 | |
| Electricity (kWh/year) | 4,560,000 | |
| Maximum Electricity Demand (in kW) | 0 | |
| LPG (ton/year) | 0 | |

## *Energy Services Model: Input Sheet*

| POST-PROJECT ENERGY CONSUMPTION* | |
|---|---|
| **(Segmented by Energy Services Measure)** | **Unit** |
| **Fuel Switching** | |
| Avoided Mazout Purchases (ton/year) | 0 |
| Avoided Solar Purchases (ton/year) | 3,400 |
| Avoided LPG Purchases (ton/year) | 0 |
| **Cogeneration** | |
| Avoided Mazout Purchases (ton/year) | 0 |
| Avoided Solar Purchases (ton/year) | 0 |
| Avoided Electricity Purchases (kWh/year) | 0 |
| Avoided Electricity Demand (in kW) | 0 |
| Avoided LPG Purchases (ton/year) | 0 |
| **Self-Generation** | |
| Avoided Mazout Purchases (ton/year) | 0 |
| Avoided Solar Purchases (ton/year) | 0 |
| Avoided Electricity Purchases (kWh/year) | 0 |
| Avoided Electricity Demand (in kW) | 0 |
| Avoided LPG Purchases (ton/year) | 0 |

*Note: The implementation of each energy services measure will result in natural gas being consumed at the customer's facility. Natural gas consumption is calculated on the "Key Results" Sheet

| COGENERATION & SELF-GENERATION INPUTS | |
|---|---|
| | **Unit** |
| Electric Capacity (kW) | 0 |
| Stream Capacity (Tons/Hour) | 0 |
| Fuel Type | 0 |
| Plant Heat Rate (kJ/kWh) | 0 |
| Operating Hours Per Year | 0 |

| PROJECT COSTS AND CONSTRUCTION SCHEDULE | |
|---|---|
| **Type** | **Cost (in LE)** |
| Energy Audit & Feasibility Study | 25,000 |
| Equipment Costs | 1,300,000 |
| Engineering & Design | 100,000 |
| Construction Management | 50,000 |
| Contingency (% of Total Capital Cost) | 10% |
| Construction Period (in months) | 3 |

**OPERATING EXPENSES**

| **Operation & Maintenance** | **% of Annual Fuel Cost** |
|---|---|
| Cogen | 20% |
| Self-Gen | 15% |
| Fuel Switch | 2% |

| **Project Monitoring & Verification** | **Annual Cost in LE** |
|---|---|
| Annual M&V Cost | 50,000 |

## GENERAL ASSUMPTIONS

**ENERGY PRICES**

| **Energy Type** | **Price** |
|---|---|
| Mazout (LE/ton) | 185 |
| Solar (LE/ton) | 463 |
| Natural Gas (LE/m3) | 0.14 |
| Electricity: Energy Charge (LE/kWh) | 0.1835 |
| Electricity: Demand Charge (LE/kW/month) | 7.3 |
| LPG (LE/ton) | 320 |

**ESCALATION ASSUMPTIONS**

| **Fuel Prices** | **Annual Escalation** |
|---|---|
| Mazout (LE/ton) | 2% |
| Solar (LE/ton) | 2% |
| Natural Gas (LE/m3) | 2% |
| Electricity: Energy Charge (LE/kWh) | 2% |
| Electricity: Demand Charge (LE/kW/month) | 2% |
| LPG (LE/ton) | 2% |

| **Operating Expenses** | **Annual Escalation** |
|---|---|
| Operation & Maintenance | 2% |
| Project Monitoring & Verification | 2% |

**ECONOMIC ASSUMPTIONS**

| | |
|---|---|
| Discount Rate | 18% |

## *Energy Services Model: Input Sheet*

**ENVIRONMENTAL ASSUMPTIONS**

| Emissions by Fuel Type | Ton CO2 | Ton SO2 | Ton NOx |
|---|---|---|---|
| 1 ton Mazout | 3.229600 | 0.080000 | 0.004000 |
| 1 ton Solar | 3.229600 | 0.040000 | 0.004000 |
| 1 $m^3$ of Natural Gas | 0.001950 | 0.000000 | 0.000000 |
| 1 kWh of Electricity (assumes emissions are from a central utility-owned power stration) | 0.000775 | 0.000019 | 0.000002 |
| 1 ton of LPG | 3.027000 | 0.000000 | 0.000000 |

**FUEL SWITCHING INPUTS**

| Heating Values | Unit |
|---|---|
| Mazout (kj/kg) | 44,700 |
| Solar (kj/kg) | 43,700 |
| Natural Gas (kj/m3) | 37,000 |
| LPG (kj/kg) | 48,000 |

| Fuel Density and Properties | $kg/m^3$ |
|---|---|
| Mazout | 943 |
| Solar | 864 |
| Natural Gas | 0.888 |
| LPG | 2.100 |

**CASE STUDY #2: : PROJECT B**
**COGENERATION INVESTMENT EXAMPLE: CONSUMER PRODUCTS INDUSTRY**

**Project Background**
Based on the results of an energy audit conducted at a consumer products company, there is the potential for a project involving both cogeneration and fuel switching. The consumer products company requires the continuous use of electricity and steam to manufacture its product (i.e., they have a steady energy demand with no seasonal peaks). The company has a demand for steam of 3 tons per hour and a maximum electricity demand of 6,000 kW. The company currently meets its energy needs by purchasing electricity from the national grid and generating steam on-site through an oil-fired boiler. Last year, the company consumed 4,200 tons of Solar and 35,000,000 kWh of electricity. The company operates 7,800 hours per year. The development of this project will enable the company to meet all of its energy needs on-site using natural gas-based energy systems.

**Equipment**
Assuming that natural gas is delivered to the border of the company's factory (at the standard 7 bars of pressure), the equipment needed for this project includes a gas turbine, gas engine, waste heat recovery boiler, gas burners, pressure reduction station, and piping & valves.

**Total Investment Cost (Cogeneration and Fuel Switching - Combined)**
In order to cover any fluctuations in demand, the cogeneration system will have an installed capacity of 7,115 kW. The cogeneration system will use a gas turbine (6,215 kW) and a gas engine (900 kW) that have an average heat rate of 10,915 kJ/kWh. It is assumed that the cogeneration system will generate enough power meet the company's entire electricity demand as well as a portion of its thermal demand. The remaining portion of the company's thermal demand will be met by converting the company's oil-consuming equipment to natural gas. The construction period for the entire project is 8 months. The investment cost (in Egyptian Pounds) for this combined cogeneration and fuel switching project includes the following components:

| | |
|---|---|
| Energy Audit & Feasibility Study | 25,000 |
| Equipment Cost | 14,500,000 |
| Engineering & Design | 500,000 |
| Construction Management | 400,000 |
| Contingency | 1,542,500 |
| Interest During Construction | 827,023 |
| TOTAL | 17,794,523 LE |

**Annual Savings**
The company's current annual energy costs are LE 8,892,700 (LE 1,944,600 for Solar and LE 6,948,100 for electricity). Once the combined cogeneration and fuel switching project is implemented, the company's annual energy cost will be LE 2,139,979. This translates into an estimated annual energy cost savings of LE 6,752,724.

**Project Operating Expenses (Non-fuel Costs)**
The project will have operation and maintenance (O&M) and monitoring and verification (M&V) costs. It is assumed that the O&M costs for the project are equal to 20% of the company's annual cost of natural gas. The project will also incur some M&V in order to determine the

annual savings from the project. In this example, it is assumed that M&V costs are LE 100,000 per year for an initial five year period (the length of NewCo's contract with the customer).

**Energy Services Agreement**
It is assumed that NewCo will finance 100% of the total project costs as well provide all of the technical and engineering services required to develop the project. It is also assumed that NewCo guarantees the customer that the project will achieve an agreed upon level of technical and/or economic performance. In return for their providing technical and financial services, it is assumed that NewCo will receive a 70% share of the project savings from during its initial five years of operation. After the initial five year period, the customer will keep 100% of the savings.

**Financing Assumptions**
In this example, it is assumed that NewCo finances the project using a capital structure of 20% equity and 80% debt (commercial bank loan). The commercial bank loan term is for 5 years at a 16% interest rate.

