

The Local Net Zero Accelerator (LNZA)

Net Zero Investment Training Programme

Module 4: Financial Modelling for Net Zero Projects

Funded by



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Fit4Finance

The Local Net Zero Accelerator



Department for
Energy Security
& Net Zero

Government has provided £19 million to unleash the potential of local government to attract new investment for green growth by piloting new approaches in three areas.

1. Two Local Net Zero Accelerators: Greater Manchester Combined Authority and West Midlands Combined Authority will develop aggregated bundles of projects to secure long-term sustainable investment.
2. A City Leap Replicator: York & North Yorkshire Combined Authority will replicate a similar model to Bristol City Leap, which has established an innovative public-private partnership to secure investment into decarbonising Bristol's council owned estate.
3. Local Net Zero Finance Support Service: to provide access to relevant financial skills, knowledge, and experience.

GMCA GREATER
MANCHESTER
COMBINED
AUTHORITY


West Midlands
Combined Authority


YORK
& NORTH
YORKSHIRE
COMBINED AUTHORITY


Greater
South East
Net Zero Hub

The Net Zero Investment Training Programme

Objectives:

- Provide specialised investment training tailored for local authority professionals that hold positions related to the development and/or financing of net-zero projects
- Up-skill local authority professionals so that they are better placed to both develop and finance Net Zero projects
- Provide training to local authority staff so that they are better placed to support their respective authorities to deliver on climate ambitions/targets

Audience:

- Local Authority Section 151 Officers (Finance Directors)
- Climate, Environment or Sustainability Officers/Directors
- Any other local authority professionals involved in the development or financing of Net Zero projects

The Net Zero Investment Training Programme: Structure

The Net Zero Investment Training Programme is a specialised programme consisting of 6 modules, each requiring a total of 20 hours split between guided and independent learning to complete. The 6 modules are:

1. Understanding the Basics of Net Zero Finance
2. Options Analysis and Appraisal
3. Develop an Effective Business Case
4. Financial Modelling for Net Zero Projects
5. Exploring Innovative Financing for Net Zero
6. Whole-System Financing for Net Zero

Module 4: Financial Modelling for Net Zero Projects

Investment Fundamentals

This module comprises **20 hours of Total Qualification Time (TQT)**, made up of:

- **10 hours of** Guided Learning Hours
- **10 hours of** Independent Learning Hours

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Overview

The purpose of this learning module is to provide a fundamental knowledge of investments and finance to an audience with no or limited financial training or experience.

The objective is to upskill personnel with practical investment knowledge that is relevant to their other specialisms and focus areas.

Use of jargon or complex explanations is limited only to the extent that they are absolutely needed or relevant to know.

Contents

Each section requires a total of **4 learning hours: 2 hours of Guided Learning** and **2 hours of Independent Learning**.

Section 1:

- Core concepts
- Net Present Value & Internal Rate of Return
- Weighted Average Cost of Capital

Section 2:

- Capital Instruments
- Energy Metrics
- Case Study

Section 3:

- Accounting 101
- Cashflows in Excel
- Free Cash flow

Section 4:

- Financial Models
- Scenario planning and sensitivity analysis
- Risks

Section 5:

- Consolidation and case studies

Glossary

- **PV:** Present Value
- **FV:** Future Value
- **FV:** Future Value
- **PV:** Present Value
- **NPV:** Net Present Value
- **WACC:** Weighted Average Cost of Capital
- **IRR:** Internal Rate of Return
- **CoC:** Cash-on-Cash Return
- **kW:** Kilowatt
- **kWh:** Kilowatt Hour
- **kWp:** Kilowatt Pence

Glossary

- **LCOE:** Levelised Cost of Energy
- **M&O:** Operations and Maintenance cost (per unit of energy produced)
- **CF:** Capacity Factor
- **AICPA:** American Institute of Certified Public Accountants
- **FCF:** Free Cash Flow
- **UFCF:** Unlevered Free Cash Flow
- **CAPEX:** Capital Expenditure
- **OPEX:** Operational Expenditure
- **MOIC:** Multiple on Invested Capital
- **DCF:** Discounted Cash Flow

Glossary

- **EBIT:** Earnings Before Interest and Taxes
- **EBITDA:** Earnings Before Interest, Taxes, Depreciation, and Amortisation
- **EPC:** Engineering, Procurement, and Construction (Contractor)

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Section 1:

Summary

Introduces the financial foundations of investment decision-making, linking time value of money to investment appraisal and cost of capital.

Learning Outcomes

- Explain time value of money and discounting
- Interpret and calculate NPV and IRR
- Understand WACC and its role as a discount rate

Section 1 requires 4 learning hours: 2 hours of Guided Learning and 2 hours of Independent Learning.

Core Concepts

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Time Value of Money

The Time Value of Money simply means:

A dollar today is worth more than a dollar tomorrow

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Time Value of Money

This is best evidenced with a thought experiment.

Would you rather receive:

- a) £100 today
- b) £100 in 10 years

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Time Value of Money

Thought Experiment:

Would you rather receive:

- a) £100 today
- b) £100 in 10 years

The correct answer is that you would rather £100 today.

But why?

Time Value of Money

The reasons why money today is worth more than future money:

a) Opportunity Cost

If you had £100 today, you could earn a return by putting it in a savings account or investing. If you waited 10 years to receive the hypothetical £100 you wouldn't receive that return and the difference is referred to as an opportunity cost.

b) Inflation

As the price of goods and services go up over time, your £100 today can buy more goods and services compared to £100 in 10 years time.

c) Risk

There is a risk in waiting 10 years to receive your £100. What if the person or businesses offering it to you went into bankruptcy? By taking £100 today you are avoiding that risk.

Discount Rate

But how much less is £100 worth in 10 years time?

This is where our next concept is introduced; Discount Rate.

Discount Rate is the rate used, expressed as a percentage, to quantify the time value of money.

Let's look at example.

Discount Rate

Let us assume that the discount rate is 8%.

Would you rather receive:

- a) £100 today
- b) £110 in 1 years

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Discount Rate

Let us assume that the discount rate is 8%.

Would you rather receive:

- a) £100 today
- b) £110 in 1 year

The correct answer is £110 in 1 years time. This is because if we selected the first option, we would receive £100 today and in 1 years time it would be worth £108.

Therefore, if we chose the first option, we would have £2 less, i.e., the opportunity cost of selecting the first option is £2.

Discount Rate

Calculating the exact discount rate is outside the scope of this course. However, you can intuitively consider discount risks like the required return you would expect from a given investment opportunity.

There isn't one discount rate for all scenarios. The discount rate is influenced by what is happening in the market, what is happening in that sector, geopolitical risk, and the specific risks associated with the project or company.

Examples	Expected Return
Government Bonds	3-5% p.a.
A Stable Established Publicly Listed Company Stocks e.g.,	6-10% p.a.
An early-stage start up with a limited track record	20% + p.a.,

Discount Rate

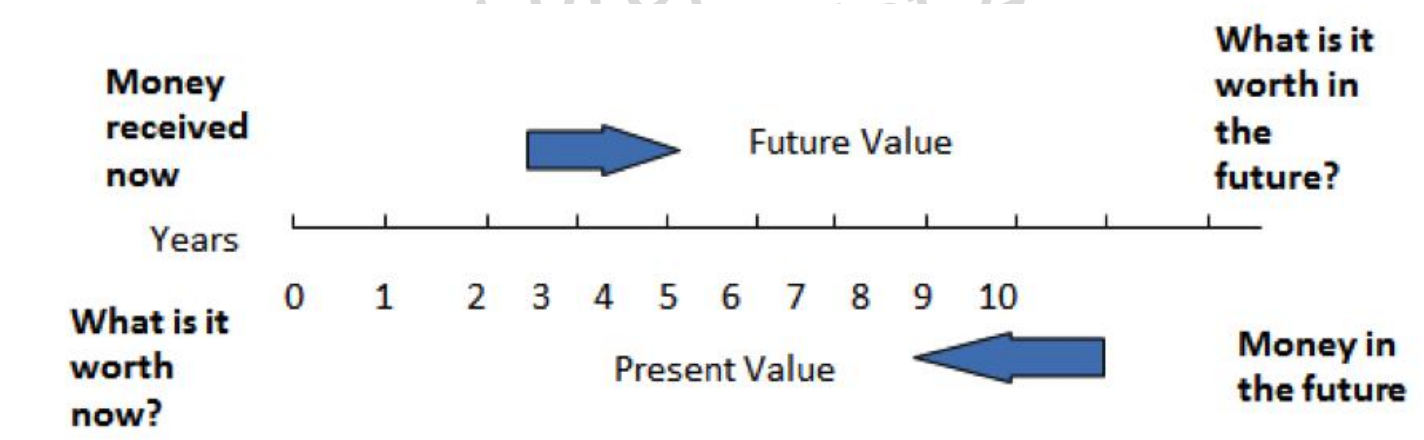
This introduces two new terms;

1) Present Value

- Present Value (PV) is concerned with what is the value of the money in today's terms. In our example, the PV is £100.

2) Future Value

- Future Value (FV) is how much money will we receive in the future. In our example the FV was £108.



Discount Rate

When we know the PV, we can calculate the FV using the following formula:

$$FV = PV(1+r)^n$$

FV = Future Value

PV = Present Value

r = Discount Rate

n = Number of Time Periods (e.g., how many years)

Using our example $FV = £100(1+8\%)^1$ therefore $FV = £108$

Discount Rate

When we know the FV, we can calculate the PV by rearranging the previous formula:

$$PV = FV \frac{1}{(1 + r)^n}$$

FV = Future Value

PV = Present Value

r = Discount Rate

n = Number of Time Periods (e.g., how many years)

Discount Rate

We were previously given the example of £100 today or £110 in 1 year, with a discount rate of 8%.

Let's use the Present Value formula to determine how much £110 in 1 year is worth in today's terms i.e., its Present Value.

$$PV = £110 \times ((1 / (1 + 8\%))^{1})$$

$$PV = £101.85$$

$$PV = FV \frac{1}{(1 + r)^n}$$

This process is referred to as discounting back to present value.

Tips

- When calculating PV, FV, and other formulas, it is easiest to do so on Microsoft Excel
- Reminder that 8% can also be expressed as a decimal of 0.08
- To calculate the number of periods we need to use 'to the power of' function. In Excel we do this using ^ e.g., 2 to the power of 4 is represented as 2^4 .
- Complete the Investment Training #1 exercise. Adjust blue cells to see how Discount Rate & Time affect the PV or FV.

Question 1

You have two choices;

- 1) Receive £150 today
- 2) Receive £150 in five years time

Which would you choose and why?

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Question 1 - Answered

You have two choices;

- 1) Receive £150 today
- 2) Receive £150 in five years time

Which would you choose and why?

Answer:

You should choose Option A, receiving £150 today.

The key reasons are:

- Opportunity Cost: You can invest the £150 today and potentially earn returns, making it worth more in five years.
- Inflation: Over five years, inflation reduces purchasing power. Money today buys more than the same amount in the future.
- Risk: Accepting money in the future carries the risk that it might not be delivered (e.g., due to default or bankruptcy).

Question 2

If the discount rate is 5%, would you prefer to receive £200 today or £220 one year from now? Explain your calculation clearly.

Please feel free to use a calculator or Microsoft Excel to calculate.

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Question 2 - Answered

Go to: [Module4Exercises.xls](#),
Core concepts - Question 2 tab 

If the discount rate is 5%, would you prefer to receive £200 today or £220 one year from now? Explain your calculation clearly.

Please feel free to use a calculator or Microsoft Excel to calculate.

Answer:

We should calculate the future value (FV) of receiving £200 today at the given discount rate:

Where:

- PV = £200
- $r = 5\%$ or 0.05
- $n = 1$ year

Thus:

$$FV = 200 \times (1+0.05)^1 = 200 \times 1.05 = £210$$

The future value of £200 today is £210, compared to £220 in one year. Therefore, it is better to choose the future £220 payment, as it provides £10 more value compared to the present value adjusted for the discount rate.

