Teach yourself how to build a Business Case for any industry

incl mining

2d Step 3: Compute the basket of powerful metrics: NPV, IRR & Payback

Aspendale Beach

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It may have errors so always check your own work and have it audited by a competent person

Inside Level 2 there usually are five steps …

Level 3: Decision making

Level 2: Evaluating the business/project

Level 1: Hands-on business modelling

In this module we will focus on NPV, IRR & Payback →

- Step 1: Decide which business entity is to be evaluated

- Step 2: Create the hands-on model

- **Step 3:** Compute the basket of powerful economic measures: **NPV, IRR, Payback,** four cash streams, cash break even, key drivers, dollar trees, uncertainty, risk, optionality

- Step 4: Assess alternatives, flexibility, options, risks, the business, the industry

 Step 5: Interact so the decision makers "have their eyes wide open"

NPV		
IRR		
Payback		
Life		
Cash Breakev		
Key Driver #1		
Key Driver #2		
Key Driver #3		
Closure /Disp		
Social & Com		
Environment		
Governance	x	x

Three metrics have become pre-eminent in economic evaluation: -

NPV is so powerful that it has become exalted. It is a wonderful invention (I think it was first commonly used about 40 to 50 years ago.) Some businesses and people do become addicted to NPV and believe it is the 'one true and absolute' measure. The 'holy grail'. NPV tells you a lot about the **quantity** of an investment, but as is stressed below it is a subjective result with some shortcomings.

IRR tells you a lot about the **quality** of an investment. It is the second most popular metric – again for very good reason.

Payback tells you a lot about the **speed**. It is employed by some battle-hardened operators and managers as a ruthless but sensible metric – and for good reason.

I love all three but recognise that each has its merits and its short-comings.

These three are quite easy to understand …

But from the beginning, remember that our role is much, much more than pumping out NPVs, IRRs & Payback!

Each business/project/opportunity should be assessed by a much wider <u>basket</u> of economic measures; PLUS a complete understanding of the business, its competitors and the industry.

You must work with your colleagues to define …
- ❖ Its **ability to flex and adapt** to a wide range of business and operating conditions
- ❖ Its uncertainties, risks, rewards, optionality
- ❖ Its strengths and weaknesses
- ❖ Its fit inside your company
- ❖ Its direct, indirect and coming competitors

and most importantly
- ❖ the future for that industry

Each person can then use experience and wisdom to form their own balanced judgement – much more than looking at numbers

I have performed evaluations on several major projects for senior executives who were motivated by getting their pet idea approved or by a bonus for completing a transcation.

NPV					
IRR					
Payback					
Life					
Cash Breakeven					
Key Driver #1					
Key Driver #2	x	x	x	x	x
Key Driver #3	x	x	x	x	x
Closure /Disposal	x	x	x	x	x
Social & Community	x	x	x	x	x
Environmental	x	x	x	x	x
Governance	x	x	x	x	x

This module is in four parts: -

Part 1: NPV – net present value
Part 2: IRR – internal rate of return
Part 3: Payback

Part 4: A brief look at computing and illusrating NPV

Part 1: NPV is the <u>QUANTITY</u> of value…

NPV is a great measure

In theory it says you should be indifferent to receiving the NPV as cash in your hand today or taking the project/investment/business for its life.

> It is easy to calculate
>
> It is easy to understand and discuss
>
> NPV can incorporate uncertainty, risks and optionality into its computation
>
> It can draw everyone around you into its calculation

It is by far the most revered of all the metrics.

NPV = quantity,: IRR = quality: Payback = speed

Three home truths about NPV …

1. NPV is wonderful and powerful *- but does have shortcomings*

2. NPV is subjective. *It is nothing more than the mathematical treatment of a collation of best estimates, expert judgements and knowledgeable opinions. Managers are highly naïve if they believe that NPV is a dispassionate, objective and absolute metric.*

3. The process and discipline of extracting all this information from these experts is as important as the NPV itself.

Home Truth #1: NPV is wonderful & powerful

Depending on the overall value of the business investment/project,
you may have to lead the team through a sequence of evaluations
that may be something like: -

