SHIP Egypt

Session 16

Financial Analysis of energy-efficiency and renewable-energy options

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The Need for Financial Analysis

- **Clean Energy Technologies (CETs), energy efficiency and the utilization of renewable energy not only avoid and reduce GHG-emissions, but also offer a direct cost advantage to the business.**
- **However, the options are typically long term, involving medium to high investment, and hence are perceived as a larger business risks than end-of-pipe solutions. The crux of the problem is that this risk is often not clearly quantified and predicted.**
- **Thus, financial analysis of GET options becomes necessary.**

Objectives of this Seminar

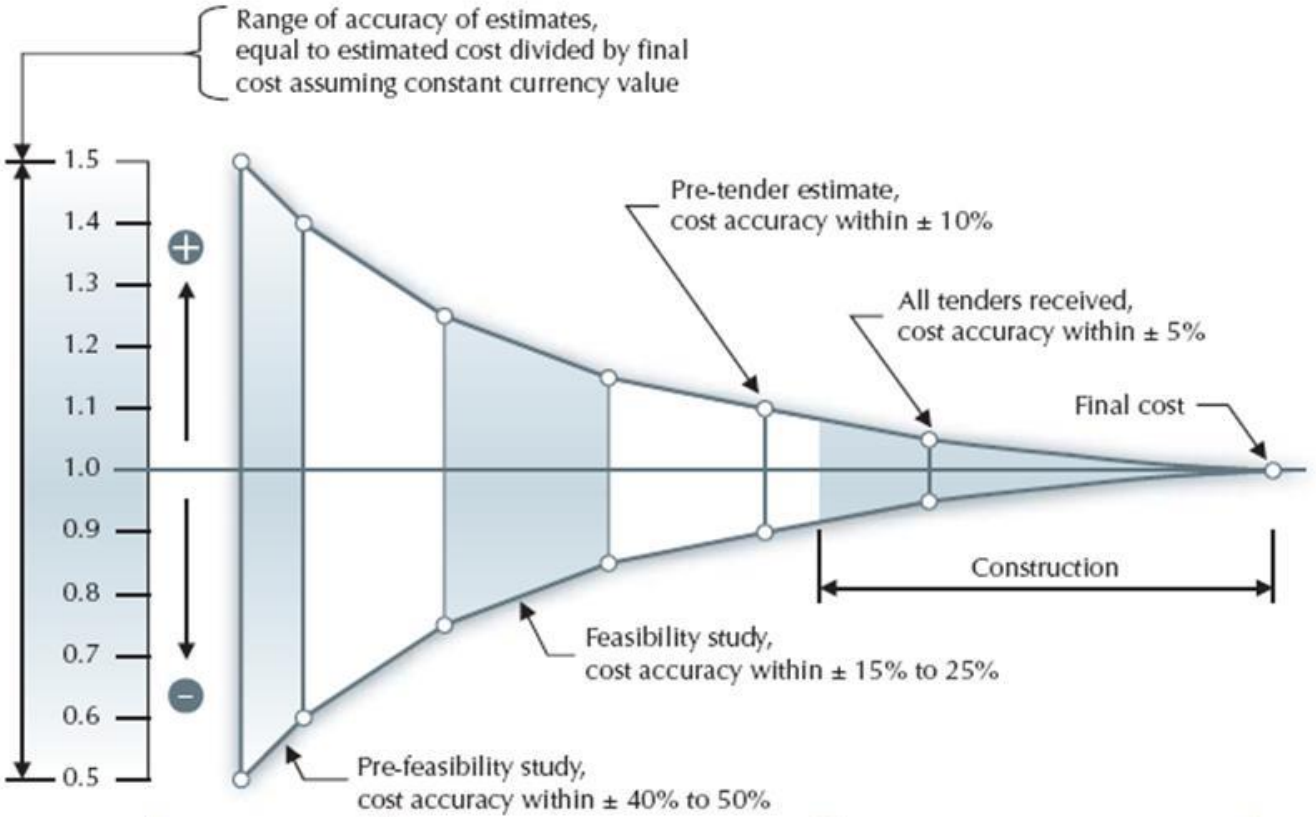
- **To understand the basics of financial analysis**
- **To implement fundamental principles of financial analysis for GET options**
- **To screen options based on financial aspects**

Introduction to Cost Benefit Analysis (CBA)

