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Subject: Open Elective EE-604(B) Energy Conservation and Management

Unit: 05

Topic: internal rate of return, net present value; Life Cycle costing, ESCO concept.

UNIT-05/LECTURE- 02
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Internal Rate of Return (IRR)
Internal rate of return (IRR) is the interest rate at which the net present value of all the cash flows (both positive and negative) from a project or investment equal zero. Internal rate of return is used to evaluate the attractiveness of a project or investment. If the IRR of a new project exceeds a company's required rate of return, that project is desirable. If IRR falls below the required rate of return, the project should be rejected. IRR Formula & Example
You can use the following formula to calculate IRR:
0 = P0 + P1/(1+IRR) + P2/(1+IRR)2 + P3/(1+IRR)3 + . . . +Pn/(1+IRR)n
where P0, P1, . . . Pn equals the cash flows in periods 1, 2, . . . n, respectively; and
IRR equals the project's internal rate of return.Let's look at an example to illustrate how to use IRR.
Assume Company XYZ must decide whether to purchase a piece of factory equipment for $300,000. The equipment would only last three years, but it is expected to generate $150,000 of additional annual profit during those years. Company XYZ also thinks it can sell the equipment for scrap afterward for about $10,000. Using IRR, Company XYZ can determine whether the equipment purchase is a better use of its cash than its other investment options, which should return about 10%.Here is how the IRR equation looks in this scenario:
0 = -$300,000 + ($150,000)/(1+.2431) + ($150,000)/(1+.2431)2 + ($150,000)/(1+.2431)3 + $10,000/(1+.2431)4
The investment's IRR is 24.31%, which is the rate that makes the present value of the investment's cash flows equal to zero. From a purely financial standpoint, Company XYZ should purchase the equipment since this generates a 24.31% return for the Company --much higher than the 10% return available from other investments.

A general rule of thumb is that the IRR value cannot be derived analytically. Instead, IRR must be found by using mathematical trial-and-error to derive the appropriate rate. However, most business calculators and spreadsheet programs will automatically perform this function.IRR can also be used to calculate expected returns on stocks or investments, including the yield to maturity on bonds. IRR calculates the yield on an investment and is thus different than net present value (NPV) value of an investment.

Why is IRR Important?

IRR allows managers to rank projects by their overall rates of return rather than their net present values, and the investment with the highest IRR is usually preferred. This easy comparison makes IRR attractive, but there are limits to its usefulness. One downside for example: IRR works only for investments that have an initial cash outflow (the purchase of the investment) followed by one or more cash inflows. In addition, IRR does not measure the absolute size of the investment or the return. This means that IRR can favor investments with high rates of return even if the dollar amount of the return is very small. For example, a $1 investment returning $3 will have a higher IRR than a $1 million investment returning $2 million, but the latter brings in $1 million dollars instead of just $2. Another short coming is that IRR can't be used if the investment generates interim cash flows. Finally, IRR does not consider cost of capital and can't compare projects with different durations. Overall, IRR is best-suited for analyzing venture capital and private equity investments, which typically entail multiple cash investments over the life of the business, and a single cash outflow at the end via IPO or sale.

What is a Good IRR?

Typically, the higher the IRR, the higher the rate of cash inflow a company can expect from a project or investment.That said, organizations may prefer a lower IRR on a large project rather than a high IRR on a small one. For example, expecting a 15% IRR from a proposed project may seem better than earning a 10% return on another investment at first glance. But put in dollar terms, earning $1,500 from a $10,000 project would not add as much overall value or cash flow to your organization as earning $100,000 from a $1 million project, even though the IRR would be higher on the first project (15% versus 10%).

What Does a Negative IRR Mean?

A positive IRR means a project or investment is expected to return some value to the organization. A negative IRR would mean that the proposed project or investment is expected to cost more than it returns, or lose value for the company. Generally a company would forgo making an investment in something with a negative IRR.Before you make a decision, double check your math to make sure the IRR figure you found is correct!

Net Present Value (NPV)

Net present value (NPV) is a method used to determine the current value of all future cash flows generated by a project, including the initial capital investment. It is widely used in capital

budgeting to establish which projects are likely to turn the greatest profit.The formula for NPV varies depending on the number and consistency of future cash flows. If there's one cash flow from a project that will be paid one year from now, the calculation for the net present value is as follows:

$$NPV = \frac{\text{Cash flow}}{(1+i)^t} - \text{initial investment}$$

where:

i = Required return or discount rate

t = Number of time periods

If analyzing a longer-term project with multiple cash flows, the formula for the net present value of a project is:

$$NPV = \sum_{t=0}^{n} \frac{R_t}{(1+i)^t}$$

where:

R_t = net cash inflow-outflows during a single period t

i = discount rate

t = number of time periods

Life Cycle Costing

Life cycle costing is a system that tracks and accumulates the actual costs and revenues attributable to cost object from its invention to its abandonment. Life cycle costing involves tracing cost and revenues on a product by product base over several calendar periods.

The Life Cycle Cost (LCC) of an asset is defined as:

"The total cost throughout its life including planning, design, acquisition and support costs and any other costs directly attributable to owning or using the asset". Life Cycle Cost (LCC) of an item represents the total cost of its ownership, and includes all the cots that will be incurred during the life of the item to acquire it, operate it, support it and finally dispose it. Life Cycle Costing adds all the costs over their life period and enables an evaluation on a common basis for the specified period (usually discounted costs are used). This enables decisions on acquisition, maintenance,refurbishment or disposal to be made in the light of fullcost implications. In essence, Life Cycle Costing is a meansof estimating all the costs involved in procuring,operating, maintaining and ultimately disposing a productthroughout

its life.Life cycle costing is different from traditional costaccounting system which reports cost object profitabilityon a calendar basis (i.e. monthly, quarterly and annually)

whereas life cycle costing involves tracing costs and revenues of a cost object (i.e. product, project etc.) over several calendar periods (i.e. projected life of the cost object). Thus, product life cycle costing is an approach used to provide a long-term picture of product line profitability, feedback on the effectiveness of the life cycle planning and cost data to clarify the economic impact on alternative chosen in the design, engineering phase etc. It is also considered as a way to enhance the control of manufacturing costs. It is important to track and measure costs during each stage of a product's life cycle. Life cycle costing processConducting a life cycle cost assessment helps you better predict how much your business will pay when you acquire a new asset.