**Data and Inputs for Financial Analysis**
See the attached "Input Sheets" at the end of this case study summary section

## PROJECT-SPECIFIC ASSUMPTIONS

| | | |
|---|---|---|
| **PROJECT INFORMATION** | | **Data Input Check** |
| Primary Energy Services Measure: Cogen, Fuel Switch, or Self-Gen | Cogen | OK |
| Project Name/Scenario | PROJECT B | |
| Company Name | Company B | |
| Company Location | 6th of October City | |
| **FINANCING ASSUMPTIONS** | | |
| **Capital Structure** | | |
| Debt | 80% | |
| Equity | 20% | |
| **Loan Terms** | | |
| Interest Rate | 16% | |
| Loan Repayment Period (in years) | 5 | |
| **Financing Sponsors** | | **Data Input Check** |
| Equity Investment: NewCo or Customer | NewCo | OK |
| Debt: NewCo or Customer | NewCo | OK |
| **ENERGY SERVICES AGREEMENT ASSUMPTIONS** | | |
| % of Savings Received by NewCo | 70% | |
| Term of NewCo's share of savings (in Years) | 5 | |
| **BASELINE (PRE-PROJECT) ENERGY CONSUMPTION** | | |
| **Type** | **Unit** | |
| Mazout (ton/year) | 0 | |
| Solar (ton/year) | 4,200 | |
| Natural Gas (m3/year) | 0 | |
| Electricity (kWh/year) | 35,000,000 | |
| Maximum Electricity Demand (in kW) | 6,000 | |
| LPG (ton/year) | 0 | |

## *Energy Services Model: Input Sheet*

**POST-PROJECT ENERGY CONSUMPTION***

| (Segmented by Energy Services Measure) | Unit |
|---|---|
| **Fuel Switching** | |
| Avoided Mazout Purchases (ton/year) | 0 |
| Avoided Solar Purchases (ton/year) | 4,200 |
| Avoided LPG Purchases (ton/year) | 0 |
| **Cogeneration** | |
| Avoided Mazout Purchases (ton/year) | 0 |
| Avoided Solar Purchases (ton/year) | 0 |
| Avoided Electricity Purchases (kWh/year) | 35,000,000 |
| Avoided Electricity Demand (in kW) | 6,000 |
| Avoided LPG Purchases (ton/year) | 0 |
| **Self-Generation** | |
| Avoided Mazout Purchases (ton/year) | 0 |
| Avoided Solar Purchases (ton/year) | 0 |
| Avoided Electricity Purchases (kWh/year) | 0 |
| Avoided Electricity Demand (in kW) | 0 |
| Avoided LPG Purchases (ton/year) | 0 |

*Note: The implementation of each energy services measure will result in natural gas being consumed at the customer's facility. Natural gas consumption is calculated on the "Key Results" Sheet

**COGENERATION & SELF-GENERATION INPUTS**

| | Unit |
|---|---|
| Electric Capacity (kW) | 7,115 |
| Stream Capacity (Tons/Hour) | 3 |
| Fuel Type | Gas |
| Plant Heat Rate (kJ/kWh) | 10,915 |
| Operating Hours Per Year | 7,800 |

**PROJECT COSTS AND CONSTRUCTION SCHEDULE**

| Type | Cost (in LE) |
|---|---|
| Energy Audit & Feasibility Study | 25,000 |
| Equipment Costs | 14,500,000 |
| Engineering & Design | 500,000 |
| Construction Management | 400,000 |
| Contingency (% of Total Capital Cost) | 10% |
| Construction Period (in months) | 8 |

**OPERATING EXPENSES**

| **Operation & Maintenance** | **% of Annual Fuel Cost** |
|---|---|
| Cogen | 20% |
| Self-Gen | 15% |
| Fuel Switch | 2% |

| **Project Monitoring & Verification** | **Annual Cost in LE** |
|---|---|
| Annual M&V Cost | 100,000 |

## GENERAL ASSUMPTIONS

**ENERGY PRICES**

| **Energy Type** | **Price** |
|---|---|
| Mazout (LE/ton) | 185 |
| Solar (LE/ton) | 463 |
| Natural Gas (LE/m3) | 0.14 |
| Electricity: Energy Charge (LE/kWh) | 0.1835 |
| Electricity: Demand Charge (LE/kW/month) | 7.3 |
| LPG (LE/ton) | 320 |

**ESCALATION ASSUMPTIONS**

| **Fuel Prices** | **Annual Escalation** |
|---|---|
| Mazout (LE/ton) | 2% |
| Solar (LE/ton) | 2% |
| Natural Gas (LE/m3) | 2% |
| Electricity: Energy Charge (LE/kWh) | 2% |
| Electricity: Demand Charge (LE/kW/month) | 2% |
| LPG (LE/ton) | 2% |

| **Operating Expenses** | **Annual Escalation** |
|---|---|
| Operation & Maintenance | 2% |
| Project Monitoring & Verification | 2% |

**ECONOMIC ASSUMPTIONS**

| | |
|---|---|
| Discount Rate | 18% |

## *Energy Services Model: Input Sheet*

**ENVIRONMENTAL ASSUMPTIONS**

| **Emissions by Fuel Type** | **Ton CO2** | **Ton SO2** | **Ton NOx** |
|---|---|---|---|
| 1 ton Mazout | 3.229600 | 0.080000 | 0.004000 |
| 1 ton Solar | 3.229600 | 0.040000 | 0.004000 |
| 1 $m^3$ of Natural Gas | 0.001950 | 0.000000 | 0.000000 |
| 1 kWh of Electricity (assumes emissions are from a central utility-owned power stration) | 0.000775 | 0.000019 | 0.000002 |
| 1 ton of LPG | 3.027000 | 0.000000 | 0.000000 |

**FUEL SWITCHING INPUTS**

| **Heating Values** | **Unit** |
|---|---|
| Mazout (kj/kg) | 44,700 |
| Solar (kj/kg) | 43,700 |
| Natural Gas (kj/m3) | 37,000 |
| LPG (kj/kg) | 48,000 |

| **Fuel Density and Properties** | **kg/$m^3$** |
|---|---|
| Mazout | 943 |
| Solar | 864 |
| Natural Gas | 0.888 |
| LPG | 2.100 |

## *Energy Services Model: Key Results*

**PROJECT A**

### FINANCIAL RESULTS

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 36% |
| Simple Payback Period (in Years) | 1.71 |
| Net Present Value (in LE at 18% Discount Rate) | 99,946 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 1.71 |
| Net Present Value (in LE at 18% Discount Rate) | 4,205,967 |

### PROJECT COST SUMMARY (in thousand LE)

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 2% |
| Equipment Costs | 1,300,000 | 78% |
| Engineering & Design | 100,000 | 6% |
| Construction Management | 50,000 | 3% |
| Contingency (% of Total Capital Cost) | 147,500 | 9% |
| *Total Capital Costs* | 1,622,500 | 98% |
| **Financing Costs** | | |
| Interest During Construction | 34,766 | 2% |
| *Total Financing Costs* | 34,766 | 2% |
| **Total Project Cost/Uses of Funds** | 1,657,266 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 331,453 | 20% |
| Debt | 1,325,813 | 80% |
| **Total Sources of Funds** | 1,657,266 | 100% |

### ENERGY USE AND COST SUMMARY

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 3,400 | 1,574,200 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 4,560,000 | 836,760 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,410,960 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 4,015,676 | 562,195 |
| Electricity (kWh/year)[1] | 4,560,000 | 836,760 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 1,398,955 |
| **Net Annual Energy Cost Savings (post-project)*** | | 1,012,005 |

### NATURAL GAS USE SUMMARY

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,015,676 | 562,195 |
| Cogeneration | 0 | 0 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 4,015,676 | 562,195 |

| ENVIRONMENTAL SUMMARY | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 3,150 |
| Sulfur Dioxide (SO2) Emission Reductions | 136 |
| Nitrous Oxide (Nox) Emission Reductions | 14 |

*Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas

2) These savings do not include project operating expenses (O&M, M&V) and debt service

*Energy Services Model: NewCo Cash Flow Statement (in Egyptian Pounds)*

## NewCo Cash Flow Statement

**PROJECT A**

| | *Year End* 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plus: Project Revenues[1] | 0 | 1,605,684 | 1,637,798 | 1,670,554 | 1,703,965 | 1,738,044 | 1,772,805 | 1,808,261 | 1,844,426 | 1,881,315 | 1,918,941 |
| Less: Project Operating Expenses | 0 | 635,907 | 648,625 | 661,598 | 620,708 | 633,122 | 645,785 | 658,701 | 671,875 | 685,312 | 699,018 |
| Less: Project Debt Repayment | 0 | 590,329 | 590,329 | 590,329 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Customer Share of Project Cash Flow[2] | 0 | 189,724 | 199,422 | 209,314 | 1,083,256 | 1,104,922 | 1,127,020 | 1,149,560 | 1,172,552 | 1,196,003 | 1,219,923 |
| **Operating Cash Flow for NewCo** | 0 | 189,724 | 199,422 | 209,314 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Project Capital Cost[3] | 1,657,266 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for NewCo After Investments** | (1,657,266) | 189,724 | 199,422 | 209,314 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plus: Project Loan Draws | 1,325,813 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for NewCo After Debt Financing** | (331,453) | 189,724 | 199,422 | 209,314 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plus: Project Equity Draws | 331,453 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Cash Flow Available for NewCo** | 0 | 189,724 | 199,422 | 209,314 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Cash Flow Available for NewCo | 0 | 189,724 | 199,422 | 209,314 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Equity Paid in Cash by NewCo | 331,453 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NewCo Equity Participants Cash Flow[4] | (331,453) | 189,724 | 199,422 | 209,314 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NPV for NewCo at 18% Discount Rate** | 99,946 | | | | | | | | | | |
| **IRR for NewCo** | 36% | | | | | | | | | | |
| **Simple Payback Period** | 1.71 | | | | | | | | | | |
| **Annual Debt Coverage Ratio** | 0.00 | 1.64 | 1.68 | 1.71 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Notes

1) Includes all project-related savings. The customer has a claim on a portion of the savings which are paid out after the project operating expenses and debt service

2) Customer Share of Cash Flow is based on the terms of the energy services agreement

3) Capital costs include all equipment, engineering & design, installation, and financing costs associated with the project.