Question 3

Go to: Module4Exercises.xls,
Core concepts - Question 3 tab 

You will receive £300 three years from now. Assuming a discount rate of 6%, calculate the Present Value (PV) of that £300.

Please feel free to use a calculator or Microsoft Excel to calculate.

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Question 3 - Answered

You will receive £300 three years from now. Assuming a discount rate of 6%, calculate the Present Value (PV) of that £300.

Answer:

We calculate the present value using the following formula:

$$PV = FV \frac{1}{(1 + r)^n}$$

Where:

- FV = £300
- r = 6% or 0.06
- n = 3 years

Thus:

$$PV = 300 / (1.06)^3 = £251.89$$

Net Present Value & Internal Rate of Return

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Net Present Value

Net Present Value (NPV) builds on the Time Value of Money and Discount Rate concepts we previously learnt about.

NPV looks at all the money going out and in (also referred to as cashflows) over the lifetime of an investment. NPV then discounts all of these cashflows to PV.

If this adds up to a positive NPV, that means the investment makes money when factoring in risk and time.

If this adds up to a negative NPV, that means the investment loses money when factoring in risk and time.

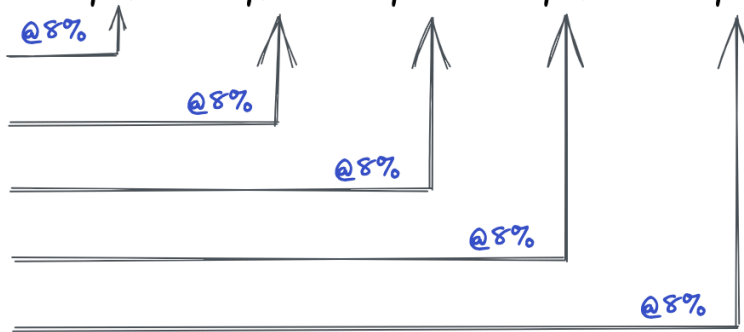
Net Present Value

Using the below hypothetical scenario, we can see a series of cashflows. In Year 0, we invest £100k and receive £10k p.a. until Year 5 when we receive £110k as a final payment.

Year	Cash Flow
0	-100,000 + 9,259 + 8,573 + 7,938 + 7,350 + 74,864 = <u>7,985</u>
1	10,000
2	10,000
3	10,000
4	10,000
5	110,000

IRR 10%

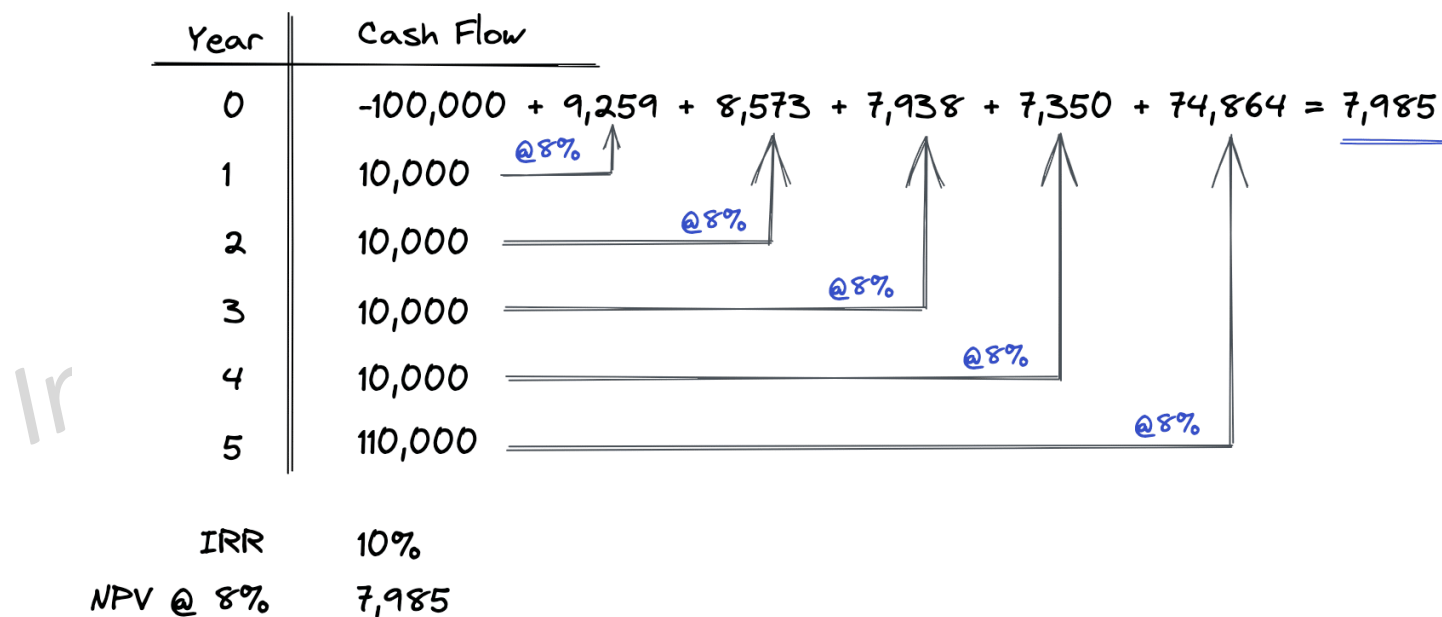
NPV @ 8% 7,985



Net Present Value

We can individually calculate the PV of each cashflow, as shown below, using a discount rate of 8%.

Then by summing up each cashflow we can arrive at a NPV. In this case, it is positive.



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Year	Cash Flow
0	-100,000 + 9,259 + 8,573 + 7,938 + 7,350 + 74,864 = <u>7,985</u>
1	10,000 @8%
2	10,000 @8%
3	10,000 @8%
4	10,000 @8%
5	110,000 @8%

IRR 10%

NPV @ 8% 7,985

Net Present Value

The formula to calculate NPV is:

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

where:

i = Required return or discount rate

t = Number of time periods

This is very similar to the PV formula we previously looked at except:

- We subtract the initial investment (in the previous example, this was £100k)
- We repeat the PV formula for each cashflow

Net Present Value

Practically, this is very onerous to do.

Instead, we use Excel.

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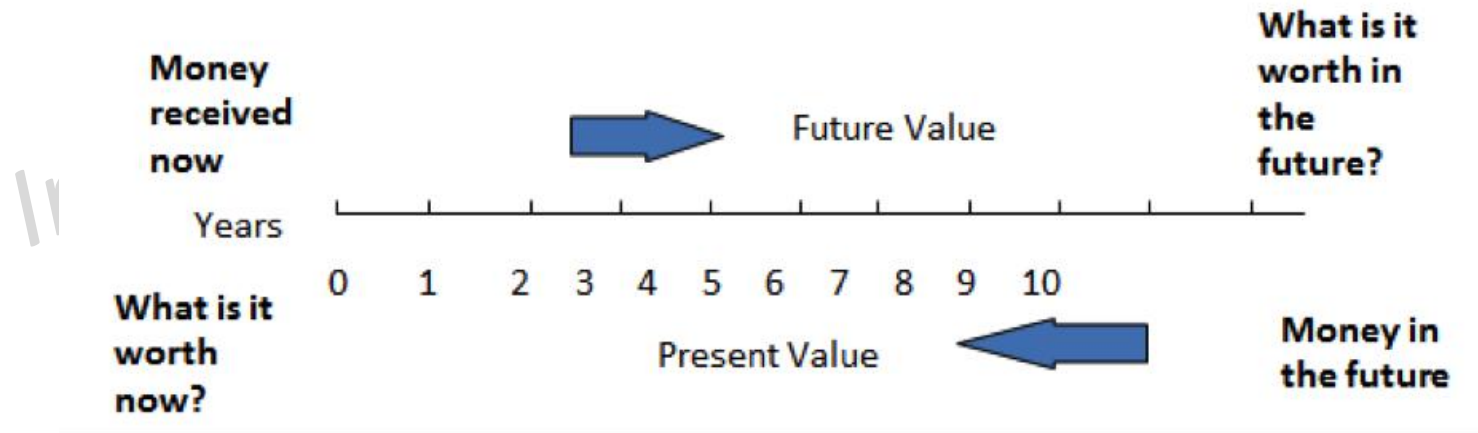
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Tips

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- To calculate the number of periods we need to use 'to the power of' function. In Excel we do this using ^ e.g., 2 to the power of 4 is represented as 2^4 .
- Complete the Investment Training #2 exercises. Adjust blue cells to see how Discount Rate & the timing of cash coming in and out affect the NPV in Activity 1 & IRR in Activity 2.

Question 1

What does a positive NPV indicate about an investment? Provide a brief explanation of why.

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Question 1 - Answered

What does a positive NPV indicate about an investment? Provide a brief explanation of why.

Answer:

A positive NPV indicates that the investment generates more money (in today's value) than it costs, after factoring in both the time value of money and associated risks.

Essentially, it shows that the investment is profitable because the present value (PV) of future cash flows exceeds the initial amount invested.

Question 2

Go to: Module4Exercices.xls,
NPV- Question 2 tab



You are considering investing £50,000 in a project that promises returns of £15,000 per year for the next 4 years.

Assuming a discount rate of 7%, calculate the NPV and explain if you would invest in this project or not.

Please feel free to use a calculator or Microsoft Excel to calculate the answer.

Question 2 - Answered

You are considering investing £50,000 in a project that promises returns of £15,000 per year for the next 4 years.

Assuming a discount rate of 7%, calculate the NPV and explain if you would invest in this project or not.

Answer:

First, calculate the present value (PV) of each future cash flow:

Evaluating each year separately:

- Year 1: $£15,000 / 1.07 = £14,018.69$
- Year 2: $£15,000 / (1.07)^2 = £13,101.58$
- Year 3: $£15,000 / (1.07)^3 = £12,244.47$
- Year 4: $£15,000 / (1.07)^4 = £11,443.43$

Summing these present values:

$$14,018.69 + 13,101.58 + 12,244.47 + 11,443.43 = £50,808.17$$

Subtract initial investment (£50,000): $50,808.17 - 50,000 = £808.17$

Since the NPV is positive (£808.17), the investment is considered profitable and therefore advisable.

Question 3

Answer the following:

- 1) Do higher discount rates typically lead to higher or lower NPV values?
- 2) Why?

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Question 3 - Answered

Answer the following:

- 1) Do higher discount rates typically lead to higher or lower NPV values?
- 2) Why?

Answer:

- 1) Lower
- 2) A higher discount rate reflects greater risks or the requirement for higher returns. When discounting future cash flows at a higher rate, each future cash flow becomes less valuable in today's terms because you are effectively penalizing future money for increased uncertainty or risk.

This effect emphasizes caution and encourages investors to carefully assess whether the potential future returns sufficiently compensate for higher risks associated with an investment.

Weighted Average Cost of Capital

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Weighted Average Cost of Capital

To date, we have assumed that all of the money for these projects comes from one source; equity.

In reality, companies and projects usually have multiple sources of capital such as equity (money from shareholders) or debt (money from lenders such as banks).

Weighted Average Cost of Capital (WACC) is a metric which shows, as it sounds, the average cost of capital for an investment, accounting for various sources of capital.

Weighted Average Cost of Capital

Simplistically, WACC is the combination of both the Cost of Equity and the Cost of Debt.

When we say weighted average cost of capital, it reflects how much of the total capital is debt versus equity to determine a WACC.



Weighted Average Cost of Capital

WACC is often used interchangeably with Discount Rate and frequently acts as a good proxy for Discount Rate

We used Discount Rate and Cost of Equity interchangeably previously because we assumed there was no debt. When there are multiple capital sources we need to ensure we are using the correct terminology.