1. Base case or Mid scenario NPV
2. Minimum, Low, High, Maximum scenarios NPVs
3. Probability weighted NPV
4. Perhaps probabilistic NPV

For major decisions you may need to enhance the results with:-
5. Above scenarios with risks incorporated
6. Above scenarios with optionality added
7. Alternative investment ideas

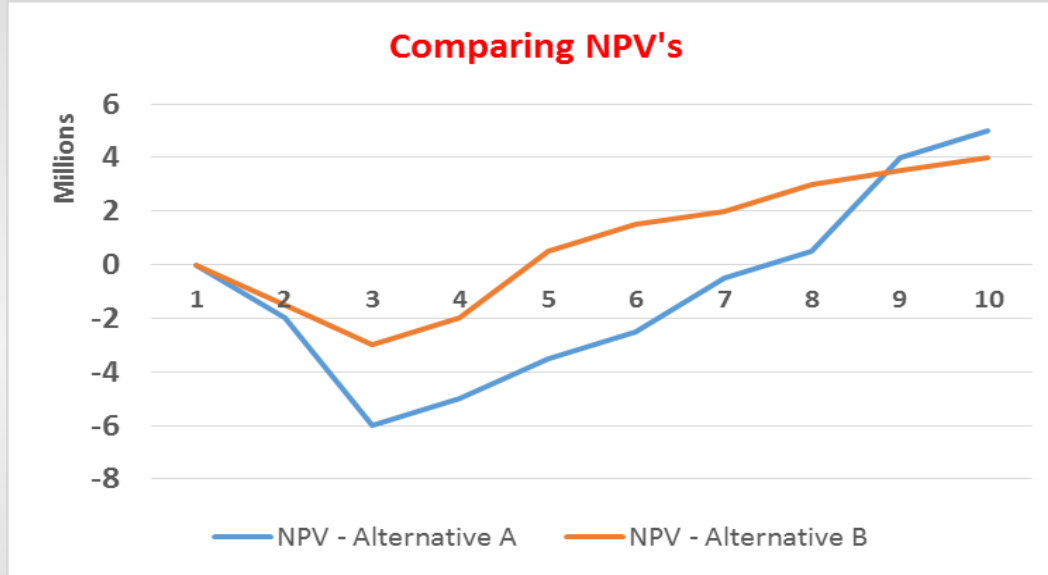Part 4 below illustrates the calculation and presentation of NPV

NPV's Shortcoming. Which is the better investment?

	Investment	NPV
Case #1	$300 000	$160 000
Case #2	$3 000 000	$320 000

← **Case #2 has double the NPV but requires ten times the investment**

NPV's Shortcoming. Which is the better investment?

Comparing NPV's

← If this was your business, would you select Alternative A below because it has the highest final NPV in Year 10?
Or would you select Alternative B with lower investment, faster pay-back, earlier positive NPV, lower risk but a smaller final NPV?

I was dragged into an infamous, mega, complex project where the final NPV was the driving metric. It was a pet project of the CEO who was happily and repeatedly told its final NPV is positive.
 I suspect he never told the Board that it required huge injections of cash over decades before the NPV turned positive. They probably were told "It has a positive NPV!".
The project leaders wanted to please their boss. They were hardened engineering project managers and seemed to regard the business side as subordinate: something less important people can worry about. Even the peer review seemed to be under the influence of the CEO.

Eventually it was abandoned.
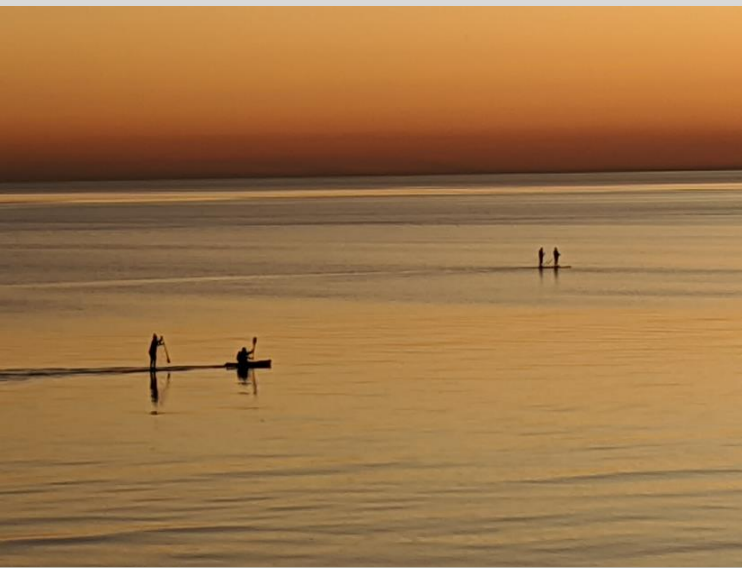
NPV's Shortcoming. Which is the better investment?