4) Cash flow is pre-tax

*Energy Services Model: NewCo Cash Flow Statement (in Egyptian Pounds)*

## NewCo Cash Flow Statement

**PROJECT A**

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Plus: Project Revenues[1] | 1,957,320 | 1,996,466 | 2,036,396 | 2,077,123 | 2,118,666 | 2,161,039 | 2,204,260 | 2,248,345 | 2,293,312 | 2,339,178 |
| Less: Project Operating Expenses | 712,999 | 727,259 | 741,804 | 756,640 | 771,773 | 787,208 | 802,952 | 819,011 | 835,392 | 852,099 |
| Less: Project Debt Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Customer Share of Project Cash Flow[2] | 1,244,321 | 1,269,208 | 1,294,592 | 1,320,484 | 1,346,893 | 1,373,831 | 1,401,308 | 1,429,334 | 1,457,921 | 1,487,079 |
| **Operating Cash Flow for NewCo** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Project Capital Cost[3] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for NewCo After Investments** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plus: Project Loan Draws | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for NewCo After Debt Financing** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plus: Project Equity Draws | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Cash Flow Available for NewCo** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Cash Flow Available for NewCo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Equity Paid in Cash by NewCo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NewCo Equity Participants Cash Flow[4] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NPV for NewCo at 18% Discount Rate** | | | | | | | | | | |
| **IRR for NewCo** | | | | | | | | | | |
| **Simple Payback Period** | | | | | | | | | | |
| **Annual Debt Coverage Ratio** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Notes

1) Includes all project-related savings. The customer h
2) Customer Share of Cash Flow is based on the term
3) Capital costs include all equipment, engineering & c
4) Cash flow is pre-tax

*Energy Services Model: Customer Cash Flow Statement (in Egyptian Pounds)*

## Customer Cash Flow Statement

**PROJECT A**

| | Year End 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plus: Project Revenues[1] | 0 | 1,605,684 | 1,637,798 | 1,670,554 | 1,703,965 | 1,738,044 | 1,772,805 | 1,808,261 | 1,844,426 | 1,881,315 | 1,918,941 |
| Less: Project Operating Expenses | 0 | 635,907 | 648,625 | 661,598 | 620,708 | 633,122 | 645,785 | 658,701 | 671,875 | 685,312 | 699,018 |
| Less: Project Debt Repayment | 0 | 590,329 | 590,329 | 590,329 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: NewCo Share of Project Cash Flow[2] | 0 | 189,724 | 199,422 | 209,314 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Operating Cash Flow for Customer** | 0 | 189,724 | 199,422 | 209,314 | 1,083,256 | 1,104,922 | 1,127,020 | 1,149,560 | 1,172,552 | 1,196,003 | 1,219,923 |
| Less: Project Capital Cost[3] | 1,657,266 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for Customer After Investments** | (1,657,266) | 189,724 | 199,422 | 209,314 | 1,083,256 | 1,104,922 | 1,127,020 | 1,149,560 | 1,172,552 | 1,196,003 | 1,219,923 |
| Plus: Project Loan Draws | 1,325,813 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for Customer After Debt Financing** | (331,453) | 189,724 | 199,422 | 209,314 | 1,083,256 | 1,104,922 | 1,127,020 | 1,149,560 | 1,172,552 | 1,196,003 | 1,219,923 |
| Plus: Project Equity Draws | 331,453 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Cash Flow Available For Customer** | 0 | 189,724 | 199,422 | 209,314 | 1,083,256 | 1,104,922 | 1,127,020 | 1,149,560 | 1,172,552 | 1,196,003 | 1,219,923 |
| Net Cash Flow Available for the Customer | 0 | 189,724 | 199,422 | 209,314 | 1,083,256 | 1,104,922 | 1,127,020 | 1,149,560 | 1,172,552 | 1,196,003 | 1,219,923 |
| Less: Equity Paid in Cash by the Customer | Not Applicable | | | | | | | | | | |
| Customer Equity Participants Cash Flow[4] | Not Applicable | | | | | | | | | | |
| **NPV for Customer at 18% Discount Rate** | 4,205,967 | | | | | | | | | | |
| **IRR for Customer** | Not Applicable | | | | | | | | | | |
| **Simple Payback Period** | 1.71 | | | | | | | | | | |
| **Annual Debt Coverage Ratio** | Not Applicable | | | | | | | | | | |

Notes

1) Includes all project-related savings. The customer has a claim on a portion of the savings which are paid out after the project operating expenses and debt service

2) NewCo Share of Cash Flow is based on the terms of the energy services agreement

3) Capital costs include all equipment, engineering & design, installation, and financing costs associated with the project.

4) Cash flow is pre-tax

*Energy Services Model: Customer Cash Flow Statement (in Egyptian Pounds)*

## Customer Cash Flow Statement

**PROJECT A**

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Plus: Project Revenues[1] | 1,957,320 | 1,996,466 | 2,036,396 | 2,077,123 | 2,118,666 | 2,161,039 | 2,204,260 | 2,248,345 | 2,293,312 | 2,339,178 |
| Less: Project Operating Expenses | 712,999 | 727,259 | 741,804 | 756,640 | 771,773 | 787,208 | 802,952 | 819,011 | 835,392 | 852,099 |
| Less: Project Debt Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: NewCo Share of Project Cash Flow[2] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Operating Cash Flow for Customer** | 1,244,321 | 1,269,208 | 1,294,592 | 1,320,484 | 1,346,893 | 1,373,831 | 1,401,308 | 1,429,334 | 1,457,921 | 1,487,079 |
| Less: Project Capital Cost[3] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for Customer After Investments** | 1,244,321 | 1,269,208 | 1,294,592 | 1,320,484 | 1,346,893 | 1,373,831 | 1,401,308 | 1,429,334 | 1,457,921 | 1,487,079 |
| Plus: Project Loan Draws | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for Customer After Debt Financing** | 1,244,321 | 1,269,208 | 1,294,592 | 1,320,484 | 1,346,893 | 1,373,831 | 1,401,308 | 1,429,334 | 1,457,921 | 1,487,079 |
| Plus: Project Equity Draws | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Cash Flow Available For Customer** | 1,244,321 | 1,269,208 | 1,294,592 | 1,320,484 | 1,346,893 | 1,373,831 | 1,401,308 | 1,429,334 | 1,457,921 | 1,487,079 |
| Net Cash Flow Available for the Customer | 1,244,321 | 1,269,208 | 1,294,592 | 1,320,484 | 1,346,893 | 1,373,831 | 1,401,308 | 1,429,334 | 1,457,921 | 1,487,079 |
| Less: Equity Paid in Cash by the Customer | | | | | | | | | | |
| Customer Equity Participants Cash Flow[4] | | | | | | | | | | |
| **NPV for Customer at 18% Discount Rate** | | | | | | | | | | |
| **IRR for Customer** | | | | | | | | | | |
| **Simple Payback Period** | | | | | | | | | | |
| **Annual Debt Coverage Ratio** | | | | | | | | | | |

Notes
1) Includes all project-related savings. The customer
2) NewCo Share of Cash Flow is based on the terms
3) Capital costs include all equipment, engineering &
4) Cash flow is pre-tax

*Energy Services Model: Project Revenues (in Egyptian Pounds)*

## Project Revenues

| | Year End | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Mazout Savings (tons/year) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mazout Cost (LE/ton) | 185 | 189 | 192 | 196 | 200 | 204 | 208 | 213 | 217 | 221 | 226 |
| Avoided Cost of Mazout Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Solar Savings (tons/year) | 0 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| Solar Cost (LE/ton) | 463 | 472 | 482 | 491 | 501 | 511 | 521 | 532 | 542 | 553 | 564 |
| Avoided Cost of Solar Purchases | 0 | 1,605,684 | 1,637,798 | 1,670,554 | 1,703,965 | 1,738,044 | 1,772,805 | 1,808,261 | 1,844,426 | 1,881,315 | 1,918,941 |
| Electricity Savings (kWh/year) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electricity Cost (LE/kWh) | 0.184 | 0.187 | 0.191 | 0.195 | 0.199 | 0.203 | 0.207 | 0.211 | 0.215 | 0.219 | 0.224 |
| Avoided Cost of Electricity Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduction in Maximum Electricity Demand | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electricity Demand Charge (LE/kW/year) | 88 | 89 | 91 | 93 | 95 | 97 | 99 | 101 | 103 | 105 | 107 |
| Avoided Electricity Demand Charges | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LPG Savings | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LPG Cost (tons/year) | 320 | 326 | 333 | 340 | 346 | 353 | 360 | 368 | 375 | 382 | 390 |
| Avoided Cost of LPG Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Project Revenues** | 0 | 1,605,684 | 1,637,798 | 1,670,554 | 1,703,965 | 1,738,044 | 1,772,805 | 1,808,261 | 1,844,426 | 1,881,315 | 1,918,941 |