Calculating Cost of Equity is outside the scope of this presentation.

The Cost of Debt is usually easy to calculate, as it is usually the interest rate that the lender is charging the company or project (incl. fees).

Weighted Average Cost of Capital

The formula for calculating WACC is:

$$WACC = \frac{E}{D + E} (r_e) + \frac{D}{D + E} (r_d)(1 - t)$$

Where:

E = market value of equity

D = market value of debt

r_e = cost of equity

r_d = cost of debt

t = corporate tax rate

This may look daunting, but by breaking it down and applying it to a hypothetical situation, it will help.

Weighted Average Cost of Capital

Situation:

We are a property investment company and want to buy a house with £300k from our bank account and a \$400k mortgage.

I estimate that my Cost of Equity is 12% and the interest rate on my mortgage is 6%.

Step 1: Calculate the first part of the formula (which is the Cost of Equity).

This is simply trying to figure out how much of the capital is coming from equity and then the cost of that equity.

Therefore, $\text{£}300\text{k} / (\text{£}400\text{k} + \text{£}300\text{k}) = 42.86\%$

$42.86\% \times 12.00\% = 5.14\%$

Cost of Equity = 5.14%

$$\text{WACC} = \frac{E}{D + E} (r_e) + \frac{D}{D + E} (r_d)(1 - t)$$

Where:

E = market value of equity

D = market value of debt

r_e = cost of equity

r_d = cost of debt

t = corporate tax rate

Weighted Average Cost of Capital

Situation:

We are a property investment company and want to buy a house with £300k from our bank account and a \$400k mortgage.

I estimate that my Cost of Equity is 12% and the interest rate on my mortgage is 6%.

Step 2: Calculate the second part of the formula (which is the Cost of Debt).

Therefore, $\text{£}400\text{k} / (\text{£}400\text{k} + \text{£}300\text{k}) = 57.14\%$

$57.14\% \times 6.00\% = 3.43\%$

$$\text{WACC} = \frac{E}{D + E} (r_e) + \frac{D}{D + E} (r_d)(1 - t)$$

Where:

E = market value of equity

D = market value of debt

r_e = cost of equity

r_d = cost of debt

t = corporate tax rate

Weighted Average Cost of Capital

If we were exempt from tax, then we would simply add those two figures together to determine our WACC. E.g. $5.14\% + 3.43\% = 8.57\%$

However, tax does exist and we need to account for it. The way tax affects WACC is through interest on debt being tax deductible.

Meaning, if you are a company and pay £1,000 a year on interest for your loans and your tax rate is 25%, then at the end of the year you can take £250 off your tax bill.

Weighted Average Cost of Capital

Step 3: Ensure the Cost of Debt reflects the effects of tax.

The UK corporate tax rate is 25% therefore we need to multiply our Cost of Debt by (1 – 25%).

$$57.14\% \times 6.00\% = 3.43\%$$

$$3.43\% \times (1 - 25\%) = 2.57\%$$

$$\text{Cost of Debt} = 2.57\%$$

$$\text{WACC} = \frac{E}{D + E} (r_e) + \frac{D}{D + E} (r_d)(1 - t)$$

Where:

E = market value of equity

D = market value of debt

r_e = cost of equity

r_d = cost of debt

t = corporate tax rate

Weighted Average Cost of Capital

Step 4: Sum the Cost of Debt and the Cost of Equity to determine the WACC.

Cost of Equity = 5.14%

Cost of Debt = 2.57%

WACC = 5.14% + 2.57%

WACC = 7.71%

Tips

- WACC can change during the investment period and should be monitored.
- WACC (mostly the Cost of Equity portion) is subjective and although we can try and estimate it accurately, some parties may view it differently.
- Use 'Investment Training #3 Exercises' – Activity 1 to adjust different sources of capital and see the effect on WACC.
- Adjust the blue cells in Activity 2 to show how adjusting WACC and Time affect NPV.

Question 1

Explain what WACC (Weighted Average Cost of Capital) is, and why it's important in investment decisions.

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Question 1 - Answer

Explain what WACC (Weighted Average Cost of Capital) is, and why it's important in investment decisions.

Answer:

WACC is a calculation of a firm's overall cost of capital, combining the costs of both equity (money from shareholders) and debt (money from lenders).

It's important because it represents the minimum return an investment must generate to satisfy all investors.

Investors and managers use WACC as the discount rate in NPV calculations to evaluate whether investments or projects create value.

Question 2

Go to: Module4Exercises.xls,
WACC- Question 2 tab



A business plans to fund a £200,000 project using £120,000 equity at a 10% cost and £80,000 debt at a 5% interest rate. The corporate tax rate is 20%. Calculate the company's WACC.

Please use Microsoft Excel to answer.

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Question 2 - Answer

A business plans to fund a £200,000 project using £120,000 equity at a 10% cost and £80,000 debt at a 5% interest rate. The corporate tax rate is 20%. Calculate the company's WACC.

Answer:

Step-by-step calculation:

1. Calculate Cost of Equity:

$$120,000 / 200,000 = 60\%; \quad 60\% \times 10\% = 6\%$$

2. Calculate Cost of Debt (Pre-Tax):

$$80,000 / 200,000 = 40\%; \quad 40\% \times 5\% = 2\%$$

3. Adjust Cost of Debt for Tax:

$$2\% \times (1 - 20\%) = 1.6\%$$

4. Calculate WACC (Summation of the two):

$$\text{WACC} = 6\% + 1.6\% = 7.6\%$$

Therefore, the company's WACC is 7.6%.

Question 3

Go to: Module4Exercices.xls,
WACC- Question 3 tab



An investor considers a project requiring an initial investment of £100,000 today. It provides £30,000 annually for 5 years.

Using the WACC you calculated in Question 2 (7.6%) as your discount rate, calculate the project's NPV and decide if the investment should be undertaken.

Please use Microsoft Excel to answer.

Question 3 - Answer

An investor considers a project requiring an initial investment of £100,000 today. It provides £30,000 annually for 5 years.

Using the WACC you calculated in Question 2 (7.6%) as your discount rate, calculate the project's NPV and decide if the investment should be undertaken.

Answer:

Use the NPV formula to calculate present value (PV) of future cashflows:

- Calculating individually:
 - Year 1: $£30,000 / (1.076^1) = £27,881.04$
 - Year 2: $£30,000 / (1.076^2) = £25,911.75$
 - Year 3: $£30,000 / (1.076^3) = £24,081.55$
 - Year 4: $£30,000 / (1.076^4) = £22,380.62$
 - Year 5: $£30,000 / (1.076^5) = £20,799.84$

Summing the cashflows:

- $27,881.04 + 25,911.75 + 24,080.55 + 22,380.62 + 20,799.84 = £121,054.80$

Subtract initial investment:

- $NPV = 121,054.80 - 100,000 = £21,054.80$
- As the NPV (£21,054.80) is positive, the project exceeds the required return implied by the WACC and is thus a viable investment.

Section 2:

Summary

Examines how net zero projects are financed and evaluated using capital structures, energy-specific metrics, and applied case analysis

Learning Outcomes

- Compare debt, equity, and hybrid instruments
- Understand capital priority and returns
- Use energy metrics (LCOE, capacity factor)
- Perform a high-level project sense check

Section 2 requires 4 learning hours: 2 hours of Guided Learning and 2 hours of Independent Learning.

Capital Instruments

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Sources of Capital

A project or company always needs capital at different stages of its lifecycle.

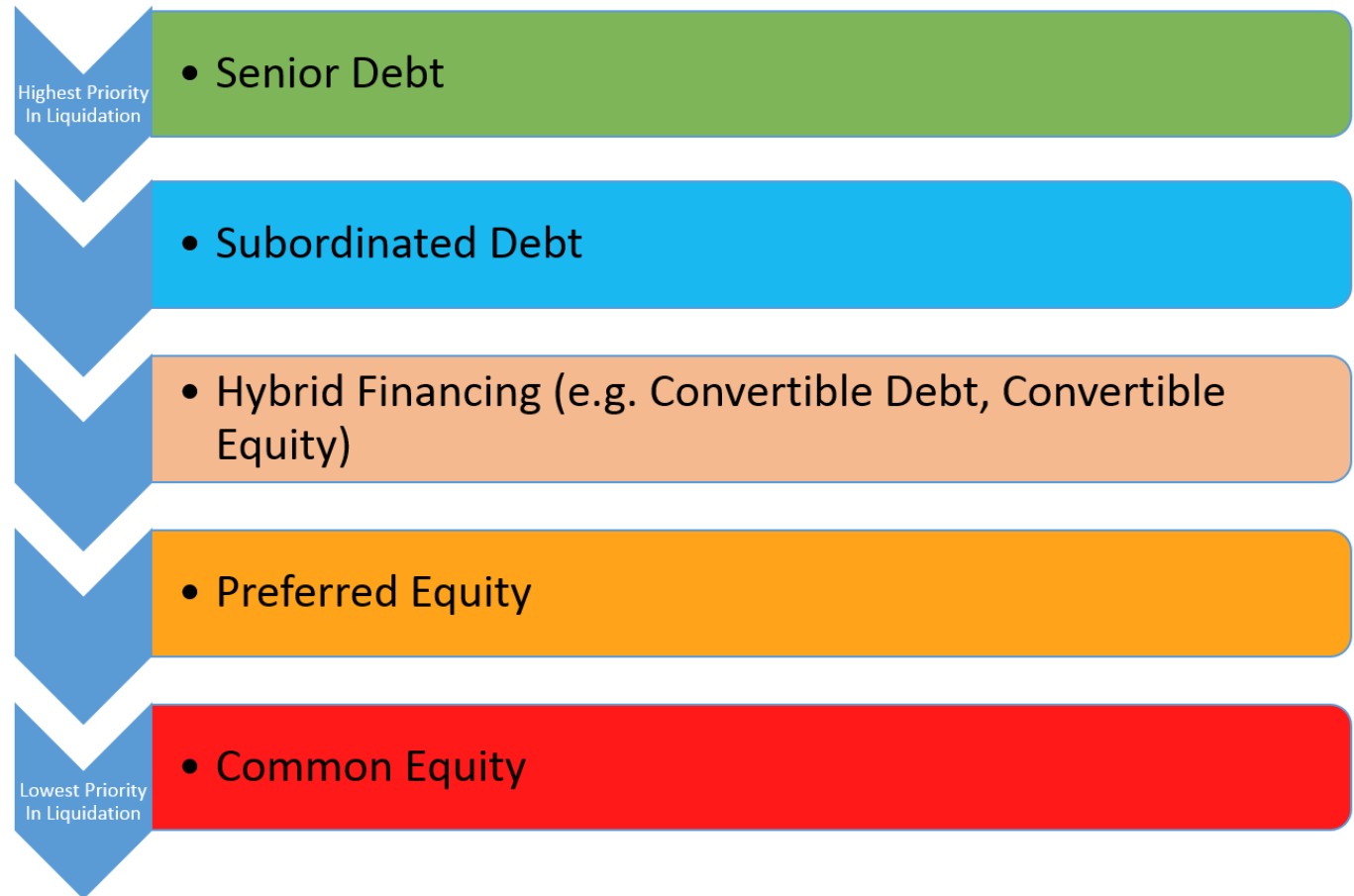
Funders can use different instruments such as debt or equity. These different ways of funding are referred to as instruments.

There are pros and cons to each instrument type and certain instruments are more appropriate for particular projects or companies.

Types of Capital: Overview

Instruments can be ordered in terms of who gets paid first, this is called order of priority.

E.g., if you own a home and sell it, your bank gets it loan (senior debt) repaid first and you get what is left over as the owner (common equity) because senior debt has a higher priority than common equity.



Types of Capital: Senior Debt

Debt can be thought of as the same as a loan.

When more than one lender or bank is involved there tends to be one who gets repaid first (the senior debt provider) and one who gets repaid afterward (the junior debt provider – discussed further next).