	Industry, Competitiveness, Flexibility,	Final NPV
Alternative S	poor	75
Alternative T	good	50

← **Alternative S has the better NPV but the business might not survive!**

NPV does not tell you how your project or business is positioned in that industry, your cost competitiveness, your ability to flex operations to capture booms and ride-out market troughs.
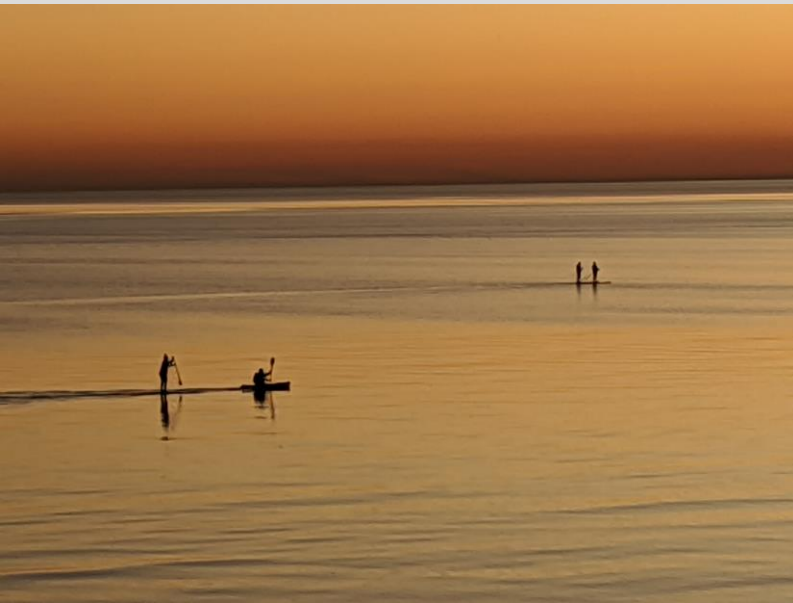
NPV does not necessarily get more accurate with more sophisticated mathematics.

(but it does gets more accurate with better forecasts of price, sales, opex and capex)

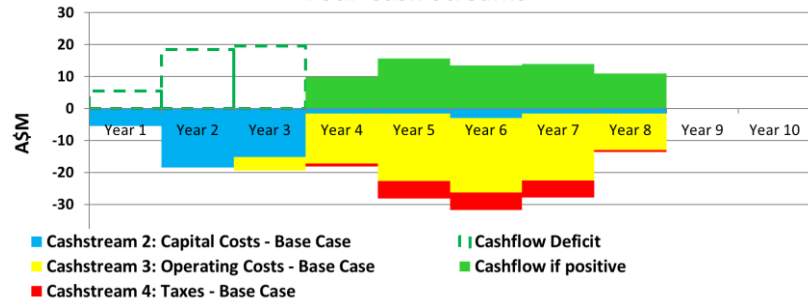|	Computation Method	Final NPV
Alternative Y	One case	48
Alternative Y	Multiple cases - probability weighted	42
Alternative Y	Sophisticated probabilistic software	53

Above, Alternative Y is assessed by three methods –

1. The decision makers may find upfront, that a 'one case' is best to rapidly understand the business and to expose its drivers. To get a good feel for what it is all about!

