Finicial evaluation of techologies

Analysis of two energy proposals Two electri supply technologies have the following characteristics: Capital cost Annual operating cost Lifetime (years)

Salvage value (/cost) ($)

Annual electricity supplied (kWh)

Technology A (a sustainable energy option)

20 000

500

20

2000

25 000

Technology B (a fossil fuel option)

10 000

3000

10

-2000

25 000

1. Calculate the simple payback period for technology A relative to technology B.

Would a company that sets a two year maximum payback period for new investments spend the extra capital on technology A?

Project A

Project B

Initial Investment

$20, 000

$10, 000

Annual electricity supplied

$ 6, 000

$ 6, 000

Less: Maintenance cost

500

3, 000

Net annual benefit

5, 500

$ 3, 000

Payback period

3. 63 years

3. 3 years

*Assume that the cost of electricity per kwh is 12cents –(In US)

In simple calculations, Proj. B has a shorter time frame of return on investments which is 3. 3 years as compared with 3. 6 years of Proj. A. None of the projects fall within the required 2 years time frame.

2. Calculate the internal rate of return for the additional investment in A compared to B over the assessment periods:

a. 5 years

b. 10 years

c. 20 years

Project A

Initial investment

Cash flows

PV 5%

NPV

-20, 000

5 yrs 0. 7815

30000

23, 445

3, 445

10 yrs. 0. 6139

60, 000

92, 085

72, 085

15 yrs. 0. 4810

90, 000

43, 290

23, 290

Project B

Initial Investment

Cash Flows

PV 5%

NPV

-10, 000

5 yrs 0. 7815

30, 000

23, 445

13, 445

10 yrs 0. 6139

60, 000

92, 085

82, 085

15 yrs. 0. 4810

90, 000

43, 290

33, 290

Both projects show positive PV and NPV at 5% rate of return. However TSech B has a higher PV and positive NPV. Between two positsive proposals, one that gives a higher value is acceptable.

In each case state whether the company would invest the extra capital in technology A if its minimum required real internal rate of return is 10%. (Be careful to take account of all replacements and salvage values during each assessment period. But in the case of a technology that still has a useful lifetime remaining at the end of a period, do not seek to estimate its residual value; that is, only count the salvage value at the end of a lifetime.)

Project A

Cash flows

PV 10%

0. 6209

NPV

Initial cost

20, 000

5 YEARS

30, 000

Less: Depn.

5, 000

Net of cash flows

25, 000

15, 522. 5

-4477. 50

PROJECT B

Initial Cost

10, 000

5 YEARS

30, 000

Less depreciation

5, 000

Net of cash flows

25, 000`

15, 522. 50

5, 552. 50

In both computation, Project B shows a higher positive NPV showing that " B" is acceptable than " A". In this case, company should invest its excess capital to " B" at 10% rate of return.

3. Calculate the Present Worth (that is, the Net Present Value [NPV] of total costs) for each of the technologies for the real discount rates and periods of assessment as specified in the following tables (please present results in this format):

Technology A

Assessment period

Discount rate

(years)

5%

10%

15%

20%

5

0. 7815

0. 6209

0. 497

0. 402

10

0. 6139

0. 3855

0. 247

0. 162

15

0. 4810

0. 2394

0. 123

0. 065

20

0. 3769

0. 1486

0. 061

0. 026

Technology B

Assessment period

Discount rate

(years)

5%

10%

15%

20%

5

0. 7815

0. 6209

0. 497

0. 402

10

0. 6139

0. 3855

0. 247

0. 162

15

0. 4810

0. 2394

0. 123

0. 065

20

0. 3769

0. 1486

0. 061

0. 026

Hence fill in the following table saying which technology would be selected for each of the cases on the basis of highest Present Worth (that is, NPV of lowest total cost):

Project A

Net Present Value

Assessment

Period

5%

10%

15%

20%

-20, 000

5

3445

-1, 373

-5090

-5090

10

17914

3130

-5180

-5180

15

23, 290

1546

-8980

-8980

20

25, 228

-2168

-12680

-12680

Project B

Net Present Value

Assessment

Period

5%

10%

15%

20%

5

22445

17627

4910

11060

10

26834

13130

4820

8720

15

33290

11545

1070

-4150

20

35228

7832

-2680

-7000

At different discount rates and number of years, NPV of Proj. B is higher than A.