Loans tend to have less control rights e.g., lenders do not sit on the boards of companies but they might have what's called covenants e.g., rules you need to follow. Covenants might be that every year you need to provide the lender with your financial statements or that the bank will check to make sure you are maintaining adequate financial performance metrics.

If covenants are breached then the bank usually has the right to ask for the loan to be repaid immediately. In reality, the lender usually works with the borrower to get back into a compliant state.

If you sell a project or business, there is a requirement to pay back the lender before the equity holders get any of their equity back.

Lenders tend to require periodic payments to be made to them e.g., monthly loan payments.

Types of Capital: Ordinary Equity

Equity holders are the shareholders and are essentially owners of the project or company.

Ordinary Equity, also sometimes called Common Equity, is the type of equity most people are familiar with when they think of shareholders. Later, we will look at Preferred Equity, which is less common.

Equity investors can have some powers or control mechanisms, like board seats, restrictions on what the company does, veto rights, approval rights of budgets etc.

On the vast majority of projects and companies, there will be two instruments; ordinary equity & senior debt. The rest are less common.

Note; a small shareholding doesn't necessarily mean a small level of control. A 5% shareholder can hold disproportionate levels of control e.g., veto rights or the need to approve budgets.

There are various different types of equity investor, more information can be [found here](#).

Types of Capital: Junior Debt

Junior Debt ranks below Senior Debt in terms of priority but above most other instruments, such as equity.

A project might opt to use Junior Debt because its Senior Debt provider cannot provide them with all the capital they need (or want) but a Junior Lender has a higher risk and return tolerance and can 'top up' the Senior Debt.

Junior Debt will likely have higher interest rates compared to Senior Debt due to increased risk.

Types of Capital: Preferred Equity

Has some elements of both debt & equity.

Preferred Equity ranks above Ordinary Equity in repayment but below Debt.

Sometimes requires the company to pay Preferred Equity shareholders a dividend before any of the Ordinary Equity holders get any dividends.

Sometimes has a 'liquidity preference' condition. This is expressed as a multiple e.g., a 1.5x liquidity preference means that for every £1 the preferred equity investors invest, they will get back £1.50 before returns are then split amongst all shareholders.

Sometimes preferred equity holders don't have some rights though, like voting rights.

Types of Capital: Convertibles

As it sounds, convertibles start as one instrument and convert into another at an agreed point.

Common particularly in early stage space where it is really difficult to value a company. Investors tend to issue a loan to the company that converts into equity at a later point (such as in 3 years or at the next capital raise time when more data is available to determine a valuation).

Funders who use convertibles somewhat get the best of both worlds. In the early years, when it is a debt instrument, they are the first to be repaid if things go badly. But when it goes well, they can convert their debt to equity and earn a higher return.

The terms within most of these are subject to negotiation so they can vary significantly from transaction to transaction.

Types of Capital: Grants

A common source of capital is a grant. Grants can be provided by a range of sources, such as non-profits or governments.

The grant tends to have a defined purpose e.g., to build a business case using third-party specialist consultants.

Grants can be treated like Equity, unless it needs to be repaid, in which case it is treated like Debt.

Key Terms

Pari Passu

- The instruments rank even in priority i.e., Senior Debt & Junior Debt both get repaid at the same time.

Priority / Senior / Junior / Subordinated

- Refers to the order of priority that capital is repaid to providers e.g., senior has priority over junior / mezz debt
- Also referred to as junior debt being subordinated to senior debt

Principal & Interest (P&I) or Interest Only (IO)

- Interest Only means you only pay the interest portion of the loan off each month and it is assumed that when the loan matures in the future it will either be paid off in a lump sum (also referred to as a balloon payment) or you will get a new loan to repay it.
- P&I pays off both the interest and the principal so the loan balance gets less and less each month. P&I is always a higher monthly payment than IO.

Secured versus unsecured

- Usually, debt is secured. What this means is that if things go badly and the loan needs to be repaid, the lender can sell the security to recover its lost money. Think of a home loan and the bank having your home as security. For a business, the bank might hold specific security such as on just one item like the business's high-value assets like its vehicles, buildings, or equipment. Sometimes the loan is secured by all the assets a business owns.
- Unsecured debt has no security. This is usually more common in personal finance e.g., credit cards, overdrafts, or personal loans.
- Having security is a way to reduce the risk to the lender but it should not be the only concern e.g., a bank should not let someone get a mortgage who cannot afford repayments just because they have a lot of assets the bank can repossess. That's why lenders need to assess security and the ability to service the loan.

Exercise

- **Complete the Investment Training #4 exercise.**

- **Activity 1**

- Fill the fields in blue with the relevant information
 - A company needs £1.2m to fund a new Solar PV development
 - It has secured £100k in grant funding
 - They have an additional £200k in cash (equity) they can contribute
 - They have spoken to a bank (Senior Debt provider) and they have agreed to lend them \$750k
- Answer the following
 - What is the capital shortfall?
 - What other form of Debt could be used to fill the gap?
 - What are some things to consider when deciding when asking for Debt?

Exercise

- Activity 2

- Fill the fields in blue with the relevant information
 - Using the same project as previous, input the grant, Ordinary Equity, & Senior Debt capital figures.
 - You decide to use £75k of Junior Debt and £75k Preferred Equity for the shortfall. The Preferred Equity has a liquidity preference of 1.25x
 - Your project now sells for £2.5m 1 year later.
- Answer the following
 - Review the Returns Waterfall to see how the £2.5m is distributed and in what order.
 - Calculate the MOIC for each of the Instruments in the green cells.

Go to: Module4Exercises.xls,
Capital Instruments- 1 tab



Go to: Module4Exercises.xls,
Capital Instruments- 2 tab



Question 1

Put the following capital instruments in order of priority in terms of repayment:

- Preferred Equity
- Junior Debt
- Senior Debt
- Ordinary Equity

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Question 1 - Answer

Put the following capital instruments in order of priority in terms of repayment:

- Preferred Equity
- Junior Debt
- Senior Debt
- Ordinary Equity

Answer:

- 1) Senior Debt
- 2) Junior Debt
- 3) Preferred Equity
- 4) Ordinary Equity

Question 2

Why would a project consider using Junior Debt in addition to Senior Debt, and what are two implications of doing so?

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Question 2 - Answer

Why would a project consider using Junior Debt in addition to Senior Debt, and what are two implications of doing so?

Answer:

Projects consider using Junior Debt if the Senior Debt provider cannot supply the full amount of capital required. Junior Debt acts as a "top-up" funding source.

Two implications of using Junior Debt:

- **Higher Interest Rates:**
Junior Debt providers face higher risks (repaid after Senior Debt), so they require higher returns to compensate for this additional risk.
- **Complex Capital Structure:**
Using multiple debt sources increases complexity, including managing different lenders' covenants and priorities.

Question 3

A company needs £500,000 for a new project. They secure funding using:

- Ordinary Equity: £200,000 at a Cost of Equity of 12%.
- Senior Debt: £200,000 at an interest rate (Cost of Debt) of 6%.
- Preferred Equity: £100,000 at a return rate of 9%(Cost of Preferred Equity).

Question 3 - Answer

A company needs £500,000 for a new project. They secure funding using:

- Ordinary Equity: £200,000 at a Cost of Equity of 12%.
- Senior Debt: £200,000 at an interest rate (Cost of Debt) of 6%.
- Preferred Equity: £100,000 at a return rate of 9%(Cost of Preferred Equity).

Corporate tax rate: 25%.

Calculate the company's Weighted Average Cost of Capital (WACC).

Answer:

Cost of Ordinary Equity:

$$200,000 / 500,000 = 40\%; \quad 40\% \times 12\% = 4.8\%$$

Cost of Senior Debt (After-Tax):

$$200,000 / 500,000 = 40\%; \quad 40\% \times 6\% = 2.4\%$$

Adjust for tax:

$$2.4\% \times (1 - 0.25) = 1.8\%$$

Cost of Preferred Equity (No Tax Adjustment, dividends not tax-deductible):

$$100,000 / 500,000 = 20\%; \quad 20\% \times 9\% = 1.8\%$$

Calculate WACC (sum of all components):

$$\text{WACC} = 4.8\% (\text{Equity}) + 1.8\% (\text{Senior Debt}) + 1.8\% (\text{Preferred Equity}) = 8.4\%$$

The company's WACC is 8.4%. This figure represents the minimum acceptable return needed for the project, combining the costs of all sources of capital.

Energy Metrics

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Overview

Energy-related projects utilise both traditional financial metrics and energy-specific metrics.

This lesson recaps some metrics that we are already familiar with and applies them to the energy context.

It will also introduce metrics that are common to energy-specific projects.

Internal Rate of Return

Definition: IRR is the rate of return at which the net present value of all cash flows (both incoming and outgoing) from a project equals zero. It is a comprehensive measure of a project's potential profitability over time

Importance: IRR is a critical measure for evaluating investment efficiency and comparing it with alternative projects or a required rate of return.

Net Present Value

Definition: NPV represents the difference between the present value of cash inflows and outflows over a project's lifetime. It quantifies the total value added by a project, taking into account the time value of money.

Importance: NPV is a crucial metric for assessing the profitability and financial feasibility of an investment. A positive NPV indicates a potentially profitable project, whereas a negative NPV suggests that the project may not cover its initial costs and required return.

Cash-on-Cash Return

Definition: CoC Return measures an investor's annual equity return on the initial equity invested in a project, expressed as a percentage. This KPI focuses solely on the actual cash flows within a specific period, bypassing the concept of the time value of money.

Calculation:

$$\text{CoC Return} = \frac{\text{Annual Cash Income}}{\text{Total Cash Invested}} \times 100\%$$

Example: If an investor invests £100,000 in a project and receives £10,000 annually as a return, the CoC Return would be 10%

Importance: CoC Return is a straightforward and immediate measure of a project's cash yield, widely used for initial profitability assessments.

Payback Period

Definition: The Payback Period calculates the duration required for the equity cash inflows from a project to equal the initial equity investment. It's a vital metric for understanding the liquidity and risk from an equity investor's perspective.

Calculation: Determine the Payback Period by summing the annual equity cash inflows until they match the initial equity investment amount.

Example: For an initial equity investment of £1,000 and annual equity cash inflows of £500, the Payback Period is 2 years

Importance: This KPI is particularly relevant for equity investors as it clearly indicates how quickly they can recoup their investment, offering a direct insight into the investment's risk and return profile.

kW vs kWh vs kWp

kW: a unit of electrical power that reflects the rate at which energy is consumed or produced

Example: a microwave oven operating at 800 watts (W) consumes 800 W of energy per second, which is equivalent to 0.8 kW of power.

Importance: Knowing how many kilowatts a house needs, it is possible to plan and design a PV system that covers energy needs efficiently.

kWh: a unit of energy used to measure how much electricity is consumed or generated in a given time interval.

Example: if you use a 2 kW appliance for 3 hours, you will have consumed 6 kWh (2 kW x 3 hours).

Importance: kWh is essential to determine the system's capacity to cover the electrical needs of the home and to manage the sale of surplus energy to the grid.

kWp: expresses the maximum power that a photovoltaic system can generate under optimal conditions.

Example: a solar panel with a capacity of 5 kWp can generate up to 5 kW of power under ideal conditions.

Importance: Although this measurement indicates the maximum capacity under ideal conditions, the actual performance of a PV system can vary due to factors such as climate, orientation and tilt of the solar panels.

Levelised Cost of Electricity

Definition: LCOE represents the average cost per unit of electricity generated by a project, considering all of the project's lifecycle costs. It's a comprehensive measure that includes capital expenses, operational costs, and maintenance over the project's lifespan, divided by the total electricity output. Therefore, it is one of the most crucial KPIs for renewable energy projects.