2. As the project is developed, they might see the 'multiple cases' providing a useful range of outcomes. How good it might become and how bad it might turn. They give each of these various cases its own estimates of probability weighting

3. They might feel that the 'sophisticated probabilistic NPV' is 'interesting' but for this situation it is too much of an act of faith in software and mathematics where garbage in gives garbage out.
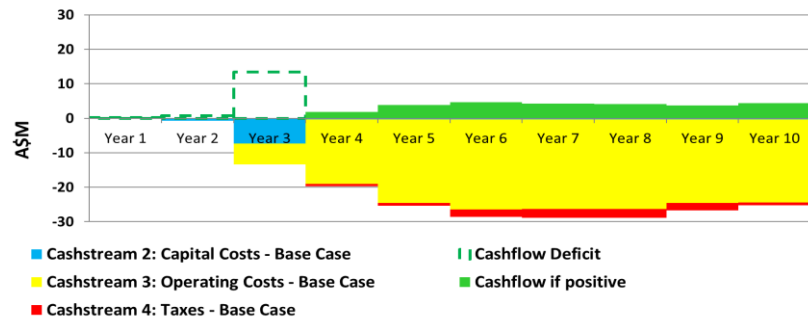
Be very wary when a project's NPV is poor (either as one case or as multiple cases with optionality), but then is said to be attractive when probabilistic/Black Scholes is used "to recognise its full value"..

If you do not understand what is happening in simple, easy-to-understand terms then alarm bells should ring in your head.
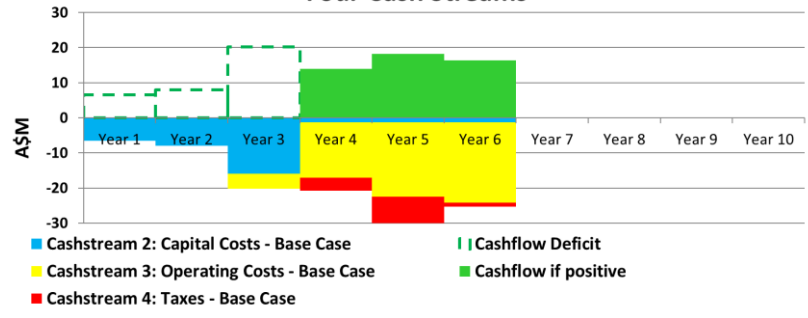
Four Cash Streams (Upper graph)

Legend:
- Cashstream 2: Capital Costs - Base Case
- Cashstream 3: Operating Costs - Base Case
- Cashstream 4: Taxes - Base Case
- Cashflow Deficit
- Cashflow if positive

What is your opinion …

- Here are illustrations of three businesses/projects **with upfront investments**.
- The blue is the capital expenditure. The solid green blocks from Year 4 are cash surpluses.
- These three have the same NPV's. *Which would you prefer?*

This is where IRR & Payback are equally important metrics.

Project	NPV	IRR	Payback
Upper graph	4.1	11%	Year 8
Middle graph	4.1	16%	Year 8
Lower graph	4.1	13%	Year 6

The middle project has lowest capital investment and the highest IRR but its yearly cash margins are very thin – it could easily go bad if the market weakens or operating costs increase slightly. But it could be far better if the reverse occurs.

The lower project has the attraction of the fastest payback but has a short life. It has a long capital investment period and could easily go bad if the market and opex are worse than forecast. Equally it could go very well if the market in four years is stronger or opex is far better.

The upper project has the least favourable metrics but somehow might be the safest investment?

This where experience and wisdom are needed – not just metrics.

NPV's shortcoming is that expressing a project as one mathematical number does not reveal its profile: it does not characterise the size and duration of any upfront investment, nor the margins and nor duration of the returns.

Which business would you choose?

Here are illustrations of three **existing businesses**.

- The green is the surplus cash expected to be generated each year.
- When surplus cashflows are discounted back to the start of Year 1, these three existing businesses have very similar NPV's.
- NPV's tell us these three businesses are equally good!
- *Would you prefer one?   Before assessing each business properly, I favour the middle one. The thin margins of the upper business and the two year gap in surplus cash of the lower business make me apprehensive.*

Again here, the shortcoming of NPV is that expressing a business as one mathematical number does not reveal the underlying profile of the business.