*Energy Services Model: Project Revenues (in Egyptian Pounds)*

## Project Revenues

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mazout Savings (tons/year) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mazout Cost (LE/ton) | 230 | 235 | 239 | 244 | 249 | 254 | 259 | 264 | 270 | 275 |
| Avoided Cost of Mazout Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Solar Savings (tons/year) | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 | 3,400 |
| Solar Cost (LE/ton) | 576 | 587 | 599 | 611 | 623 | 636 | 648 | 661 | 675 | 688 |
| Avoided Cost of Solar Purchases | 1,957,320 | 1,996,466 | 2,036,396 | 2,077,123 | 2,118,666 | 2,161,039 | 2,204,260 | 2,248,345 | 2,293,312 | 2,339,178 |
| Electricity Savings (kWh/year) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electricity Cost (LE/kWh) | 0.228 | 0.233 | 0.237 | 0.242 | 0.247 | 0.252 | 0.257 | 0.262 | 0.267 | 0.273 |
| Avoided Cost of Electricity Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Reduction in Maximum Electricity Demand | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electricity Demand Charge (LE/kW/year) | 109 | 111 | 113 | 116 | 118 | 120 | 123 | 125 | 128 | 130 |
| Avoided Electricity Demand Charges | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LPG Savings | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LPG Cost (tons/year) | 398 | 406 | 414 | 422 | 431 | 439 | 448 | 457 | 466 | 476 |
| Avoided Cost of LPG Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Project Revenues** | 1,957,320 | 1,996,466 | 2,036,396 | 2,077,123 | 2,118,666 | 2,161,039 | 2,204,260 | 2,248,345 | 2,293,312 | 2,339,178 |

*Energy Services Model: Operating Expenses (in Egyptian Pounds)*

## Operating Expenses

| | Year End | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Natural Gas Cost | 0 | 573,438 | 584,907 | 596,605 | 608,538 | 620,708 | 633,122 | 645,785 | 658,701 | 671,875 | 685,312 |
| Operation & Maintenance | 0 | 11,469 | 11,698 | 11,932 | 12,171 | 12,414 | 12,662 | 12,916 | 13,174 | 13,437 | 13,706 |
| Monitoring and Verification | 0 | 51,000 | 52,020 | 53,060 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Operating Expenses** | 0 | 635,907 | 648,625 | 661,598 | 620,708 | 633,122 | 645,785 | 658,701 | 671,875 | 685,312 | 699,018 |

*Energy Services Model: Operating Expenses (in Egyptian Pounds)*

## Operating Expenses

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas Cost | 699,018 | 712,999 | 727,259 | 741,804 | 756,640 | 771,773 | 787,208 | 802,952 | 819,011 | 835,392 |
| Operation & Maintenance | 13,980 | 14,260 | 14,545 | 14,836 | 15,133 | 15,435 | 15,744 | 16,059 | 16,380 | 16,708 |
| Monitoring and Verification | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Operating Expenses** | 712,999 | 727,259 | 741,804 | 756,640 | 771,773 | 787,208 | 802,952 | 819,011 | 835,392 | 852,099 |

*Energy Services Model: Financing Sheet (in Egyptian Pounds)*

## Financing Sheet

| | Year End | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Interest Expense | 0 | 212,130 | 151,618 | 81,425 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 378,199 | 438,710 | 508,904 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Debt Repayment** | 0 | 590,329 | 590,329 | 590,329 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Financing Note

* Recourse on project debt is to NewCo

*Energy Services Model: Financing Sheet (in Egyptian Pounds)*

## Financing Sheet

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Interest Expense | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Debt Repayment** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Financing Note

* Recourse on project debt is to NewCo

*Energy Services Model: Interest During Construction (in Egyptian Pounds)*

| Construction Period (in months) | 3 |
|---|---|

| Month | Debt Disbursement | Total Debt Disbursement | Percent Disbursement | Interest During Construction | Equity Contribution | Cumulative Disbursement |
|---|---|---|---|---|---|---|
| 1 | 441,938 | 441,938 | 33.33% | 5,845 | 110,484 | 33% |
| 2 | 441,938 | 883,875 | 33.33% | 11,614 | 110,484 | 67% |
| 3 | 441,938 | 1,325,813 | 33.33% | 17,307 | 110,484 | 100% |
| 4 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 5 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 6 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 7 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 8 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 9 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 10 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 11 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 12 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 13 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 14 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 15 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 16 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 17 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 18 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 19 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 20 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 21 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 22 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 23 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 24 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| TOTALS | 1,325,813 | 1,325,813 | 100.00% | 34,766 | 331,453 | |

## Escalation Sheet

| | Year | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Project Revenues** | | | | | | | | | | | |
| Mazout Price (LE/ton) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Solar Price (LE/ton) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Electricity Price (LE/kWh) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Electricity Demand Charge (LE/kW/month) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| LPG Price (LE/ton) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| **Operating Expenses** | | | | | | | | | | | |
| Natural Gas Cost | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Operation & Maintenance | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Monitoring and Verification | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |

## Escalation Sheet

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Project Revenues** | | | | | | | | | | |
| Mazout Price (LE/ton) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Solar Price (LE/ton) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Electricity Price (LE/kWh) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Electricity Demand Charge (LE/kW/month) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| LPG Price (LE/ton) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| **Operating Expenses** | | | | | | | | | | |
| Natural Gas Cost | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Operation & Maintenance | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Monitoring and Verification | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |

*Energy Services Model: Key Results*

**PROJECT B**

**FINANCIAL RESULTS**

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 36% |
| Simple Payback Period (in Years) | 2.74 |
| Net Present Value (in LE at 18% Discount Rate) | 1,616,759 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 2.74 |
| Net Present Value (in LE at 18% Discount Rate) | 19,868,911 |

**PROJECT COST SUMMARY (in thousand LE)**

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 0% |
| Equipment Costs | 14,500,000 | 81% |
| Engineering & Design | 500,000 | 3% |
| Construction Management | 400,000 | 2% |
| Contingency (% of Total Capital Cost) | 1,542,500 | 9% |
| *Total Capital Costs* | 16,967,500 | 95% |
| **Financing Costs** | | |
| Interest During Construction | 827,023 | 5% |
| *Total Financing Costs* | 827,023 | 5% |
| **Total Project Cost/Uses of Funds** | 17,794,523 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 3,558,905 | 20% |
| Debt | 14,235,618 | 80% |
| **Total Sources of Funds** | 17,794,523 | 100% |

**ENERGY USE AND COST SUMMARY**

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 4,200 | 1,944,600 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 35,000,000 | 6,422,500 |
| Maximum Electricity Demand (in kW) | 6,000 | 525,600 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 8,892,700 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 15,285,541 | 2,139,976 |
| Electricity (kWh/year)[1] | 0 | 0 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,139,976 |
| **Net Annual Energy Cost Savings (post-project)[2]** | | 6,752,724 |

**NATURAL GAS USE SUMMARY**

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,960,541 | 694,476 |
| Cogeneration | 10,325,000 | 1,445,500 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 15,285,541 | 2,139,976 |

| ENVIRONMENTAL SUMMARY | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 10,886 |
| Sulfur Dioxide (SO2) Emission Reductions | 840 |
| Nitrous Oxide (Nox) Emission Reductions | 73 |

*Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas

2) These savings do not include project operating expenses (O&M, M&V) and debt service