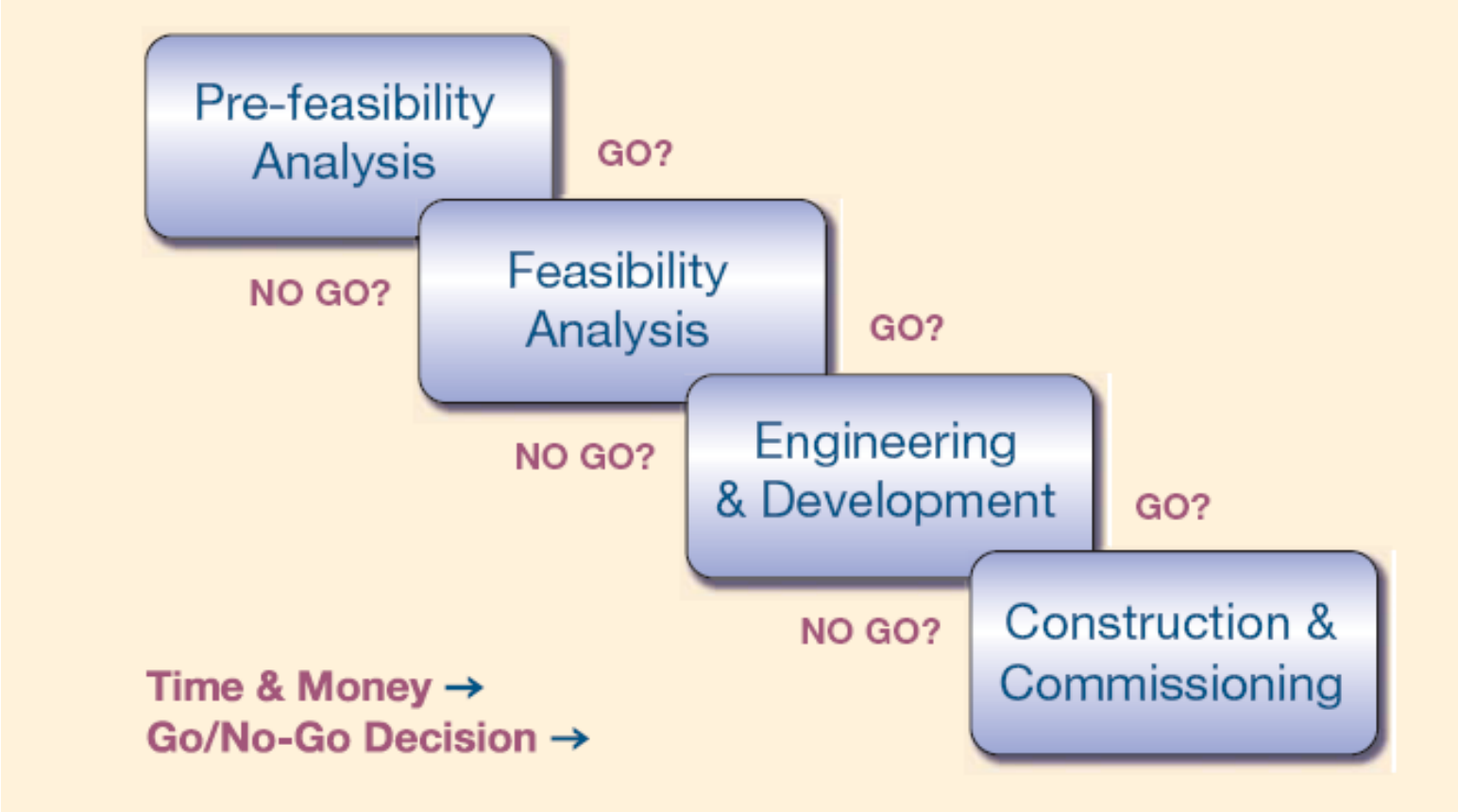
- **CBA facilitates the comparison of alternatives in terms of the monetary costs involved and the benefits obtained.**
- **The costs and benefits (environmental, social or economic) must be quantified in monetary terms to the maximum extent possible. Typically, CBA is used as a tool in feasibility studies for selection of an alternative together with for e.g., life cycle assessment, audits, etc.**
- **Thus, CBA is used in financial analysis to estimate the profitability of a potential investment for a CET option.**

Cost accurarcy will increase during the planning process (Source: Retscreen, 2005)

- **For Pre-feasibility studies, the cost accurarcy might be in the range of ±50%, during the feasibility study uncertaininty should be reduced to ±15%**



Typical CET project implementaion process (Source: RETSCREEN,2005)