Calculation:

$$\text{LCOE} = \frac{\text{Total Lifecycle Costs}}{\text{Total Energy Produced}}$$

Example: If a wind farm project incurs total lifecycle costs of £5 million and is expected to produce 100 million kWh of electricity over its lifetime, the LCOE would be £0.05 per kWh (£5 million / 100 million kWh).

Importance: LCOE is crucial in evaluating and comparing the cost-effectiveness of different energy generation technologies. By providing a consistent basis for comparison, LCOE helps determine which technologies are most cost-effective and sustainable in the long term.

Levelised Cost of Electricity

Detailed

Key:

- The initial cost of investment expenditures (I)
- Maintenance and operations expenditures (M)
- Fuel expenditures (if applicable) (F) / and or Decommissioning

The total output of the power-generating asset will include:

- The sum of all electricity generated (E)
- The discount rate of the project (r)
- The life of the system (n)

$$\text{LCOE} = \frac{\sum \frac{(I_t + M_t + F_t)}{(1 + r)^t}}{\sum \frac{E_t}{(1 + r)^t}}$$

Capacity Factor

Definition: The Capacity Factor of a renewable energy generation asset is a measure of how much energy the plant produces compared to its maximum potential output. It is expressed as a percentage and indicates the actual utilization of the plant over a period, typically a year.

Given that a year has 8,760 hours, the Maximum Possible Output is calculated as the installed capacity multiplied by 8,760 hours.

Calculation:

$$\frac{\text{Actual Energy Output (in kWh)}}{\text{Maximum Possible Output (in kWh)}} \times 100\%$$

Example: For a wind farm with an installed capacity of 1,000 kW that generates 3,500,000 kWh of electricity in a year, its Maximum Possible Output would be $1,000 \text{ kW} \times 8,760 \text{ hours} = 8,760,000 \text{ kWh}$.

Importance: The Capacity Factor is a crucial indicator of the efficiency and reliability of a renewable energy source. A higher Capacity Factor means the energy source is being utilized more effectively, which can significantly impact the economics and feasibility of the project. It helps investors and operators evaluate the performance of energy assets, adjust operation strategies, and make informed decisions about new installations.

Availability

Availability is the potential of a power plant to generate electrical power

It is often measured in two metrics:

- i. Time-based availability refers to the time the system was able to do its job divided by the total time we're measuring.
- ii. Energy-based availability refers to production-based availability and measures the performance of the systems compared to its actual potential under certain conditions

Time-based availability

Two common ways to define the “total time”:

- i. Full-period availability:

$$\text{Availability}_{\text{full}} = \frac{\text{Available hours}}{\text{Total hours in period}} \times 100\%$$

- ii. In-limits availability:

$$\text{Availability}_{\text{in-limits}} = \frac{\text{Available hours within operating limits}}{\text{Total hours within operating limits}} \times 100\%$$

Energy-based availability

$$\text{Energy-based availability} = \frac{\text{Actual energy produced}}{\text{Actual energy produced} + \text{Lost production}} \times 100\%$$

Equivalently:

$$\text{Energy-based availability} = 1 - \frac{\text{Lost production}}{\text{Actual energy produced} + \text{Lost production}}$$

M&O

M&O as an energy metric is the operations and maintenance cost per unit of energy produced, in other words, how much it costs to run the plant for each kWh/MWh it generates.

Importance: It lets you compare how “expensive to run” different net-zero assets are even if one produces more energy (higher CF) than another

$$\text{M\&O cost per unit of energy} = \frac{\text{Annual O\&M cost}}{\text{Annual energy produced}}$$

Question 1

A solar project incurs total lifecycle costs of £2,000,000 and is expected to generate 50,000,000 kWh of electricity over its lifespan. Calculate the Levelised Cost of Electricity (LCOE) and explain why LCOE is a critical metric for energy investors.

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Question 1 - Answer

A solar project incurs total lifecycle costs of £2,000,000 and is expected to generate 50,000,000 kWh of electricity over its lifespan. Calculate the Levelised Cost of Electricity (LCOE) and explain why LCOE is a critical metric for energy investors.

Answer:

Calculation:

$$LCOE = \frac{\text{Total lifecycle costs}}{\text{Total electricity output}} = \frac{£2,000,000}{50,000,000 \text{ kWh}} = £0.04/\text{kWh}$$

- LCOE = £0.04 per kWh
- Importance:
LCOE allows investors and decision-makers to evaluate the overall cost-effectiveness of different energy projects, enabling direct comparison across technologies, and assessing the long-term financial sustainability and attractiveness of renewable energy investments.

Question 2

A solar project incurs total lifecycle costs of £2,000,000 and is expected to generate 50,000,000 kWh of electricity over its lifespan. Calculate the Levelised Cost of Electricity (LCOE) and explain why LCOE is a critical metric for energy investors.

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Question 2 - Answer

A solar project incurs total lifecycle costs of £2,000,000 and is expected to generate 50,000,000 kWh of electricity over its lifespan. Calculate the Levelised Cost of Electricity (LCOE) and explain why LCOE is a critical metric for energy investors.

Answer:

First, calculate the maximum possible annual output:

- $1,000 \text{ kW} \times 8,760 \text{ hours / year} = 8,760,000 \text{ kWh/year}$

Now calculate Capacity Factor for each project:

Project A:

- $\text{Capacity Factor} = 4,000,000 / 8,760,000 \times 100\% = 45.66\%$

Project B:

- $\text{Capacity Factor} = 2,500,000 / 8,760,000 \times 100\% = 28.54\%$

Impact on NPV:

A higher Capacity Factor (Project A) implies more energy production, leading to greater revenue generation over time, which directly increases cash flows and thus the project's NPV. Conversely, a lower Capacity Factor (Project B) generates less revenue, potentially lowering the project's NPV and attractiveness to investors, especially if costs are similar.

Case Study

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Case Study

A county wants to install a small 2 MW solar microgrid to power a health facility and sell excess power to the local utility. They've asked you to do a very high-level investment check to see if the project looks worthwhile.

Use the information below to answer the questions.

Given data

- Project size: 2 MW
- Expected annual cash inflow (years 1–5): £180,000 per year
- Project life (for the taster): 5 years
- Upfront investment (Year 0): £600,000
- Required/target discount rate: 10%
- Possible financing sources: county budget (equity), concessional loan, or small climate grant

Question 1

Why is £180,000 received in Year 5 worth less than £180,000 received in Year 1?

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Question 1 - Answer

Why is £180,000 received in Year 5 worth less than £180,000 received in Year 1?

Because money today can be invested/earns a return (and inflation/risk reduce future value), $£1 \text{ today} > £1 \text{ later}$.

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Question 2

Discount the Year 1 cash inflow of £180,000 at 10%.

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Question 2 - Answer

Discount the Year 1 cash inflow of £180,000 at 10%.

$$PV = 180,000 \div 1.10 = £163,636 \text{ (approx.)}$$

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Question 3

Go to: [Module4Exercises.xls](#), 
Case study – Q3 tab

Using a 10% discount rate, calculate the NPV of the project:

Year 0: –£600,000

Years 1–5: +£180,000 per year

Is the NPV positive or negative? What does that tell you?

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Question 3 - Answer

Using a 10% discount rate, calculate the NPV of the project:

Year 0: –£600,000

Years 1–5: +£180,000 per year

Is the NPV positive or negative? What does that tell you?

PV of 5-year annuity @10%:

$$PV = 180,000 \times 3.7908 \approx \text{£}682,344$$

$$NPV = 682,344 - 600,000 = +\text{£}82,344$$

Accept (it creates value).

Question 4

If the county wants to reduce annual cash outflows, which instrument makes the most sense to add?

- a) Pure equity from county budget
 - b) Long-tenor debt at low interest
 - c) Commercial short-term loan at high interest
- Pick one and explain.

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Question 4 - Answer

If the county wants to reduce annual cash outflows, which instrument makes the most sense to add?

- a) Pure equity from county budget
 - b) Long-tenor debt at low interest
 - c) Commercial short-term loan at high interest
- Pick one and explain.

Spreads cash out and is cheaper than a commercial loan.

Question 5

This is a solar project. Which metric tells us how much energy we get out of the installed capacity over the year?

- a) LCOE
- b) Capacity factor
- c) Discount rate

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Question 5 - Answer

This is a solar project. Which metric tells us how much energy we get out of the installed capacity over the year?

- a) LCOE
- b) Capacity factor
- c) Discount rate

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Section 3:

Summary

Focuses on how financial models support investment decisions under uncertainty through structured modelling, scenario testing, and risk analysis.

Learning Outcomes

- Navigate and assess financial models
- Identify good modelling practice
- Run scenario and sensitivity analysis
- Understand financial risk and risk adjustment

Section 3 requires 4 learning hours: 2 hours of Guided Learning and 2 hours of Independent Learning.

Accounting 101

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What is accounting?

Accounting is a means through which information about a business entity or project is communicated.

Through the financial statements accounting delivers information to different users to help them in making decisions

The American Institute of Certified Public Accountants (AICPA) defines accounting as: "the art of recording, classifying, and summarizing in a significant manner and in terms of money, transactions and events which are, in part at least of financial character, and interpreting the results thereof."

Accounting information

Accounting provides different types of information:

- i. Results of operations as it pertains to the profits generated over a period of time
- ii. The financial position of an entity in terms of resources owned etc.
- iii. The entity's ability to pay obligations
- iv. Inflows and outflows of cash

Basic accounting principles

- Matching Principle –means that expenses are recognized in the period the related income is earned, and income is recognized in the period the related expenses are incurred.
- Revenue Recognition Principle – In accrual basis accounting, revenue or income is recognized when earned regardless of when received. It means that income is recorded when the service is fully performed or when sale occurs, even if the amount is not yet collected.
- Expense Recognition Principle –expenses are also recognized when incurred regardless of when they are paid. In other words, expenses are recorded when used (incurred), even if they are not yet paid.

Elements of accounting

The major elements of accounting are:

- i. Assets – these are resources owned and controlled by the entity as a result of past transactions and events
- ii. Liabilities – these refer to what is owed e.g. debts or obligations
- iii. Capital – refers to what is left after liabilities have been settled i.e.
Total assets – Total liabilities

Assets

These are properties or rights owned by the business. They may be classified as current or non-current.

- Current assets – these are assets held for the purpose of being traded or consumed within twelve months after the end of the period or its normal operating cycle (whichever is longer), or if it is cash. Examples include prepaid expenses, cash or cash equivalents and inventory
- Non-current assets – these are long-term assets useful for a period longer than 12 months or the company's normal operating cycle. Examples include land, equipment and long-term investments

Liabilities

These are financial obligations that are owed to others. They are often classified as current or non-current.

- Current liabilities – These are short-term financial obligations due within one year. Examples include interests payable, dividends payable
- Non-current liabilities - Any liability that's not near-term falls under non-current liabilities that are expected to be paid in 12 months or more. Examples include long-term debt

Capital

Capital is affected by the following:

- Initial and additional contributions of owner/s (investments)
- Withdrawals made by owner/s (dividends for corporations)
- Income
- Expenses

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Financial statements

Financial statements refer to a set of specific reports that aim to provide economic information about an entity.

The key types of financial statements include:

- Income statement also known as profit and loss statement
- Balance sheet also known as statement of financial position
- Cash flow statement or statement of cash flows

Income statement

- An income statement shows the net income or net loss of a business

$$\text{Revenue} - \text{Expenses} = \text{Net income/Loss}$$

- If revenue exceeds expenses, there is a net income. If expenses exceed revenue, there is a net loss.
- The income statement complies with the accrual basis of accounting. Revenue is recognized when earned regardless of when collected. Expenses are recognized when incurred regardless of when paid.