This is aggravated when there is no upfront cash deficit - as in these three existing businesses - because there is no IRR or payback to give extra guidance. (IRR and payback require an overall cash deficit in the early years to work mathematically)
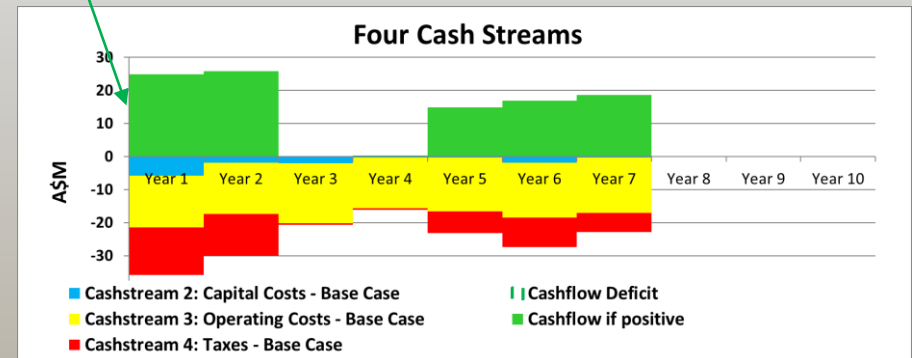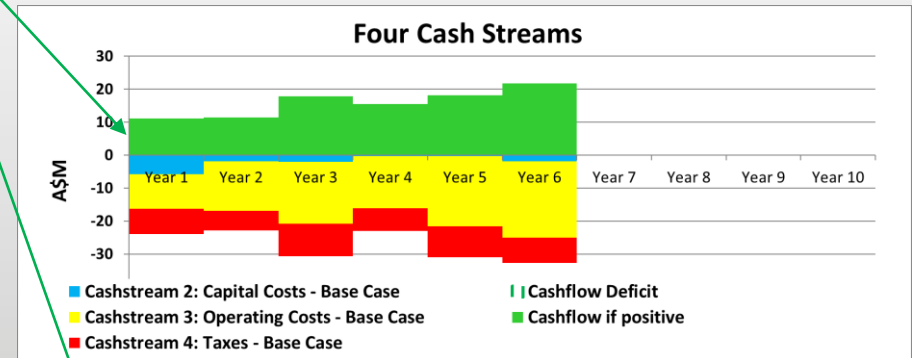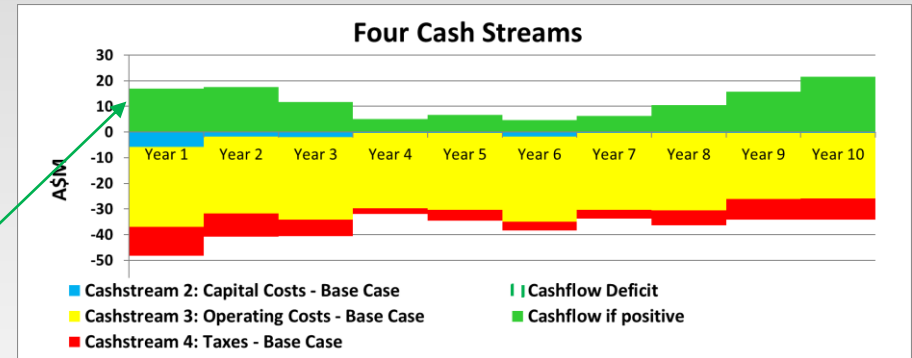
Home Truth #2: NPV is subjective

It is nothing more than the mathematical treatment of a collation of best estimates, expert judgements and knowledgeable opinions.

Many senior managers and decision-makers do not appreciate this home truth.
They mistakenly think NPV is an objective truth. Their company's investment documents might have a box for NPV, which they regard as sacrosanct. They just want a magical number to put in the box to get approval.
But NPV is of course derived from the aggregation of the four cashstreams. In turn each of these is derived from estimates by experts. Within each cashstream there is likely to be parameters that are known with confidence and others that are nothing more than best estimates of the situation that may occur some years out. Some are 'quicksands'.
A different team of equal experts, or the same team some time later, are most likely to generate a different NPV.

Home Truth #3: The process and discipline of extracting all this information from these experts is as important as the NPV itself.

When the managers/leaders are directly involved in identifying and estimating the key parameters then the process of computing NPV has the most value. These key people can learn the variability around each parameter and realise how much confidence they should have in the NPV.