*Energy Services Model: NewCo Cash Flow Statement (in Egyptian Pounds)*

## NewCo Cash Flow Statement

**PROJECT B**

| | *Year End* 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plus: Project Revenues[1] | 0 | 9,070,554 | 9,251,965 | 9,437,004 | 9,625,744 | 9,818,259 | 10,014,625 | 10,214,917 | 10,419,215 | 10,627,600 | 10,840,152 |
| Less: Project Operating Expenses | 0 | 2,579,657 | 2,631,250 | 2,683,875 | 2,737,553 | 2,792,304 | 2,735,534 | 2,790,244 | 2,846,049 | 2,902,970 | 2,961,030 |
| Less: Project Debt Repayment | 0 | 4,347,691 | 4,347,691 | 4,347,691 | 4,347,691 | 4,347,691 | 0 | 0 | 0 | 0 | 0 |
| Less: Customer Share of Project Cash Flow[2] | 0 | 642,962 | 681,907 | 721,631 | 762,150 | 803,479 | 7,279,091 | 7,424,673 | 7,573,166 | 7,724,629 | 7,879,122 |
| **Operating Cash Flow for NewCo** | 0 | 1,500,244 | 1,591,116 | 1,683,806 | 1,778,350 | 1,874,785 | 0 | 0 | 0 | 0 | 0 |
| Less: Project Capital Cost[3] | 17,794,523 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for NewCo After Investments** | (17,794,523) | 1,500,244 | 1,591,116 | 1,683,806 | 1,778,350 | 1,874,785 | 0 | 0 | 0 | 0 | 0 |
| Plus: Project Loan Draws | 14,235,618 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for NewCo After Debt Financing** | (3,558,905) | 1,500,244 | 1,591,116 | 1,683,806 | 1,778,350 | 1,874,785 | 0 | 0 | 0 | 0 | 0 |
| Plus: Project Equity Draws | 3,558,905 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Cash Flow Available for NewCo** | 0 | 1,500,244 | 1,591,116 | 1,683,806 | 1,778,350 | 1,874,785 | 0 | 0 | 0 | 0 | 0 |
| Net Cash Flow Available for NewCo | 0 | 1,500,244 | 1,591,116 | 1,683,806 | 1,778,350 | 1,874,785 | 0 | 0 | 0 | 0 | 0 |
| Less: Equity Paid in Cash by NewCo | 3,558,905 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NewCo Equity Participants Cash Flow[4] | (3,558,905) | 1,500,244 | 1,591,116 | 1,683,806 | 1,778,350 | 1,874,785 | 0 | 0 | 0 | 0 | 0 |
| **NPV for NewCo at 18% Discount Rate** | 1,616,759 | | | | | | | | | | |
| **IRR for NewCo** | 36% | | | | | | | | | | |
| **Simple Payback Period** | 2.74 | | | | | | | | | | |
| **Annual Debt Coverage Ratio** | 0.00 | 1.49 | 1.52 | 1.55 | 1.58 | 1.62 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Notes

1) Includes all project-related savings. The customer has a claim on a portion of the savings which are paid out after the project operating expenses and debt service

2) Customer Share of Cash Flow is based on the terms of the energy services agreement

3) Capital costs include all equipment, engineering & design, installation, and financing costs associated with the project.

4) *Cash flow is pre-tax*

*Energy Services Model: NewCo Cash Flow Statement (in Egyptian Pounds)*

## NewCo Cash Flow Statement

**PROJECT B**

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Plus: Project Revenues[1] | 11,056,955 | 11,278,094 | 11,503,656 | 11,733,729 | 11,968,403 | 12,207,771 | 12,451,927 | 12,700,965 | 12,954,985 | 13,214,084 |
| Less: Project Operating Expenses | 3,020,250 | 3,080,655 | 3,142,268 | 3,205,114 | 3,269,216 | 3,334,600 | 3,401,292 | 3,469,318 | 3,538,705 | 3,609,479 |
| Less: Project Debt Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Customer Share of Project Cash Flow[2] | 8,036,704 | 8,197,439 | 8,361,387 | 8,528,615 | 8,699,187 | 8,873,171 | 9,050,634 | 9,231,647 | 9,416,280 | 9,604,606 |
| **Operating Cash Flow for NewCo** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Project Capital Cost[3] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for NewCo After Investments** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plus: Project Loan Draws | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for NewCo After Debt Financing** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Plus: Project Equity Draws | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Cash Flow Available for NewCo** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net Cash Flow Available for NewCo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: Equity Paid in Cash by NewCo | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NewCo Equity Participants Cash Flow[4] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NPV for NewCo at 18% Discount Rate** | | | | | | | | | | |
| **IRR for NewCo** | | | | | | | | | | |
| **Simple Payback Period** | | | | | | | | | | |
| **Annual Debt Coverage Ratio** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Notes

1) Includes all project-related savings. The customer h
2) Customer Share of Cash Flow is based on the term
3) Capital costs include all equipment, engineering & c
4) Cash flow is pre-tax

*Energy Services Model: Customer Cash Flow Statement (in Egyptian Pounds)*

## Customer Cash Flow Statement

**PROJECT B**

| | Year End 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plus: Project Revenues[1] | 0 | 9,070,554 | 9,251,965 | 9,437,004 | 9,625,744 | 9,818,259 | 10,014,625 | 10,214,917 | 10,419,215 | 10,627,600 | 10,840,152 |
| Less: Project Operating Expenses | 0 | 2,579,657 | 2,631,250 | 2,683,875 | 2,737,553 | 2,792,304 | 2,735,534 | 2,790,244 | 2,846,049 | 2,902,970 | 2,961,030 |
| Less: Project Debt Repayment | 0 | 4,347,691 | 4,347,691 | 4,347,691 | 4,347,691 | 4,347,691 | 0 | 0 | 0 | 0 | 0 |
| Less: NewCo Share of Project Cash Flow[2] | 0 | 1,500,244 | 1,591,116 | 1,683,806 | 1,778,350 | 1,874,785 | 0 | 0 | 0 | 0 | 0 |
| **Operating Cash Flow for Customer** | 0 | 642,962 | 681,907 | 721,631 | 762,150 | 803,479 | 7,279,091 | 7,424,673 | 7,573,166 | 7,724,629 | 7,879,122 |
| Less: Project Capital Cost[3] | 17,794,523 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for Customer After Investments** | (17,794,523) | 642,962 | 681,907 | 721,631 | 762,150 | 803,479 | 7,279,091 | 7,424,673 | 7,573,166 | 7,724,629 | 7,879,122 |
| Plus: Project Loan Draws | 14,235,618 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for Customer After Debt Financing** | (3,558,905) | 642,962 | 681,907 | 721,631 | 762,150 | 803,479 | 7,279,091 | 7,424,673 | 7,573,166 | 7,724,629 | 7,879,122 |
| Plus: Project Equity Draws | 3,558,905 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Cash Flow Available For Customer** | 0 | 642,962 | 681,907 | 721,631 | 762,150 | 803,479 | 7,279,091 | 7,424,673 | 7,573,166 | 7,724,629 | 7,879,122 |
| Net Cash Flow Available for the Customer | 0 | 642,962 | 681,907 | 721,631 | 762,150 | 803,479 | 7,279,091 | 7,424,673 | 7,573,166 | 7,724,629 | 7,879,122 |
| Less: Equity Paid in Cash by the Customer | Not Applicable | | | | | | | | | | |
| Customer Equity Participants Cash Flow[4] | Not Applicable | | | | | | | | | | |
| **NPV for Customer at 18% Discount Rate** | 19,868,911 | | | | | | | | | | |
| **IRR for Customer** | Not Applicable | | | | | | | | | | |
| **Simple Payback Period** | 2.74 | | | | | | | | | | |
| **Annual Debt Coverage Ratio** | Not Applicable | | | | | | | | | | |

Notes

1) Includes all project-related savings. The customer has a claim on a portion of the savings which are paid out after the project operating expenses and debt service

2) NewCo Share of Cash Flow is based on the terms of the energy services agreement

3) Capital costs include all equipment, engineering & design, installation, and financing costs associated with the project.

4) Cash flow is pre-tax

*Energy Services Model: Customer Cash Flow Statement (in Egyptian Pounds)*

## Customer Cash Flow Statement

**PROJECT B**

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Plus: Project Revenues[1] | 11,056,955 | 11,278,094 | 11,503,656 | 11,733,729 | 11,968,403 | 12,207,771 | 12,451,927 | 12,700,965 | 12,954,985 | 13,214,084 |
| Less: Project Operating Expenses | 3,020,250 | 3,080,655 | 3,142,268 | 3,205,114 | 3,269,216 | 3,334,600 | 3,401,292 | 3,469,318 | 3,538,705 | 3,609,479 |
| Less: Project Debt Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Less: NewCo Share of Project Cash Flow[2] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Operating Cash Flow for Customer** | 8,036,704 | 8,197,439 | 8,361,387 | 8,528,615 | 8,699,187 | 8,873,171 | 9,050,634 | 9,231,647 | 9,416,280 | 9,604,606 |
| Less: Project Capital Cost[3] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for Customer After Investments** | 8,036,704 | 8,197,439 | 8,361,387 | 8,528,615 | 8,699,187 | 8,873,171 | 9,050,634 | 9,231,647 | 9,416,280 | 9,604,606 |
| Plus: Project Loan Draws | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash Flow for Customer After Debt Financing** | 8,036,704 | 8,197,439 | 8,361,387 | 8,528,615 | 8,699,187 | 8,873,171 | 9,050,634 | 9,231,647 | 9,416,280 | 9,604,606 |
| Plus: Project Equity Draws | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Cash Flow Available For Customer** | 8,036,704 | 8,197,439 | 8,361,387 | 8,528,615 | 8,699,187 | 8,873,171 | 9,050,634 | 9,231,647 | 9,416,280 | 9,604,606 |
| Net Cash Flow Available for the Customer | 8,036,704 | 8,197,439 | 8,361,387 | 8,528,615 | 8,699,187 | 8,873,171 | 9,050,634 | 9,231,647 | 9,416,280 | 9,604,606 |
| Less: Equity Paid in Cash by the Customer | | | | | | | | | | |
| Customer Equity Participants Cash Flow[4] | | | | | | | | | | |

**NPV for Customer at 18% Discount Rate**
**IRR for Customer**
**Simple Payback Period**
**Annual Debt Coverage Ratio**

Notes
1) Includes all project-related savings. The customer
2) NewCo Share of Cash Flow is based on the terms
3) Capital costs include all equipment, engineering &
4) Cash flow is pre-tax