Common revenue types

In net zero projects' revenue can come in different forms:

- i. Unit sales/usage-based: Paid per unit delivered or used e.g. pay per kWh
- ii. Subscriptions: Fixed payment for reserved capacity or service availability e.g. payment for energy connection
- iii. Performance based: Payment triggered by verified outcomes e.g. payment per emissions reduced

Types of expenses

Expenses refers to the various types of costs incurred. These are more commonly referred to as Operating Expenditure or “OpEx”

- Fixed costs are incurred regularly and are unlikely to fluctuate over time. Examples of fixed costs are overhead costs such as rent, interest expense, and property taxes.
- Variable costs are expenses that vary with production output. Examples of variable costs may include direct labor costs, direct material cost, and bonuses and sales commissions. They tend to be more diverse than fixed costs.

Balance sheet

- A Balance Sheet shows the financial position or condition of the company
- It presents information as of a certain date (at a specific point in time)
- It summarizes the assets, liabilities, and capital of a company.
- "Total assets" and "total liabilities and capital" should always be equal.
- The balance sheet may be presented in two forms:
 - i. Account form - assets are presented on the left side while liabilities and capital are presented on the right.
 - ii. Report form - assets are presented first and then followed by liabilities and capital.

Cash flow statement

A cash flow statement is one of the three core financial statements, showing cash generated and spent over a period (month, quarter, or year).

It acts as a bridge between the income statement and balance sheet by showing how cash moved in and out.

Importance: The cash flow statement shows what the income statement and balance sheet (built on accruals) don't, where cash actually comes from and where it goes.

Question 1

Which of the following is not a core financial statement?

- A. The Income Statement
- B. Statement of Cash Flows
- C. The Trial Balance
- D. The Balance Sheet

Question 1 - Answer

Which of the following is not a core financial statement?

- A. The Income Statement
- B. Statement of Cash Flows
- C. The Trial Balance
- D. The Balance Sheet

Question 2

Which of these statements about accrual accounting is true?

- A. Revenue is recorded only when payments are received, while expenses are recognized when they're incurred.
- B. All revenue from prepayments should be recognized when the payment is received, while expenses accrue over the life of the obligation.
- C. If the business has provided the goods or services and can reasonably expect to receive cash, it can recognize the revenue in that period.
- D. The matching principle dictates that expenses should be recognized when they are incurred, regardless of when revenue is recognized.

Question 2 - Answer

Which of these statements about accrual accounting is true?

- A. Revenue is recorded only when payments are received, while expenses are recognized when they're incurred.
- B. All revenue from prepayments should be recognized when the payment is received, while expenses accrue over the life of the obligation.
- C. If the business has provided the goods or services and can reasonably expect to receive cash, it can recognize the revenue in that period.
- D. The matching principle dictates that expenses should be recognized when they are incurred, regardless of when revenue is recognized.

Cashflows in Excel

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Cash flow statement

A cash flow statement is one of the three core financial statements, showing cash generated and spent over a period (month, quarter, or year).

It acts as a bridge between the income statement and balance sheet by showing how cash moved in and out.

Importance: The cash flow statement shows what the income statement and balance sheet (built on accruals) don't, where cash actually comes from and where it goes.

Cash flow definitions

- Cash flow: The actual inflows and outflows of cash and cash equivalents over a period.
- Cash balance: Cash on hand and demand deposits at a point in time
- Cash equivalents: Short-term, highly liquid investments readily convertible to known amounts of cash and with original maturities that are less than 3 months

Cash flow statement sections

- Operating activities: Cash flows from the organization's core revenue-generating operations and working capital i.e., cash received from customers; operating expenses; plus changes in current assets and current liabilities.
- Investing activities: Cash flows related to acquiring or disposing of long-term assets and investments e.g., purchases/sales of property
- Financing Activities: Any cash flows that result in changes in the size and composition of the contributed equity and borrowings of the entity

Operating activities

Cash flow from operations typically includes the cash flows associated with sales, purchases, and other expenses.

Cash flow from operating activities can be recorded in two ways:

1. Direct method: Here, we record actual cash inflows and outflows from customers, suppliers, and operating expenses.
2. Indirect method: Here, we begin with net income, add back non-cash expenses, and adjust for changes to working capital

The indirect method is the most commonly used

Cash from operations is a key signal of health: it shows whether the business generates enough cash to repay loans, keep the assets running, pay dividends, and invest for growth, without needing outside financing

Operating activities: Direct method

It is mostly used in preparing the cash flow statement to offer a more thorough breakdown of cash inflows and outflows related to operational activities

The direct method lists actual cash transactions from operating activities

Operating cash flow = Cash inflows – Cash outflows

It requires detailed cash tracking to allow for accurate reporting

Operating activities: Indirect method

The indirect method for cash flow statements adjusts net income for non-cash items and working capital changes to determine operating cash flow.

It bridges the gap between accrual accounting, where revenues and expenses are recorded when earned or incurred, and actual cash movements

Operating cash flow = Net income + Non-cash expenses +/- changes in working capital

Non-cash expenses are things like depreciation and amortization that reduce profit but don't involve cash outflows

Changes in working capital are Increases in accounts receivable or inventory that *consume* cash or increases in accounts payable or accrued expenses *provide* cash

Investing activities

Cash flow from investing activities displays how much money has been used in (or generated from) making investments during a specific time period.

Showing investing cash flows separately matters because it reveals how much cash was spent on long-term assets meant to earn money in the future

Cash flow from investing activities = Sale of long-term assets – Purchase of long-term assets

Showing investing cash flows separately matters because it shows how much cash was spent on long-term assets meant to earn money in the future

Financing activities

Cash flow from financing activities results from changes in a company's capital structure.

These include cash flows associated with borrowing and repaying bank loans or bonds and issuing and buying back shares.

Cash flow from financing activities = Cash inflows from issuing stocks/borrowing funds - cash outflows from debt repayments, dividend distributions/stock buybacks

Showing financing cash flows separately matters because it helps predict future claims on cash from lenders and investors.

Net increase/decrease in cash and closing cash balance

Net increase/ decrease in cash = Operating cash flow + Cash flow from investing activities + Cash flow from financing activities

Closing cash balance = Opening balance + Net increase/decrease in cash

The opening cash balance is last year's closing cash balance.

Cash flow in excel

Cash flows in excel can be as simple as:

Line Item	Item Amount	Totals
Cash Received From		
Customer Sales	\$ 90,000.00	
Cash Paid For		
Payroll	\$ 55,000.00	
Expenses Not Yet Paid to Vendors	\$ 7,000.00	
General Operating Expenses	\$ 20,000.00	
Cash Flow From Operations		\$ 8,000.00
Equipment Investment	\$ (6,000.00)	
Cash Flow From Investments		\$ (6,000.00)
Loan Payments	\$ (2,500.00)	
Cash Flow From Financing		\$ (2,500.00)
Add Beginning Cash		\$ 10,000.00
Ending Cash		\$ 9,500.00

Question 1

Match the terms:

- i. Cash flow
- ii. Cash balance
- iii. Cash equivalents
 - a) Cash on hand at a point in time
 - b) Actual inflows/outflows over a period
 - c) Very liquid short-term investments

Question 1 - Answer

Match the terms:

- i. Cash flow
- ii. Cash balance
- iii. Cash equivalents
 - a) Cash on hand at a point in time – Cash balance
 - b) Actual inflows/outflows over a period – Cash flow
 - c) Very liquid short-term investments – Cash equivalents

Question 2

Fill the formula:

Operating cash flow = Net income + _____ +/- changes in working capital

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Question 2 - Answer

Fill the formula:

Operating cash flow = Net income + ___non-cash expenses (e.g. depreciation)___ +/-
changes in working capital

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Free Cash flow

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Free Cash flows

Free cash flow is the amount of cash left after accounting for cash outflow expenses, related to operating expenses and capital investment

$$\text{Free Cash Flow (FCF)} = \text{Cash flow from operations} - \text{Capital expenditure}$$

Free cash flow is one measure of a company's financial performance. It shows the cash that a company can produce after deducting the purchase of assets such as property from its operating cash flow

Types of Free Cash Flow

- Unlevered Free Cash Flow (UFCF): Cash available to all capital providers (debt and equity) before debt payments.
- Levered Free Cash Flow: Cash remaining after debt payments, usually indicative of cash available to equity holders.

Importance of Free Cash Flow (FCF)

- FCF shows how much cash is generated that can be used for growth, debt payment, dividends, or share buybacks.
- Positive and growing FCF signals a healthy, sustainable business, while declining or negative FCF can indicate liquidity problems.
- Investors use FCF to assess the company's ability to generate cash beyond what is needed for day-to-day operations and reinvestment.

Question 1

What is free cash flow (FCF)?

- a) Profit after tax
- b) Cash from operations minus capital expenditure
- c) Total revenue minus O&M
- d) Cash in the bank

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Question 1 - Answer

What is free cash flow (FCF)?

- a) Profit after tax
- b) Cash from operations minus capital expenditure
- c) Total revenue minus O&M
- d) Cash in the bank

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Question 2

A wind project has cash flow from operations of £5.2m in 2026. That year it spends £1.4m on new turbines and grid upgrades (CapEx).

What is the free cash flow for 2026?

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Question 2 - Answer

A wind project has cash flow from operations of £5.2m in 2026. That year it spends £1.4m on new turbines and grid upgrades (CapEx).

What is the free cash flow for 2026?

Answer:

Cash flow from operations – Capital Expenditure

£5.2m – £1.4m = £3.8m

Section 4:

Summary

Focuses on how financial models support investment decisions under uncertainty through structured modelling, scenario testing, and risk analysis.

Learning Outcomes

- Navigate and assess financial models
- Identify good modelling practice
- Run scenario and sensitivity analysis
- Understand financial risk and risk adjustment

Section 4 requires 4 learning hours: 2 hours of Guided Learning and 2 hours of Independent Learning.

Financial Models

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Financial Models

This module helps you understand how to read and navigate financial models, especially for investment projects.

It's ideal for beginners who are comfortable with basic Excel (e.g., data entry) but want to improve their confidence reviewing models used in real-life investment decisions.

When do you need a Financial Model?

Financial models can be encountered for a variety of situations and these differ depending on your role and organisation. Some of these may be:

- You are leading a project and need to see that it is financially / commercially viable
- You are reviewing a project and need to understand what assumptions are used and how realistic these are
- You are considering funding a project and want to determine whether it is viable.

What is a Financial Model?

A financial model is a spreadsheet that:

- Enables assumptions to be used and adjusted to forecast performance
- Outputs key results like NPV, IRR, and Payback Period
- Allows users to adjust inputs and view results dynamically

Why Financial Models Matter

They help:

- Investors assess the viability of a project
- Boards understand cash requirements
- Teams track whether a project is on budget
- Funders evaluate risk and return
- Assess future financial performance
- Determine the impact of decisions

Structure of a Model

Most models follow this logic:

- Inputs / Assumptions (usually blue cells)
- Calculations (black text or formulas)
- Outputs (e.g., NPV, IRR)

Plus:

- Tabs separated by purpose (Inputs / Outputs / Checks)
- Clear headers, units (£ / % / MW), and consistent formatting

Good vs Bad Models

✓ Good:

- Clear structure
- Transparent formulas
- Inputs grouped together
- Proper formatting

✗ Bad:

- Scattered or hidden inputs
- Mixed hard-coded values + formulas
- Unclear headings / no labels
- Inconsistent formatting

Colour Coding

Without colour coding, it is extremely difficult to visually distinguish between cells that should be modified and cells that should not (i.e. formulas).

While different places have different preferences, blue is typically used to colour inputs, and black is used for formulas (or calculations). It is individual preference as to whether the full cell is colour-coded versus the text is colour-coded.

Cell Type	Excel Formula	Colour Scheme
Hard-Coded Numbers (Inputs)	=1234	Blue
Formulas (Calculations)	=A1*A2	Black
Links to other files	=[Book1]A1*A2	Red

Cell Type	Excel Formula	Colour Scheme
Hard-Coded Numbers (Inputs)	=1234	Blue
Formulas (Calculations)	=A1*A2	Black
Links to other files	=[Book1]A1*A2	Red

Dynamic vs Static

“Dynamic” refers to the process of adjusting one cell and it flows on to other cells. E.g., if you adjust the Discount Rate of a project, it automatically recalculates the NPV, IRR and MOIC.