To calculate an asset's life cycle cost, estimate the following expenses:

1. Purchase
2. Installation
3. Operating
4. Maintenance
5. Financing (e.g., interest)
6. Depreciation
7. Disposal

Life cycle costing process for intangible assets

You can also use life cycle costing to determine how much your intangible assets will cost. Intangible assets are non-physical property, such as patents, your business's brand, and your reputation.Although it is more difficult to add up the whole-life cost of an intangible asset than a tangible asset (physical property), it's still possible. Consider the total cost of acquiring and maintaining an intangible asset.For example, patents cost thousands of dollars. You might also need to hire a lawyer to help you obtain one. And, you will need to pay fees to maintain your patent.Or, consider your business's brand. You might spend money on all the things that go into creating your brand, such as developing a logo, registering your name, and setting up a small business website. Further, you will spend money on marketing and maintaining your brand.

Concept of ESCO and EPC

ESCO is a firm that provides solutions for achieving energy cost reductions, and whose overall compensation can be linked (in part or in full) to the performance of the implemented solutions. In that context, an ESCO can handle projects, mobilize financial resources (not necessary its own equity), offer turn-key services (either on its own or through collaborating with other market players) and assume performance risks.

Energy Performance Contracting (EPC) means a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the entire term of the contract, where investment in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criteria, such as financial savings.Thus, ESCO is related to the company offering energy efficiency services and EPC is the contractual model that governs the relationship between the ESCO and the client. What are the advantages of an ESCO project?Usually, the service offered by an ESCO integrates all energy services for all of the phases of the project through a single contract. Furthermore, the ESCO, grounding its benefits in energy savings, offers a guarantee of obtaining rational solutions consistent with the customer needs. Thus hiring an ESCO enables customers to renew their technology and improve competitiveness and productive assets.
Why and when it is interesting to negotiate with an ESCO?
The underlying logic of an ESCO model is to offer a solution whereby private contractors convert energy inefficiencies into future cash flows and energy saving investments are repaid from savings resulting from the analysis.EPC is highly recommended when the client needs to change its equipment and technologies to obtain gains in term of energy efficiency but the large up-front investments discourage this action.
Other added values of the ESCOs come from:
An ESCO enables its client to outsource energy management activities that are usually not in the client core business
An ESCO focuses on the reduction of energy costs through best management practices, including M&V
Consequently, it is interesting to enter into negotiations with an ESCO whenever a high initial investment is needed, since such an initial investment is minimized or eliminated by an ESCO. In the case where the ESCO provides funding for the implementation of projects, the borrowing capacity of the client will not be affected. The Client can then employ its financial resources for other needs.
What are the differences between EPC and other energy contracts?
An ESCO can generally offer two main models of contracts for energy services:
Energy Supply Contracting (ESC): In order to reduce the price of the energy bill of the client, a long term arrangement with the ESCO is signed. The ESCO may install more efficient equipment, employ more affordable fuels or implement solutions in order to achieve the savings.
Energy Performance Contracting (EPC): EPC is an agreement between the ESCO and the client on the share of the energy savings and its inherent risks as a result of the implementation of energy efficiency measures.

Thus, in the case of ESC, the service simply provides power to the customer, while the EPC offers a more complex and complete service, since it covers both the optimization of energy supply and increases the energy efficiency in the client's facilities. Therefore, the EPC option has the greatest potential of savings.

There are three main types of EPC:

Shared savings: under a shared savings contract, the investment is assumed entirely by the ESCO, including investment financing, management and control of energy consumption.

This mechanism is attractive for the ESCO as long as it excludes penalties in the event that the implemented measures perform poorly or the initial estimation proves to be too low.

In return for providing financing, the ESCO undertakes comprehensive management. In order to compensate for the managerial complexity involved, the ESCO typically prefers large or medium-sized customers.Guaranteed savings: conversely under guaranteed savings contract, the client assumes the entire investment required.

In this case, the ESCO shall ensure real savings and if they are not enough to cover debt service, then ESCO might pay the difference. If however, the savings exceed the guaranteed level, then the customer must pay an agreed upon percentage of the savings to the ESCO.

This mechanism is typically used when the investment associated with the project is undertaken by the customer. This is why this type of contract is only suited for clients with sufficient financing, typically large or medium size companies.

Mixed savings: this kind of contracting is a highbred combination of the two previous models.

The ESCO guarantees savings to the client with any additional savings shared between the ESCO and the client.Thus, the ESCO makes the investment in the new equipment, which is owned by the ESCO for the duration of the contract. Ownership of the equipment is transferred to the client at the end of the contract.Usually, there is a fixed payment (investment amortization) a maintenance fee and a variable payment based on the savings achieved (shared savings).Regarding to the risks, both the ESCO and the client share the risk of performance and, sometimes, the risk of changes to the price of energy. However, the credit risk is usually assumed by the ESCO.

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Assignment

1. Explain the concepts of IRP?
2. Explain the concepts of NPV?
3. Explain the concepts of ESCo?
4. Explain the Life Cycle Cost (LCC)?