*Energy Services Model: Project Revenues (in Egyptian Pounds)*

## Project Revenues

| | Year End | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Mazout Savings (tons/year) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mazout Cost (LE/ton) | 185 | 189 | 192 | 196 | 200 | 204 | 208 | 213 | 217 | 221 | 226 |
| Avoided Cost of Mazout Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Solar Savings (tons/year) | 0 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 |
| Solar Cost (LE/ton) | 463 | 472 | 482 | 491 | 501 | 511 | 521 | 532 | 542 | 553 | 564 |
| Avoided Cost of Solar Purchases | 0 | 1,983,492 | 2,023,162 | 2,063,625 | 2,104,898 | 2,146,996 | 2,189,935 | 2,233,734 | 2,278,409 | 2,323,977 | 2,370,457 |
| Electricity Savings (kWh/year) | 0 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 |
| Electricity Cost (LE/kWh) | 0.184 | 0.187 | 0.191 | 0.195 | 0.199 | 0.203 | 0.207 | 0.211 | 0.215 | 0.219 | 0.224 |
| Avoided Cost of Electricity Purchases | 0 | 6,550,950 | 6,681,969 | 6,815,608 | 6,951,921 | 7,090,959 | 7,232,778 | 7,377,434 | 7,524,982 | 7,675,482 | 7,828,992 |
| Reduction in Maximum Electricity Demand | 0 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| Electricity Demand Charge (LE/kW/year) | 88 | 89 | 91 | 93 | 95 | 97 | 99 | 101 | 103 | 105 | 107 |
| Avoided Electricity Demand Charges | 0 | 536,112 | 546,834 | 557,771 | 568,926 | 580,305 | 591,911 | 603,749 | 615,824 | 628,141 | 640,703 |
| LPG Savings | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LPG Cost (tons/year) | 320 | 326 | 333 | 340 | 346 | 353 | 360 | 368 | 375 | 382 | 390 |
| Avoided Cost of LPG Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Project Revenues** | 0 | 9,070,554 | 9,251,965 | 9,437,004 | 9,625,744 | 9,818,259 | 10,014,625 | 10,214,917 | 10,419,215 | 10,627,600 | 10,840,152 |

*Energy Services Model: Project Revenues (in Egyptian Pounds)*

## Project Revenues

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mazout Savings (tons/year) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mazout Cost (LE/ton) | 230 | 235 | 239 | 244 | 249 | 254 | 259 | 264 | 270 | 275 |
| Avoided Cost of Mazout Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | |
| Solar Savings (tons/year) | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 | 4,200 |
| Solar Cost (LE/ton) | 576 | 587 | 599 | 611 | 623 | 636 | 648 | 661 | 675 | 688 |
| Avoided Cost of Solar Purchases | 2,417,866 | 2,466,223 | 2,515,547 | 2,565,858 | 2,617,176 | 2,669,519 | 2,722,909 | 2,777,368 | 2,832,915 | 2,889,573 |
| | | | | | | | | | | |
| Electricity Savings (kWh/year) | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 | 35,000,000 |
| Electricity Cost (LE/kWh) | 0.228 | 0.233 | 0.237 | 0.242 | 0.247 | 0.252 | 0.257 | 0.262 | 0.267 | 0.273 |
| Avoided Cost of Electricity Purchases | 7,985,571 | 8,145,283 | 8,308,189 | 8,474,352 | 8,643,839 | 8,816,716 | 8,993,051 | 9,172,912 | 9,356,370 | 9,543,497 |
| | | | | | | | | | | |
| Reduction in Maximum Electricity Demand | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| Electricity Demand Charge (LE/kW/year) | 109 | 111 | 113 | 116 | 118 | 120 | 123 | 125 | 128 | 130 |
| Avoided Electricity Demand Charges | 653,518 | 666,588 | 679,920 | 693,518 | 707,388 | 721,536 | 735,967 | 750,686 | 765,700 | 781,014 |
| | | | | | | | | | | |
| LPG Savings | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LPG Cost (tons/year) | 398 | 406 | 414 | 422 | 431 | 439 | 448 | 457 | 466 | 476 |
| Avoided Cost of LPG Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | |
| **Total Project Revenues** | 11,056,955 | 11,278,094 | 11,503,656 | 11,733,729 | 11,968,403 | 12,207,771 | 12,451,927 | 12,700,965 | 12,954,985 | 13,214,084 |

*Energy Services Model: Operating Expenses (in Egyptian Pounds)*

## Operating Expenses

| | *Year End* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Natural Gas Cost | 0 | 2,182,775 | 2,226,431 | 2,270,959 | 2,316,378 | 2,362,706 | 2,409,960 | 2,458,159 | 2,507,323 | 2,557,469 | 2,608,618 |
| Operation & Maintenance | 0 | 294,882 | 300,780 | 306,795 | 312,931 | 319,190 | 325,574 | 332,085 | 338,727 | 345,501 | 352,411 |
| Monitoring and Verification | 0 | 102,000 | 104,040 | 106,121 | 108,243 | 110,408 | 0 | 0 | 0 | 0 | 0 |
| **Total Operating Expenses** | 0 | 2,579,657 | 2,631,250 | 2,683,875 | 2,737,553 | 2,792,304 | 2,735,534 | 2,790,244 | 2,846,049 | 2,902,970 | 2,961,030 |

*Energy Services Model: Operating Expenses (in Egyptian Pounds)*

## Operating Expenses

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas Cost | 2,660,791 | 2,714,007 | 2,768,287 | 2,823,652 | 2,880,126 | 2,937,728 | 2,996,483 | 3,056,412 | 3,117,540 | 3,179,891 |
| Operation & Maintenance | 359,460 | 366,649 | 373,982 | 381,461 | 389,091 | 396,872 | 404,810 | 412,906 | 421,164 | 429,587 |
| Monitoring and Verification | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Operating Expenses** | 3,020,250 | 3,080,655 | 3,142,268 | 3,205,114 | 3,269,216 | 3,334,600 | 3,401,292 | 3,469,318 | 3,538,705 | 3,609,479 |

*Energy Services Model: Financing Sheet (in Egyptian Pounds)*

## Financing Sheet

| | Year End | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Interest Expense | 0 | 2,277,699 | 1,946,500 | 1,562,310 | 1,116,648 | 599,682 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 2,069,992 | 2,401,191 | 2,785,382 | 3,231,043 | 3,748,010 | 0 | 0 | 0 | 0 | 0 |
| **Total Debt Repayment** | 0 | 4,347,691 | 4,347,691 | 4,347,691 | 4,347,691 | 4,347,691 | 0 | 0 | 0 | 0 | 0 |

Financing Note

* Recourse on project debt is to NewCo

*Energy Services Model: Financing Sheet (in Egyptian Pounds)*

## Financing Sheet

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| Interest Expense | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Principal Repayment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Debt Repayment** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Financing Note

* Recourse on project debt is to NewCo

*Energy Services Model: Interest During Construction (in Egyptian Pounds)*

| Construction Period (in months) | 8 |
|---|---|

| Month | Debt Disbursement | Total Debt Disbursement | Percent Disbursement | Interest During Construction | Equity Contribution | Cumulative Disbursement |
|---|---|---|---|---|---|---|
| 1 | 1,779,452 | 1,779,452 | 12.50% | 23,686 | 444,863 | 13% |
| 2 | 1,779,452 | 3,558,905 | 12.50% | 47,060 | 444,863 | 25% |
| 3 | 1,779,452 | 5,338,357 | 12.50% | 70,127 | 444,863 | 38% |
| 4 | 1,779,452 | 7,117,809 | 12.50% | 92,890 | 444,863 | 50% |
| 5 | 1,779,452 | 8,897,261 | 12.50% | 115,354 | 444,863 | 63% |
| 6 | 1,779,452 | 10,676,714 | 12.50% | 137,522 | 444,863 | 75% |
| 7 | 1,779,452 | 12,456,166 | 12.50% | 159,398 | 444,863 | 88% |
| 8 | 1,779,452 | 14,235,618 | 12.50% | 180,987 | 444,863 | 100% |
| 9 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 10 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 11 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 12 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 13 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 14 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 15 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 16 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 17 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 18 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 19 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 20 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 21 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 22 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 23 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| 24 | 0 | 0 | 0.00% | 0 | 0 | 100% |
| TOTALS | 14,235,618 | 14,235,618 | 100.00% | 827,023 | 3,558,905 | |

## Escalation Sheet

| | Year 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Project Revenues** | | | | | | | | | | | |
| Mazout Price (LE/ton) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Solar Price (LE/ton) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Electricity Price (LE/kWh) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Electricity Demand Charge (LE/kW/month) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| LPG Price (LE/ton) | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| **Operating Expenses** | | | | | | | | | | | |
| Natural Gas Cost | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Operation & Maintenance | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |
| Monitoring and Verification | 1.00 | 1.02 | 1.04 | 1.06 | 1.08 | 1.10 | 1.13 | 1.15 | 1.17 | 1.20 | 1.22 |