Of the four cashstreams, the **sales/production/revenue** stream needs to be the largest for the business/project to be viable. So the forecasting of 'price' and 'sales' will be of utmost importance to the calculation of NPV.

> The irony is that in too many companies, especially in resource companies, the nitty-gritty of forecasting the markets, sales volumes and prices of that industry is overseen by a senior executive but in truth performed by some 'back office' experts - or perhaps relegated to an external company.
>
> In companies selling into consumer markets, everyone should be aware of the range of possibilities for product mix, sales volumes and prices. Each specialist needs to make estimates across this range.

Inside **capital costs** and **operating costs** it is vital to know the likely ranges of each major component and the confidence in each. These two costs have middle leverage on NPV, so the managers/leaders should keep their probing and testing in perspective. Some project managers get lost in chasing down fine details in the capital estimate - because that's where they have expertise.

In most countries taxes are likely to be the least important cashstream. (Brazil is a prime exception). But VAT/GST can have a major (sometimes a devastating) impact. Mathematically, income tax will be a fraction of the cash left over after paying for operating and capital costs. As stressed in the Module on Taxes, a business model is not used for official tax returns and usually can contain simplified calculations that are 'fit for purpose'.

Computing NPV is a <u>overt team </u>effort that can bring everyone closer together.

Probability and NPV …

1. *Probability Weighting the NPVs of your range of various cases* is relatively easy but most useful …
metric …

	Minimum Scenario	Unfavourable Scenario	Mid Scenario (Base Case)	Favourable Scenario	Maximum Scenario
NPV	-3 325	-1 622	+1460	+2477	+3584
Probability of that scenario	10%	25%	40%	20%	5%
NPV * probability	-333	-406	+584	495	179

Probability weighted NPV = - 333 - 406 + 584 + 495 + 179 **= 519**

2. *An unkind opinion on Probabilistic NPV's:* *My experiences with Monte Carlo type computations of NPV have been disappointing. For each of the key parameters, experts in that field had generated a probability distribution whilst in a properly conducted workshop. That was fine. Then the Monte Carlo expert loaded these distributions into the software. For each of the outcomes it randomly picked values from each distribution and computed an NPV. **This was not fine!***
In most businesses there is an important structural relationship – direct or indirect – between several of these key parameters. For example if prices are increased, sales <u>might</u> decrease, product mix should change, production decrease and so unit operating costs increase. Or if poor economic conditions mean that operating costs have decreased then in these bad times, the sales might also decrease. For Monte Carlo to work in many situations, it must have mathematical relationships between the key parameters in each of the thousands of cases?

I saw Monte Carlo wildly embraced in mining after its deserved success in oil exploration (which is very different). It seemed deficient. During each run, commodity prices were changed up and down thousands of times inside Monte Carlo. But there was no way that the software had the ability to recalculate a new mine plan (of waste rock, ore and cut-off grades) for each new price. It used the same production plan for very low commodity prices and for very high commodity prices - which is not how most mines work. Also, the software could not compute the indirect impacts on capex and opex for each of the thousands of outcomes. But the results really impressed some of the senior executives who were in blissful ignorance and took results at face value. One was a disaster.

While my experiences were unsatisfactory, probabilistic valuations must be valid in some situations.

Part 2: IRR is the QUALITY of value…

IRR reveals the money generating power or quality of an investment.

Mathematically, IRR is the discount rate that gives a zero NPV.

- You could determine the IRR by trial and error, by repeatedly substituting higher/lower discount rates into your model until you find the rate that produces zero NPV.
- Fortunately Excel/Google have a simple function that does it for you.

  I generally believe the use of Excel functions in an economic evaluation model is poor practice, for the numerous reasons I explain in these modules, but accept that the Excel function is the only sensible way to compute IRR.