Dynamic: You change an input (like interest rate) → outputs automatically update

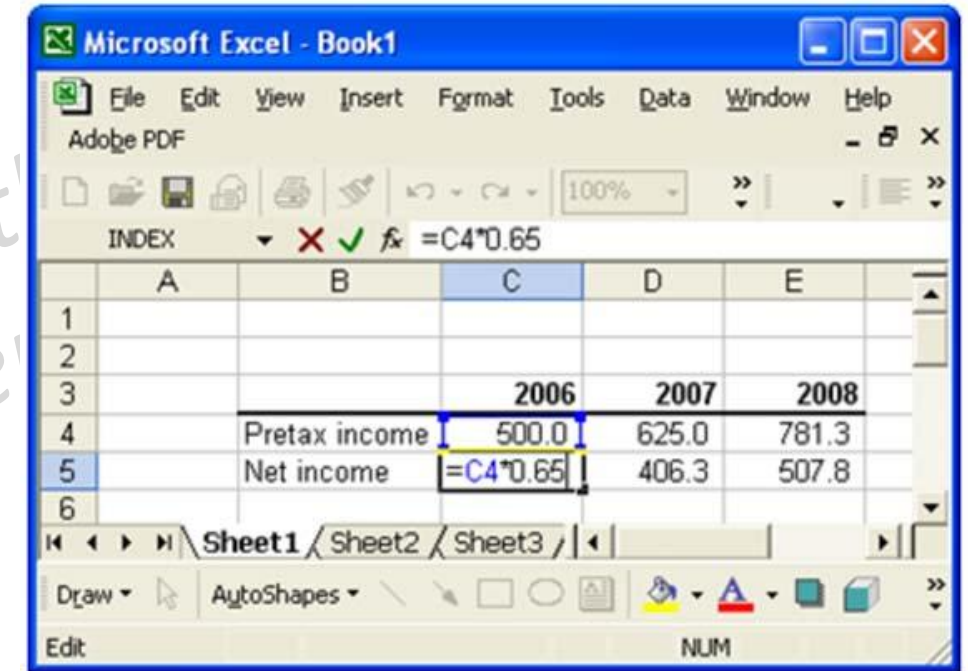
Static: Calculations are hard coded (input manually) and must be updated on a cell-by-cell basis (not scalable or safe)

Hard Coding

Hard-coded numbers (constants) should never be embedded into a cell reference.

The danger here is that you'll likely forget there is an assumption inside a formula. Inputs must be separated from calculations.

Also, another person who opens the model will be unaware of the hardcoded cell.



	A	B	C	D	E
1					
2					
3			2006	2007	2008
4		Pretax income	500.0	625.0	781.3
5		Net income	=C4*0.65	406.3	507.8
6					

Structuring Models

Models tend to follow a recognisable flow. The exact terminology may differ from model to model but in general it is:

Assumptions -> Calculations -> Outputs

Assumptions

Assumptions are the hard-coded inputs, usually colour-coded blue.

It is best practice to group the assumptions together. This could be on their own tab or their own section within a tab.

They should never be spread out within a model e.g., assumptions in the Outputs section.

Assumptions, also referred to as inputs, could include interest rate, inflation rate, etc.)

Calculations

Calculations should flow on from assumptions and do not require any user input.

Calculations can include a cashflow forecast from year to year on how revenue is then distributed.

For example, below, we have a forecast that shows projected sales (or revenue) across several years, then a range of different expenses incurred over the years. We can see from the colour coding that these are calculations from the text being black and will dynamically be updated should assumptions change.

			Y-0	Y-1	Y-2	Y-3	Y-4
Sales							
Sales				482,940	536,400	522,599	542,113
Total				482,940	536,400	522,599	542,113
Operational expenses		Growth					
O&M	70,148.0	2.0%		(70,148)	(71,551)	(72,982)	(74,442)
Insurance	11,871.2	2.0%		(11,871)	(12,109)	(12,351)	(12,598)
Asset Management	42,470.0	2.0%		(42,470)	(43,319)	(44,186)	(45,070)
Annual rent to landowner	10,230.0	2.0%		(10,230)	(10,435)	(10,643)	(10,856)
Rates, Importing, Monitoring	17,767.2	2.0%		(17,767)	(18,123)	(18,485)	(18,855)
Invertor replacement fund	6,896.1	2.0%		(6,896)	(7,034)	(7,175)	(7,318)
	-			0	0	0	0
				(159,382)	(162,570)	(165,822)	(169,138)

Outputs

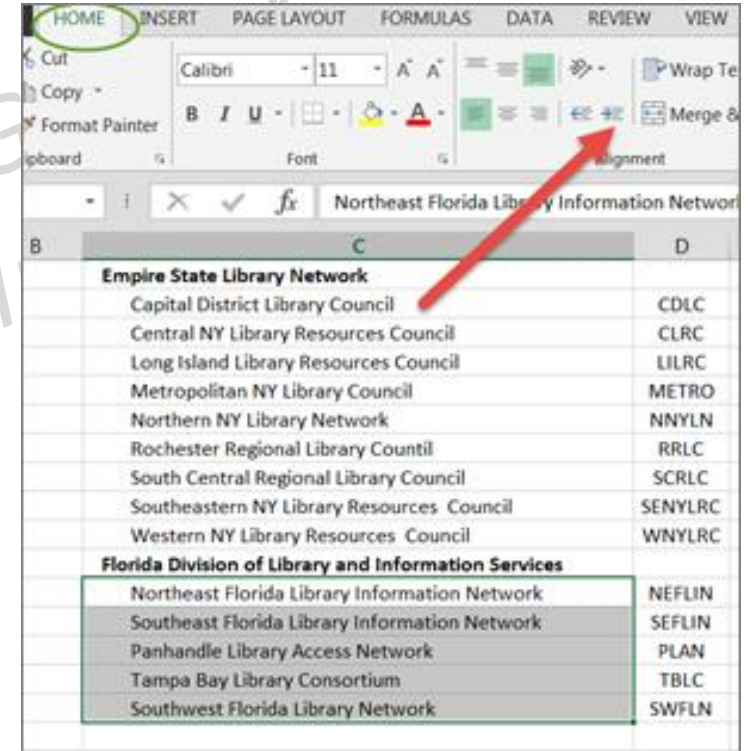
Outputs could include key metrics such as EBIT, EBITDA, Gross Profit, Net Profit, IRR, NPV, and forecast financial statements (balance sheet, cashflow statement, and profit and loss statements). These are discussed further in a future lesson.

Essentially, the outputs section contains the answers to the questions you are asking.

The majority of figures in a financial model will be displayed in Future Values i.e., undiscounted. Within the Output section, there will likely be some rows dedicated to discounting the forecasted cash flows into Present Values. Because of this, these models are sometimes called Discounted Cashflow Models or DCF Models.

Useful Shortcuts and Formatting

- F2 – Clicking F2 while on a cell which contains a formula that references other cells highlights the cells which are referenced for ease of following the formula.
- =SUM(A1:A2) – Use this formula to sum up all the cells in a particular range. In this example, the values between A1 and A2 will be added up.
- Indent – See image. By indenting labels we can clearly see what is the heading and what are the sub-labels. This improves readability more than functionality.
- Consistency around decimal places and formatting. E.g., 0 decimal places significantly reduces the number of digits on a sheet and improves readability. Likewise, negative numbers being displayed within parentheses helps readability.
- Multi-window – If you are editing assumptions on one tab and viewing outcomes on another frequently, it is easier to open Excel in two windows. You can do this by selecting View from across the top bar, then clicking New Window.



B	C	D
	Empire State Library Network	
	Capital District Library Council	CDLC
	Central NY Library Resources Council	CLRC
	Long Island Library Resources Council	LILRC
	Metropolitan NY Library Council	METRO
	Northern NY Library Network	NNYLN
	Rochester Regional Library Council	RRLC
	South Central Regional Library Council	SCRLC
	Southeastern NY Library Resources Council	SENYLRC
	Western NY Library Resources Council	WNYLRC
	Florida Division of Library and Information Services	
	Northeast Florida Library Information Network	NEFLIN
	Southeast Florida Library Information Network	SEFLIN
	Panhandle Library Access Network	PLAN
	Tampa Bay Library Consortium	TBLC
	Southwest Florida Library Network	SWFLN

Tips

A good question to ask yourself if creating or editing a model is;

Can someone open this financial model for the first time and know what it is showing and how to adjust inputs to generate accurate forecasts without needing any assistance?

There are very helpful resources online for assisting with problem-solving any issues you encounter. Also, there is an abundance of free templates available, which can either be adapted or looked at to help structure or format your financial model.

Organisations and sectors each have their own financial modelling norms and templates. It is good practice to review the financial models you may encounter in your role and understand how and where the inputs, calculations, and outputs are displayed.

Question 1

You open a financial model for a solar project. The NPV output seems unusually high.

You notice the discount rate is typed as “8%” directly inside multiple formulas (e.g., $=100000/(1+8\%)^1$) instead of referring to an assumption cell.

Why is this a problem, and how might it affect decision-making?

Question 1 – Answered

This is a form of hardcoding—embedding assumptions directly into formulas. It's a problem because:

- The discount rate isn't visible or adjustable in one place
- The model becomes static rather than dynamic
- It increases risk of user error or inconsistent updates

A change in discount rate won't flow through the model, making NPV misleading. Inputs like discount rates should always be in a separate, clearly labelled cell, so they can be changed and tracked easily.

Question 2

In a financial model, the input tab includes:

- Initial Investment: £500,000
- Annual Cash Inflows: £100,000 (for 6 years)
- Discount Rate: 7%
- The output tab shows a positive NPV.

What does this tell you about the project's viability, and why is it important that these values are dynamic rather than hardcoded?

Question 2 - Answered

- A positive NPV means the present value of future cashflows exceeds the initial investment, indicating that the project is financially viable when factoring in time and risk.
- If the inputs are dynamic (editable cells), stakeholders can quickly test different scenarios—like increasing the investment cost or changing the discount rate. This improves the model's usefulness and helps with robust decision-making.

Question 3

Which of the following statements is true?

- A. A well-built model includes colourful charts on every tab
- B. A poorly-built model uses dynamic links between inputs and outputs
- C. A well-built model separates assumptions, calculations, and outputs
- D. A poorly-built model avoids using Excel formulas

Question 3 - Answered

Which of the following is a key difference between a well-built and a poorly-built financial model?

- A. A well-built model includes colourful charts on every tab
- B. A poorly-built model uses dynamic links between inputs and outputs
- C. A well-built model separates assumptions, calculations, and outputs
- D. A poorly-built model avoids using Excel formulas

Well-built models follow the Assumptions → Calculations → Outputs logic. This structure helps others trace inputs, understand outputs like NPV/IRR, and make adjustments with confidence.

Scenario planning and sensitivity analysis

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Scenario planning

Scenario planning is a way to test different futures and see what could happen to your results.

It considers varied combinations of assumptions and events to see how the future could unfold.

Key components in scenario planning include

- i. variables (factors that change, like market trends)
- ii. assumptions (what you believe about these variables)
- iii. construction of different plausible future scenarios (like best-case, worst-case and average outcomes)

Importance: Scenario planning helps you imagine different futures and prepare for each.

Scenario planning

Scenario analysis requires creation of three possible scenarios:

- Base-case scenario – Refers to the model's expected case, determined by using the assumptions are considered most likely to occur.
- Worst-case scenario – Refers to the most extreme situation that can happen if things do not go as planned.
- Best-case scenario – Refers to the most favorable projected outcome.