## Escalation Sheet

| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Project Revenues** | | | | | | | | | | |
| Mazout Price (LE/ton) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Solar Price (LE/ton) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Electricity Price (LE/kWh) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Electricity Demand Charge (LE/kW/month) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| LPG Price (LE/ton) | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| **Operating Expenses** | | | | | | | | | | |
| Natural Gas Cost | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Operation & Maintenance | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |
| Monitoring and Verification | 1.24 | 1.27 | 1.29 | 1.32 | 1.35 | 1.37 | 1.40 | 1.43 | 1.46 | 1.49 |

Presentation To:

**Natgas Company:**

Cairo, Egypt

June 16, 2001

# Energy Services Seminar: Case Study Overview and Scenario Analysis Results

Presented by:

NEXANT

A BECHTEL TECHNOLOGY AND CONSULTING COMPANY

**June 2001**

# Presentation Outline

- Outline the characteristics of two energy service case studies (base case project inputs and assumptions)
- Discuss four scenarios that were created to evaluate the case studies under alternative conditions
- Review the case study scenario analysis results

# Energy Service Case Studies

## Base Case: Inputs and Assumptions

| | Project A | Project B |
|---|---|---|
| *Project Type* | Fuel Switching | Cogeneration & Fuel Switching |
| *Industry Sector* | Food & Beverages | Consumer Products |
| *Total Cost (in LE)* | 1,657,266 | 17,794,523 |
| *Annual Energy Use Pre-project:* | Solar: 3,400 Tons | Solar: 4,200 Tons<br>Electricity: 35,000,000 kWh |
| *Capital Structure* | 80% Debt, 20% Equity | 80% Debt, 20% Equity |
| *Loan Terms* | 3 Years at 16% | 5 Years at 16% |
| *Financing Sponsor* | NewCo (Debt and Equity) | NewCo (Debt and Equity) |
| *Energy Services Agreement* | NewCo Savings Share: 50%<br>Term of Contract: 3 Years | NewCo Savings Share: 70%<br>Term of Contract: 5 Years |

# Case Study Scenario Analysis

## Scenario Analysis: Key Variables

| Scenario Variable | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|
| *Equipment Cost* | ↑ 15% in the equipment cost for Project A and B | No change from base case | No change from base case | No change from base case |
| *Loan Terms* | No change from base case | ↓ Loan repayment drops to 2 years in Project A and 4 years in Project B | No change from base case | No change from base case |
| *Energy Services Agreement* | No change from base case | No change from base case | ↓ NewCo savings share drops to 30% in Project A and to 50% in Project B | No change from base case |
| *Cogeneration System Heat Rate* | No change from base case | No change from base case | No change from base case | ↑ 20% in Cogen plant heat rate for Project B |

# Scenario Analysis Results

## Model Demonstration: Investment Criteria for NewCo

| Project | Base Case | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|---|
| *Project A* | | | | | |
| *NPV (in LE)* | 99,946 | (28,717) | 95,157 | -72,614 | Not applicable |
| *IRR* | 36% | 13% | 30% | 4% | |
| *Payback Period* | 1.71 | 1.93 | 1.71 | 1.71 | |
| *Project B* | | | | | |
| *NPV (in LE)* | 1,616,759 | (227,033) | 1,554,043 | 137,998 | 815,762 |
| *IRR* | 36% | 16% | 31% | 20% | 27% |
| *Payback Period* | 2.74 | 3.13 | 2.74 | 2.74 | 2.90 |

## *Energy Services Model: Key Results*

**PROJECT A - SCENARIO 1**

**FINANCIAL RESULTS**

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 13% |
| Simple Payback Period (in Years) | 1.93 |
| Net Present Value (in LE at 18% Discount Rate) | -28,717 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 1.93 |
| Net Present Value (in LE at 18% Discount Rate) | 4,121,123 |

**PROJECT COST SUMMARY (in thousand LE)**

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 1% |
| Equipment Costs | 1,495,000 | 80% |
| Engineering & Design | 100,000 | 5% |
| Construction Management | 50,000 | 3% |
| Contingency (% of Total Capital Cost) | 167,000 | 9% |
| *Total Capital Costs* | 1,837,000 | 98% |
| **Financing Costs** | | |
| Interest During Construction | 39,362 | 2% |
| *Total Financing Costs* | 39,362 | 2% |
| **Total Project Cost/Uses of Funds** | 1,876,362 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 375,272 | 20% |
| Debt | 1,501,090 | 80% |
| **Total Sources of Funds** | 1,876,362 | 100% |

**ENERGY USE AND COST SUMMARY**

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 3,400 | 1,574,200 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 4,560,000 | 836,760 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,410,960 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 4,015,676 | 562,195 |
| Electricity (kWh/year)[1] | 4,560,000 | 836,760 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 1,398,955 |
| **Net Annual Energy Cost Savings (post-project)[2]** | | 1,012,005 |

**NATURAL GAS USE SUMMARY**

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,015,676 | 562,195 |
| Cogeneration | 0 | 0 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 4,015,676 | 562,195 |

| ENVIRONMENTAL SUMMARY | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 3,150 |
| Sulfur Dioxide (SO2) Emission Reductions | 136 |
| Nitrous Oxide (Nox) Emission Reductions | 14 |

*Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas

2) These savings do not include project operating expenses (O&M, M&V) and debt service

**PROJECT B - SCENARIO 1**

**FINANCIAL RESULTS**

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 16% |
| Simple Payback Period (in Years) | 3.13 |
| Net Present Value (in LE at 18% Discount Rate) | -227,033 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 3.13 |
| Net Present Value (in LE at 18% Discount Rate) | 19,293,781 |

**PROJECT COST SUMMARY (in thousand LE)**

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 0% |
| Equipment Costs | 16,675,000 | 82% |
| Engineering & Design | 500,000 | 2% |
| Construction Management | 400,000 | 2% |
| Contingency (% of Total Capital Cost) | 1,760,000 | 9% |
| *Total Capital Costs* | 19,360,000 | 95% |
| **Financing Costs** | | |
| Interest During Construction | 943,637 | 5% |
| *Total Financing Costs* | 943,637 | 5% |
| **Total Project Cost/Uses of Funds** | 20,303,637 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 4,060,727 | 20% |
| Debt | 16,242,910 | 80% |
| **Total Sources of Funds** | 20,303,637 | 100% |

**ENERGY USE AND COST SUMMARY**

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 4,200 | 1,944,600 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 35,000,000 | 6,422,500 |
| Maximum Electricity Demand (in kW) | 6,000 | 525,600 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 8,892,700 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 15,285,541 | 2,139,976 |
| Electricity (kWh/year)[1] | 0 | 0 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,139,976 |
| **Net Annual Energy Cost Savings (post-project)[2]** | | 6,752,724 |

**NATURAL GAS USE SUMMARY**

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,960,541 | 694,476 |
| Cogeneration | 10,325,000 | 1,445,500 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 15,285,541 | 2,139,976 |

| ENVIRONMENTAL SUMMARY | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 10,886 |
| Sulfur Dioxide (SO2) Emission Reductions | 840 |
| Nitrous Oxide (Nox) Emission Reductions | 73 |

*Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas

2) These savings do not include project operating expenses (O&M, M&V) and debt service

## *Energy Services Model: Key Results*

**PROJECT A - SCENARIO 2**

**FINANCIAL RESULTS**

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 30% |
| Simple Payback Period (in Years) | 1.71 |
| Net Present Value (in LE at 18% Discount Rate) | 95,157 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 1.71 |
| Net Present Value (in LE at 18% Discount Rate) | 4,201,178 |

**PROJECT COST SUMMARY (in thousand LE)**

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 2% |
| Equipment Costs | 1,300,000 | 78% |
| Engineering & Design | 100,000 | 6% |
| Construction Management | 50,000 | 3% |
| Contingency (% of Total Capital Cost) | 147,500 | 9% |
| *Total Capital Costs* | 1,622,500 | 98% |
| **Financing Costs** | | |
| Interest During Construction | 34,766 | 2% |
| *Total Financing Costs* | 34,766 | 2% |
| **Total Project Cost/Uses of Funds** | 1,657,266 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 331,453 | 20% |
| Debt | 1,325,813 | 80% |
| **Total Sources of Funds** | 1,657,266 | 100% |

**ENERGY USE AND COST SUMMARY**

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 3,400 | 1,574,200 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 4,560,000 | 836,760 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,410,960 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 4,015,676 | 562,195 |
| Electricity (kWh/year)* | 4,560,000 | 836,760 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 1,398,955 |
| **Net Annual Energy Cost Savings (post-project)*** | | 1,012,005 |

**NATURAL GAS USE SUMMARY**

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,015,676 | 562,195 |
| Cogeneration | 0 | 0 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 4,015,676 | 562,195 |

| ENVIRONMENTAL SUMMARY | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 3,150 |
| Sulfur Dioxide (SO2) Emission Reductions | 136 |
| Nitrous Oxide (Nox) Emission Reductions | 14 |

*Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas
2) These savings do not include project operating expenses (O&M, M&V) and debt service