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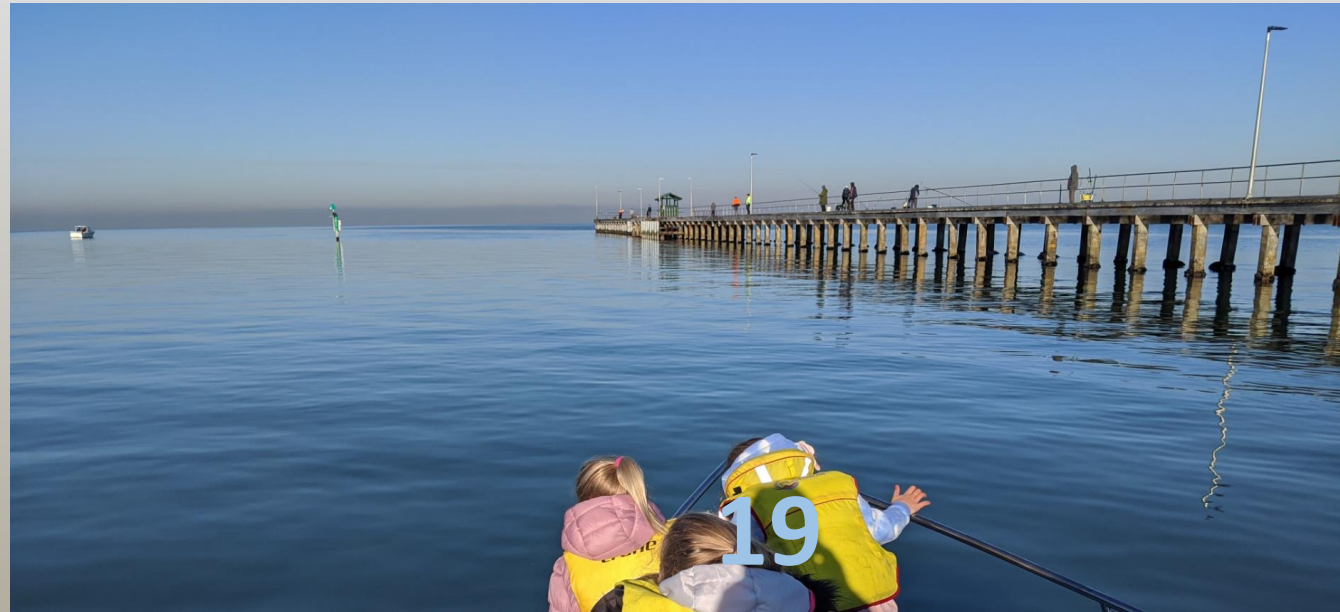
IRR computation essentials:

1. IRR and payback only work when there is a significant negative net cashflow in at least one of the early years of a business or project. Their computation is not possible for an existing business or project which will have only positive net cashflows in the early years.

2. IRR can be computed from net cash flows in real terms or in nominal terms. The difference is inflation. So if your model computes in nominal terms that IRR = 5.6% nominal the IRR in real terms could be taken as = 5.6% - 2.0% inflation = 3.6% real.

3. Whilst learning economic evaluation, many of us have made the silly mistake of computing IRR from the row of discounted cashflows rather than from the row of net cashflow before discounting. (Understandable once but not a second time.)

4. You will hear mathematically oriented 'experts' deride or dismiss IRR because if there are two periods of negative cashflow then more than IRR is mathematically possible. Tell them to use their brains to work out which/if any to accept.

Warning Bells:

Whenever I see an IRR over say 15% to 20% warning bells go off in my head.
1. Is it a mathematical error?
2. Is it a "sell" job

1. Perhaps it's a mathematical error?
   Just looking at the net cashflows over the years and the four cashflows will tell me immediately if a moderate business case has somehow generated an exceptionally high IRR'. Next I would check the formula for IRR to see if the wrong cells are used. Then I would work up the four cashstreams to identify the source.
2. Perhaps it's a "sell job"?
   Has a very favourable scenario been devised to present a business/project in its best light. I have seen this done so many times. 'This opportunity is so good you should immediately rush in without delay before someone else gets it!' But I think, why has this project not been developed before or why is this business being sold if it is so good?

I maintain a healthy scepticism until I track down an explanation

Part 3: Payback measures the SPEED ...

Payback tells how soon the money invested upfront will be repaid by the business or project. It is the third powerful guide.

Payback is a handy metric, that should not be seen as lesser than NPV and IRR even though it is less frequently computed.