Types of initial costs

- **When a CET is going to be installed, a number of first expenses and costs might occur:**
  - ⇨ Expenses for the equipment
  - ⇨ Expenses for engineering
  - ⇨ Costs of transport
  - ⇨ Costs of foundations, halls, support systems, land,…
  - ⇨ Expenses for electrical infrastructure, water supply, waste water systems, …
  - ⇨ Expenses for permits and licenses
  - ⇨ Manpower costs within the company
  - ⇨ Others, depending on the specific project

Time and size compesation for initial costs

➢ Time compensation

- ⇨ In general, there is a price increase over time in everything that is bought (inflation rate in %/year). For some technologies (like PV) that become cheaper, the annual price increase is negative.
- ⇨ To calculate the actual price I from investments at other dates I0, we usw the formula:
  - $I = I_0 * (1 + i)^{(\text{year of planned investment} - \text{year of reference investment})}$

➢ Size compensation

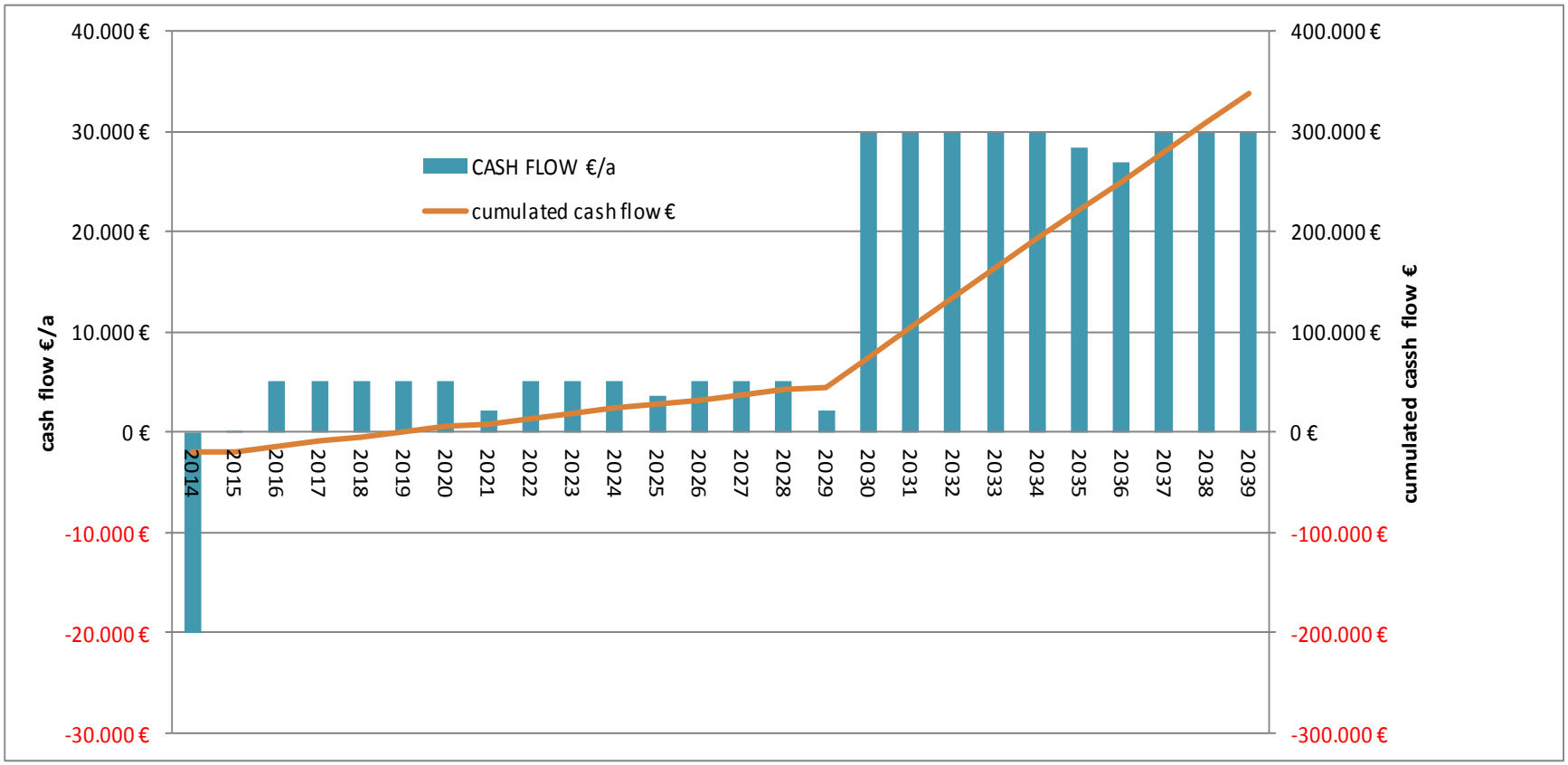
- ⇨ In general, technological installations become relatively cheaper if greater units are bought. Depending on the technology, this means, that the price increases with the power of 0.6 to 0.8 with the size.
  - $I = I_0 * \left(\frac{S}{S_0}\right)^{0.8}$