Steps to scenario planning

1. Pick the key assumptions you want to test.
2. Set up Base, Worst-, and Best-case scenarios of those assumptions.
3. Fill in the numbers for each scenario.
4. Keep the same layout for every scenario so they're easy to compare.
5. Add a single “Live Scenario” view that shows the selected case's results.
6. Link the “Live Scenario” numbers directly into the financial model.

Tools and techniques to use in excel

i. Scenario Manager

- Enables users to create, save, and switch between predefined sets of input values (scenarios) to see their impact on outputs.

ii. Data Validation with Drop-Down Menus

- Allows users to select scenarios from a dropdown list.
- Simplifies model navigation and reduces input errors when toggling scenarios.

iii. Formulas: INDEX and CHOOSE

- Use INDEX or CHOOSE functions to build dynamic models that select different input assumptions based on scenario selection.
- For example, CHOOSE can select between values for base, best, and worst cases based on a scenario switch cell.

Sensitivity analysis

Sensitivity analysis is used to analyze how the different values of a set of independent variables affect a specific dependent variable under certain specific conditions.

A good financial model is not the one that produces one single, arguably precise number, but the one that identifies the main drivers and presents some reasonable ranges within which the model's conclusions still hold true.

Steps to run a sensitivity analysis

1. Start with your financial model using baseline input values reflecting your expected assumptions.
2. Identify critical model inputs to test, such as growth rate, operating expenses, or tax rates.
3. Adjust One Variable at a time.
4. Run the financial model to see how the output e.g., Net Present Value, profit, IRR, cash flow changes with the adjusted input.
5. Note the effect on the output metric for each change in the input variable.
6. Repeat the steps for all selected inputs.
7. Compare how sensitive the output is to each variable.

Tools and techniques to use in excel

- In Excel, use data tables or manual adjustments with recalculations.
- Create sensitivity tables summarizing input changes against output results.

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Question 1

If we want to see how a higher tariff at a solar farm affects its revenue, which tool should we use?

- A. Sensitivity analysis
- B. Scenario planning

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Question 1 - Answer

If we want to see how a higher tariff at a solar farm affects its revenue, which tool should we use?

A. Sensitivity analysis

B. Scenario planning

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Question 2

You are building a model for a 20 MW solar project. You want to see what happens if:

- CapEx is higher than expected,
- Energy output is lower than expected, and
- The offtaker delays payments by 60 days.

- a) What tool should you use to test this?
- b) List the three basic scenarios you would set up.
- c) Why should all three scenarios have the same layout?

Question 2 - Answer

You are building a model for a 20 MW solar project. You want to see what happens if:

- CapEx is higher than expected,
- Energy output is lower than expected, and
- The offtaker delays payments by 60 days.

a) What tool should you use to test this?

Scenario planning

b) List the three basic scenarios you would set up.

Base, best- and worst-case scenarios

c) Why should all three scenarios have the same layout?

Same layout makes it easy to compare assumptions and results across scenarios

Risks

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Risks

- Risk refers to the possibility that the actual results of an investment or decision may turn out differently, often less favorably, than what was originally anticipated
- Total risk can be divided into:
 - i. Systematic risk - also known as market risks, are risks that can affect an entire economic market overall or a large percentage of the total market
 - ii. Unsystematic risk- also known as specific risk or idiosyncratic risk, is a category of risk that only affects an industry or a particular company

Systematic risks

- Occurs due to factors, such as political risk and macroeconomic risk, that affect the performance of the overall market.
- Common types include:
 - i. interest rate risk
 - ii. inflation risk
 - iii. currency risk
 - iv. liquidity risk
 - v. country risk
 - vi. sociopolitical risk

Unsystematic risk

- It is a category of risk that only affects an industry or a particular company.
- Examples include:
 - i. Change in management
 - ii. Competitor risk
 - iii. Product recall

Other types of risk

- i. Business risk is the risk that a company won't sell enough or earn enough to cover its operating costs and make a profit
- ii. Credit risk is the chance a borrower can't pay the interest or principal they owe.
- iii. Foreign exchange risk is the risk that changes in currency values will increase or decrease the value of your investment or cash flows when they're in a foreign currency.
- iv. Model risk is the risk that a financial model gives the wrong answer, because of bad data, wrong assumptions, or a flawed method and that someone relies on that answer to make a decision, leading to losses or bad outcomes

Risk adjustment

Since investments come with different levels of uncertainty. Financial modelling adjusts for these using either of these ways:

1. Discount rate method: It is the most common way to adjust for risk because it's simple and widely accepted. The idea is that expected future cash flows are discounted not only for the time value of money but also for an extra risk premium to reflect the investment's uncertainty. It uses the Weighted Average Cost of Capital.
2. Direct cash flow method: It adjust future cash flows themselves using a “certainty” factor (how likely you are to receive them), then discount those adjusted cash flows at the time value of money to get Net Present Value.

Model Risk management

Managing financial modelling risk means building risk checks into the model and making sure the model is strong and accurate. Key ways to do this include:

- i. Use up-to-date, reliable data - Good inputs lead to better forecasts and lower the chance of getting the wrong results.
- ii. Keep models simple and clear - Avoid unnecessary complexity so errors are less likely, and others can easily see the assumptions and understand the results.
- iii. Model validation and auditing - Check the model regularly to spot errors or weak assumptions that could change the results. This includes running error checks and testing the model's logic.

Question 1

A solar project faces:

- (a) a sudden increase in interest rates,
- (b) a new national carbon tax, and
- (c) a change in management at the EPC contractor.

Which of these are systematic risks and which is unsystematic?

Question 1 - Answer

A solar project faces:

- (a) a sudden increase in interest rates - Systematic
- (b) a new national carbon tax - Systematic
- (c) a change in management at the EPC contractor - Unsystematic

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Question 2

You've built a financial model for an offshore wind project. To reduce model risk, which of the following is the best set of actions?

- A. Add more complex formulas and macros.
- B. Use the latest data, keep the model structure simple, and run regular error/logic checks.
- C. Hide all assumption sheets so users can't change anything.

Question 2 - Answer

You've built a financial model for an offshore wind project. To reduce model risk, which of the following is the best set of actions?

- A. Add more complex formulas and macros.
- B. Use the latest data, keep the model structure simple, and run regular error/logic checks.
- C. Hide all assumption sheets so users can't change anything.

Section 5:

Summary

Integrates learning across the module through applied case studies and end-to-end investment evaluation.

Learning Outcomes

- Apply concepts across a full project lifecycle
- Interpret outputs holistically
- Justify investment decisions using financial logic

Section 5 requires 4 learning hours: 2 hours of Guided Learning and 2 hours of Independent Learning.

Consolidation and case studies

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Recap

In this module we have learnt about:

- Core Concepts (Time Value of Money & Discount Rate)
- Internal Rate of Return and Net Present Values
- Weighted Average Cost of Capital
- Capital Instruments (Equity, Debt, Convertibles, & Grants)
- Understanding Renewable Metrics (LCOE, CF, Availability, M&O etc.)
- Accounting 101
- Basic Cashflows in Excel
- Free Cashflows
- Financial Modelling 102 (Formulas, Layout, Dynamic layouts, Cell Formatting etc.)
- Sensitivity Analysis & Scenario Testing
- Different types of risks

We will do a case study to test your understanding of the project

Case study

You have been asked to build and test a simple financial view for a new onshore wind project. Use the information below for all questions.

- Project size: 40 MW
- Expected energy (Year 1): 120,000 MWh
- Selling price: £55/MWh (no indexation)
- Total construction cost (CapEx): £52 million
- CapEx schedule: 70% in Year 0 and 30% in Year 1 (before COD)
- Fixed operating costs: £60,000 per MW per year
- Variable operating costs: £2 per MWh
- Discount rate for NPV: 9%

Use these figures to calculate revenue, operating costs, CapEx timing, free cash flow, and basic debt metrics in the questions that follow.

Question 1

The 40 MW wind project produces 120,000 MWh in Year 1 and sells all energy at £55/MWh. What is Year 1 revenue?

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Question 1 - Answer

The 40 MW wind project produces 120,000 MWh in Year 1 and sells all energy at £55/MWh. What is Year 1 revenue?

Revenue = 120,000 MWh × £55/MWh = £6,600,000

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Question 2

Fixed O&M is £60,000/MW-yr and variable O&M is £2/MWh. Using the figures above, calculate total O&M for Year 1.

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Question 2 - Answer

Fixed O&M is £60,000/MW-yr and variable O&M is £2/MWh. Using the figures above, calculate total O&M for Year 1.

$$\text{Fixed O\&M} = 40 \text{ MW} \times \text{£}60,000 = \text{£}2,400,000$$

$$\text{Variable O\&M} = 120,000 \text{ MWh} \times \text{£}2 = \text{£}240,000$$

$$\text{Total O\&M} = \text{£}2,640,000$$

Question 3

Total CapEx is £52m. 70% is spent in Year 0, 30% in Year 1.
Show the CapEx cash outflow for the two years.

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Question 3 - Answer

Total CapEx is £52m. 70% is spent in Year 0, 30% in Year 1.
Show the CapEx cash outflow for the two years.

Year 0: $70\% \times £52\text{m} = £36.4\text{m}$

Year 1: $30\% \times £52\text{m} = £15.6\text{m}$

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Question 4

Suppose Year 1 operating cash flow (after O&M, after tax) is £5.8m.

- a) What is free cash flow for Year 1?
- b) Is this unlevered or levered free cash flow?

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Question 4 - Answer

Suppose Year 1 operating cash flow (after O&M, after tax) is £5.8m.

a) What is free cash flow for Year 1?

$$\text{FCF} = \text{£}5.8\text{m} - \text{£}15.6\text{m} = -\text{£}9.8\text{m}$$

b) Is this unlevered or levered free cash flow?

It's unlevered FCF (no debt service taken out yet).

Question 5

Using a 9% discount rate, what is the present value of the Year 1 free cash flow from Q4?

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Question 5 - Answer

Using a 9% discount rate, what is the present value of the Year 1 free cash flow from Q4?

$$PV = FCF \div (1 + r) = -£9.8m \div (1 + 0.09) \approx -£9.0m$$

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Question 6

If actual energy is 110,000 MWh instead of 120,000 MWh (same price, same costs), which of the following will go down?

- a) Revenue
- b) Costs
- c) Equity returns

(Choose all that apply.)

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Question 6 - Answer

If actual energy is 110,000 MWh instead of 120,000 MWh (same price, same costs), which of the following will go down?

- a) Revenue
- b) Costs
- c) Equity returns

(Choose all that apply.)

Answer:

Revenue, Equity returns

Question 7

The local buyer sometimes pays 60 days late. Is this:

- a) A market-wide (systematic) risk
- b) A project-specific (unsystematic) risk
- c) A model risk

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Question 7 - Answer

The local buyer sometimes pays 60 days late. Is this:

- a) A market-wide (systematic) risk
- b) A project-specific (unsystematic) risk
- c) A model risk

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Question 8

Your model assumes “all cash is received in the same month as energy is sold,” but in reality the buyer pays 60 days later.

- a) What type of risk is this?
- b) How should you adjust the model?

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Question 8 - Answer

Your model assumes “all cash is received in the same month as energy is sold,” but in reality the buyer pays 60 days later.

a) What type of risk is this?

Model risk (assumption doesn't match reality).

b) How should you adjust the model?

Add a collection lag (e.g. cash received 2 months later / 60 days) or move the cash inflow to the following period.

Document Version Control

Version	Date	Purpose / Change	Produced by	Approved by	Date
0.1	29-Oct-25	First Draft	Mineral Springs	Justin Olosunde	03-Nov-25
0.2	23-Dec-25	Second Draft – structured into sections	Nicholas Sia Han Ming	Justin Olosunde	23-Dec-25
1.0	26-Jan-26	Final Draft	Mineral Springs	Justin Olosunde	19-Mar-26

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