**PROJECT B - SCENARIO 2**

**FINANCIAL RESULTS**

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 31% |
| Simple Payback Period (in Years) | 2.74 |
| Net Present Value (in LE at 18% Discount Rate) | 1,554,043 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 2.74 |
| Net Present Value (in LE at 18% Discount Rate) | 19,842,032 |

**PROJECT COST SUMMARY (in thousand LE)**

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 0% |
| Equipment Costs | 14,500,000 | 81% |
| Engineering & Design | 500,000 | 3% |
| Construction Management | 400,000 | 2% |
| Contingency (% of Total Capital Cost) | 1,542,500 | 9% |
| *Total Capital Costs* | 16,967,500 | 95% |
| **Financing Costs** | | |
| Interest During Construction | 827,023 | 5% |
| *Total Financing Costs* | 827,023 | 5% |
| **Total Project Cost/Uses of Funds** | 17,794,523 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 3,558,905 | 20% |
| Debt | 14,235,618 | 80% |
| **Total Sources of Funds** | 17,794,523 | 100% |

**ENERGY USE AND COST SUMMARY**

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 4,200 | 1,944,600 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 35,000,000 | 6,422,500 |
| Maximum Electricity Demand (in kW) | 6,000 | 525,600 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 8,892,700 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 15,285,541 | 2,139,976 |
| Electricity (kWh/year)[1] | 0 | 0 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,139,976 |
| **Net Annual Energy Cost Savings (post-project)[2]** | | 6,752,724 |

**NATURAL GAS USE SUMMARY**

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,960,541 | 694,476 |
| Cogeneration | 10,325,000 | 1,445,500 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 15,285,541 | 2,139,976 |

| ENVIRONMENTAL SUMMARY | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 10,886 |
| Sulfur Dioxide (SO2) Emission Reductions | 840 |
| Nitrous Oxide (Nox) Emission Reductions | 73 |

*Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas

2) These savings do not include project operating expenses (O&M, M&V) and debt service

*Energy Services Model: Key Results*

**PROJECT A - SCENARIO 3**

**FINANCIAL RESULTS**

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 4% |
| Simple Payback Period (in Years) | 1.71 |
| Net Present Value (in LE at 18% Discount Rate) | -72,614 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 1.71 |
| Net Present Value (in LE at 18% Discount Rate) | 4,378,527 |

**PROJECT COST SUMMARY (in thousand LE)**

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 2% |
| Equipment Costs | 1,300,000 | 78% |
| Engineering & Design | 100,000 | 6% |
| Construction Management | 50,000 | 3% |
| Contingency (% of Total Capital Cost) | 147,500 | 9% |
| *Total Capital Costs* | 1,622,500 | 98% |
| **Financing Costs** | | |
| Interest During Construction | 34,766 | 2% |
| *Total Financing Costs* | 34,766 | 2% |
| **Total Project Cost/Uses of Funds** | 1,657,266 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 331,453 | 20% |
| Debt | 1,325,813 | 80% |
| **Total Sources of Funds** | 1,657,266 | 100% |

**ENERGY USE AND COST SUMMARY**

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 3,400 | 1,574,200 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 4,560,000 | 836,760 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,410,960 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 4,015,676 | 562,195 |
| Electricity (kWh/year)[1] | 4,560,000 | 836,760 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 1,398,955 |
| **Net Annual Energy Cost Savings (post-project)[2]** | | 1,012,005 |

**NATURAL GAS USE SUMMARY**

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,015,676 | 562,195 |
| Cogeneration | 0 | 0 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 4,015,676 | 562,195 |

| **ENVIRONMENTAL SUMMARY** | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 3,150 |
| Sulfur Dioxide (SO2) Emission Reductions | 136 |
| Nitrous Oxide (Nox) Emission Reductions | 14 |

[1]Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas
2) These savings do not include project operating expenses (O&M, M&V) and debt service

**PROJECT B - SCENARIO 3**

**FINANCIAL RESULTS**

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 20% |
| Simple Payback Period (in Years) | 2.74 |
| Net Present Value (in LE at 18% Discount Rate) | 137,998 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 2.74 |
| Net Present Value (in LE at 18% Discount Rate) | 21,347,672 |

**PROJECT COST SUMMARY (in thousand LE)**

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 0% |
| Equipment Costs | 14,500,000 | 81% |
| Engineering & Design | 500,000 | 3% |
| Construction Management | 400,000 | 2% |
| Contingency (% of Total Capital Cost) | 1,542,500 | 9% |
| *Total Capital Costs* | 16,967,500 | 95% |
| Financing Costs | | |
| Interest During Construction | 827,023 | 5% |
| *Total Financing Costs* | 827,023 | 5% |
| **Total Project Cost/Uses of Funds** | 17,794,523 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 3,558,905 | 20% |
| Debt | 14,235,618 | 80% |
| **Total Sources of Funds** | 17,794,523 | 100% |

**ENERGY USE AND COST SUMMARY**

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 4,200 | 1,944,600 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 35,000,000 | 6,422,500 |
| Maximum Electricity Demand (in kW) | 6,000 | 525,600 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 8,892,700 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 15,285,541 | 2,139,976 |
| Electricity (kWh/year)[1] | 0 | 0 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,139,976 |
| **Net Annual Energy Cost Savings (post-project)[2]** | | 6,752,724 |

**NATURAL GAS USE SUMMARY**

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,960,541 | 694,476 |
| Cogeneration | 10,325,000 | 1,445,500 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 15,285,541 | 2,139,976 |

| ENVIRONMENTAL SUMMARY | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 10,886 |
| Sulfur Dioxide (SO2) Emission Reductions | 840 |
| Nitrous Oxide (Nox) Emission Reductions | 73 |

*Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas

2) These savings do not include project operating expenses (O&M, M&V) and debt service

**PROJECT B - SCENARIO 4**

**FINANCIAL RESULTS**

| NewCo Results | |
|---|---|
| Internal Rate of Return (IRR) | 27% |
| Simple Payback Period (in Years) | 2.90 |
| Net Present Value (in LE at 18% Discount Rate) | 815,762 |

| Customer Results | |
|---|---|
| Internal Rate of Return (IRR) | Not Applicable |
| Simple Payback Period (in Years) | 2.90 |
| Net Present Value (in LE at 18% Discount Rate) | 18,578,262 |

**PROJECT COST SUMMARY (in thousand LE)**

| Capital Costs (in thousand LE) | Category | Percentage |
|---|---|---|
| Energy Audit & Feasibility Study | 25,000 | 0% |
| Equipment Costs | 14,500,000 | 81% |
| Engineering & Design | 500,000 | 3% |
| Construction Management | 400,000 | 2% |
| Contingency (% of Total Capital Cost) | 1,542,500 | 9% |
| *Total Capital Costs* | 16,967,500 | 95% |
| **Financing Costs** | | |
| Interest During Construction | 827,023 | 5% |
| *Total Financing Costs* | 827,023 | 5% |
| **Total Project Cost/Uses of Funds** | 17,794,523 | 100% |

| Sources of Funds | Total (in LE) | Percentage |
|---|---|---|
| Equity | 3,558,905 | 20% |
| Debt | 14,235,618 | 80% |
| **Total Sources of Funds** | 17,794,523 | 100% |

**ENERGY USE AND COST SUMMARY**

| Baseline Energy Use and Cost (pre-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 4,200 | 1,944,600 |
| Natural Gas (m3/year) | 0 | 0 |
| Electricity (kWh/year) | 35,000,000 | 6,422,500 |
| Maximum Electricity Demand (in kW) | 6,000 | 525,600 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 8,892,700 |

| Energy Use and Costs (post-project) | Energy Units | Cost (in LE) |
|---|---|---|
| Mazout (ton/year) | 0 | 0 |
| Solar (ton/year) | 0 | 0 |
| Natural Gas (m3/year) | 17,350,541 | 2,429,076 |
| Electricity (kWh/year)[1] | 0 | 0 |
| Maximum Electricity Demand (in kW) | 0 | 0 |
| LPG (ton/year) | 0 | 0 |
| *Total* | | 2,429,076 |
| **Net Annual Energy Cost Savings (post-project)[2]** | | 6,463,624 |

**NATURAL GAS USE SUMMARY**

| Energy Services Project Type | m³/year of Gas | Cost (in LE) |
|---|---|---|
| Traditional Fuel Switching | 4,960,541 | 694,476 |
| Cogeneration | 12,390,000 | 1,734,600 |
| Self Generation | 0 | 0 |
| *Total Natural Gas Use* | 17,350,541 | 2,429,076 |

| ENVIRONMENTAL SUMMARY | Tons per Year |
|---|---|
| Cardon Dioxide (CO2) Emission Reductions | 6,859 |
| Sulfur Dioxide (SO2) Emission Reductions | 840 |
| Nitrous Oxide (Nox) Emission Reductions | 73 |

*Notes:

1) For Cogen and Self-Gen projects, the customer's electricity demand will be met either in full or in part through the on-site generation of power using natural gas
2) These savings do not include project operating expenses (O&M, M&V) and debt service