Elements of CBA

- **Cash flow**
- **Present value (PV)**
- **Measures of Profitability**
  - ⇨ Payback Period
  - ⇨ Net Present Value (NPV)
  - ⇨ Internal Rate of Return (IRR)

Cash Flow

- **A Cash Flow is meant to illustrate incomes ("cash inflows") and expenses ("cash outflows"). They may be conventional and non-conventional. Each arrow represents the time period of a year in this**



Present Value (PV)

- **PV is a way of comparing the value of money now with the value of money in the future. A Ringitt today is worth more than a Ringitt in the future, because inflation erodes the buying power of the future money, while money available today can be invested to grow.**
- **Calculation of the PV requires the use of "interest rate". Interest rate is typically a percentage used to calculate the PV. It reflects the time value of money. Generally, this interest rate is taken as equal to the prevailing bank interest rate.**

Net Pressent Value (NPV)

- **NPV may be defined as the difference between the total present value of the cash inflows and the total present value of the cash outflows.**
- **NPV compares the value of the Ringitt today versus the value of that same Ringitt in the future, after taking inflation and returns into account.**
- **If the NPV of a prospective project is positive then it should be accepted (i.e. NPV > 0)**
- **However, if the NPV of a prospective project is negative, then the project should be rejected because cash flows are negative (i.e. NPV < 0)**
- **If the NPV of a prospective project is zero then it should probably be rejected as it generates exactly the return that is expected (i.e. NPV = 0)**

Internal Rate of Return (IRR)

- **The IRR method of analyzing a project or option allows one to find the interest rate that is equivalent to the Ringitt returns expected from the project or option.**
- **Once you know the IRR, you can compare it to the rates you could earn by investing your money in other projects or options.**
- **If the IRR is less than the cost of borrowing used to fund the project, the project will clearly be a money-loser.**
- **However, usually a business owner will insist that in order to be acceptable, a project must be expected to earn an IRR that is at least several percentage points higher than the cost of borrowing, to compensate the company for its risk, time, and trouble associated with the project.**

Energy production costs

- **A different way to show the economic performance of the installation of measures to improve energy efficiency or renewable energy is to calculate the costs of energy production. The LCOE (Levelised Costs of Energy) is the metrics for the cost of energy produced by an investment.**
- **This is calculated by dividing total costs occurred in one year (investment, annual and periodical) by the total amount of energy produced. The resulting number is the cost of energy produced (LCOE in €/kWh, €/MJ) for the new system. If this price is lower than the existing energy costs, the investment should be made.**
- **Operating time of installation to be considered.**

Payback Period

- **As the name suggests, the Payback Period is the time span required to recover the cost of an investment. It is calculated with the formula below:**
  - $Payback\ period = \frac{€\ invested}{€\ annual\ return}$
- **There are some serious drawbacks with this indicator:**
  - The payback period ignores the time value of money
  - The payback period ignores cash flows after the initial investment has been recouped
- **Therefore the payback period rather is a measure for the economic risk than for the economic performance.**

Calculation with subsidies

- **Subsidized feed in Tariffs**
  - ⇨ If feed in tariffs are subsidized, this has to be considered when calculating the annual revenues (negative annual costs). It might be necessary to make more detailed calculations, if the subsidized tariff has a limited time span.
- **Subsidized investments**
  - ⇨ Subsidized investments have to be taken into account when calculating the investment costs. The investment costs have to be reduced by the amount of subsidies. All other calculations stay the same.

Calculation with third party financing

- **Debt financing with a loan should be considered only if the IRR is higher than the interests rate.**
- **All economic calculations stay the same with external financing, if the following modifications are made:**
  - ⇨ The investment has to be lowered by the amount of the loan
  - ⇨ The repayment of the loan and the payment for the interests have to be added to the annual expenses
- **Since the savings now relate to a smaller amount of own money, the IRR will increase (as long as IIR>i).**

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