4. Using your answers to question 3, what are the lifecycle costs of both technologies over one lifecycle of technology A at (a) a 5% real discount rate; and (b) a 20% real discount rate. Which technology is preferred on this lifecycle cost basis in each case

A

B

Initial investment

20, 000

10, 000

PV of Operating cost

3, 769

4, 860

Residual value

2, 000

0

Total life cycle cost

25, 769

14, 860

Initial cost of project

20, 000

10, 000, 00

LCC

5, 769

4, 860

Technology A has higher LCC than Tech. B and should be preferred.

(a) Calculate the average unit cost of the power in present value terms (in cents/kWh) supplied by each technology over a period of 20 years at a discount rate of 5%. Hint: use the answers from question 3 again to find the NPV of total costs for each technology over 20 years and then divide this amount by the total electricity supplied over this period.

NPV

kW/h supplied

Ave. Cost per unit

Project A

25, 228

25, 000

1. 10

Project B

35, 228

25, 000

1. 41

5. Discuss briefly some of points emerging from this analysis of relevance to the financial comparison of sustainable energy supply options (in particular renewable) and current fossil-fuel technologies.

New technologies are being developed to replace use of fossil fuels used for power generation. Studies about renewable energies are being done by the authorities if its cost will compensate its use against cost of fossil fuels. Fossil fuels like coal and gas are the most commonly used around the world for power generation.

This study looked at the cost of technology from fossil fuel and that of sustainable energy. A comparison of both presented important points in terms of capital and cost.

1. In terms of technology, the average cost per kWh is much higher in Technology B which is 1. 41 than 1. 10 of A which means fossil energy will be more costly to produce and will be a higher price to consumer to borne.

2. Technology B gives a higher NPV than Technology A for the same 20 year period. A high positive value is an acceptable project proposition, and between two proposals, one having a higher value is considered.

Annex

1. Payback calculation using simple payback method.

Payback A

Payback B

Initial investment

20, 000

10, 000

Annual electricity supplied

6, 000

6, 000

Less maintenance cost

500

3000

Net annual benefit

5, 500

3000

3. 63 yrs

3. 3 yrs.

*Assume that the cost of electricity per kwh is 12cents –(In US)

Formula used:

Capital cost divided by net annual benefit

2. Discount rate factors solving for PV and NPV

Technology A

Assessment period

Discount rate

(years)

5%

10%

15%

20%

5

0. 7815

0. 6209

0. 497

0. 402

10

0. 6139

0. 3855

0. 247

0. 162

15

0. 4810

0. 2394

0. 123

0. 065

20

0. 3769

0. 1486

0. 061

0. 026

Assessment period

Discount rate

(years)

5%

10%

15%

20%

5

0. 7815

0. 6209

0. 497

0. 402

10

0. 6139

0. 3855

0. 247

0. 162

15

0. 4810

0. 2394

0. 123

0. 065

20

0. 3769

0. 1486

0. 061

0. 026

5%

Tech A

Cash Flow

PVFACTOR

PV

NPV

20, 000

5 yrs

30, 000

0. 7815

23445

3445

10

60000

0. 6319

37914

17914

15

90000

0. 481

43290

23, 290

20

120000

. 0. 3769

45228

25, 228

10%

20000

30, 000

0. 6209

18627

-1, 373

5

60000

0. 3855

23130

3130

10

90000

0. 2394

21546

1546

15

120000

0. 1486

17832

-2168

20

15%

5

20, 000

30, 000

0. 497

14910

-5090

10

60000

0. 247

14820

-5180

15

90000

0. 123

11070%

-8980

11070

20

120, 000

0. 061

7320%

-12680

7320

20%

5

30000

0. 402

4860

3860

10

60000

0. 162

9720

8720

15

90000%

0. 065

5850

4850

30

120000

0. 026

3000

-7000

TECHNOLOGY B

Tech B

CASH FLOW

FACTR

PV

NPV

10, 000

5%

5

30, 000

0. 7815

23445

22445

10

60000

0. 6139

36834

26834

15

90000

0. 4810

43290

33290

20

120, 000

0. 3769

45228

35228

10%

30, 000

0. 6209

18627

17627

60000

0. 3855

23130

13130

90000

0. 2394

21546

11545

120, 000

0. 1486

17832

7832

15%

30, 000

0. 497

14910

4910

60000

0. 247

14820

4820

90000

0. 123

11070

1070

120, 000

0. 061

7320

-2680

20%

30, 000

0. 402

12060

11060

60000

0. 162

9720

8720

90000

0. 065

5850

-4150

120, 000

0. 026

3000

-7000