Payback is very popular amongst wise, hands-on people because its tells them how long the investment is at risk. They may feel unsure about NPV and IRR and find this is more 'tangible'.They can look at the industry, the business, the project, the risks and think:

"*It will be six years before we get our money back and separately we are discussing whether will need to completely revamp our product range over the next few years.*"

or

"*Payback is only 30 months and in that time the business risks are low. Lets do it!*"

Payback Mathematics: -

Mathematically pay back can be computed in many different ways:

1. Dollars:
   i. Real
   ii. Nominal
2. Base date:
   i. From Day 1 of Year 1,
   ii. From the start of investing big dollars or buying
   iii. From the start of commercial operations
3. Tax
   i. Before tax
   ii. After taxes – in country
   iii. After taxes – international

I shun any before-tax method, but accept any of the others providing it is clearly defined.
I usually read payback from the row that computes 'cumulative cash flow' or from its graph.

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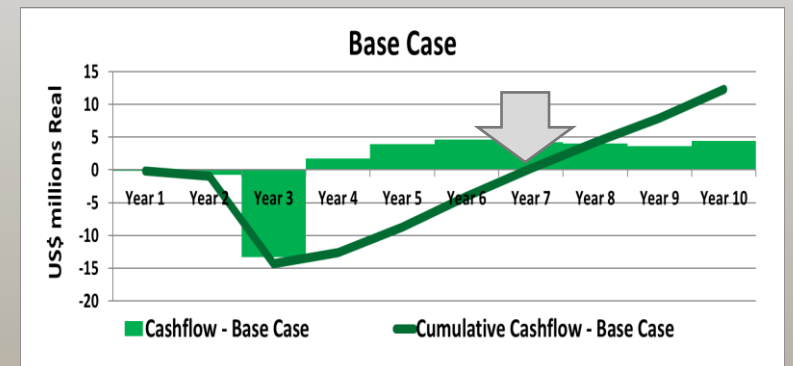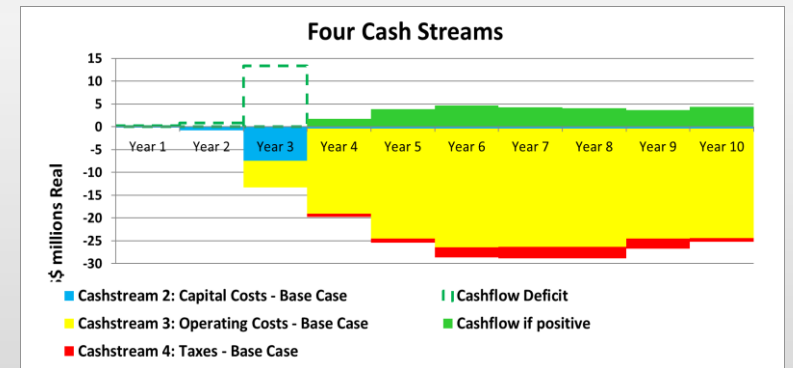
Remember for NPV, IRR and Payback: -

"If it looks too good to be true, it probably is *too good to be true!"*

NPV, IRR and Payback are powerful and exalted but there is a lot, lot more!

Inside Level 2 there usually are five steps ...

Level 3: Decision making

Level 2: Evaluating the business/project

Level 1: Hands-on business modelling

In the next module we will continue to work through Step 3 →

- Step 1: Decide which business entity is to be evaluated

- Step 2: Create the hands-on model

- **Step 3:** Compute the basket of powerful economic measures: NPV, IRR, Payback, **cash break even, key drivers, dollar trees, four cash streams,** uncertainty, risk, optionality

- Step 4: Assess alternatives, flexibility, options, risks, the business, the industry

Step 5: Interact so the decision makers "have their eyes wide open"

Part 4: A brief look at calculating & illustrating NPV…

Here's a simple example of NPV…

1. NPV holds that a dollar received some years in the future is worth less than a dollar owned today.
2. The method of '**discounting**' the worth of a future dollar is simple: Reduce its value by a percentage for every extra year until it is received.
   (This percentage is called 'discount rate' and is discussed in a separate module. In the example below we use '8%')
3. The net cash flow each year (which can be positive or negative) is discounted back to the **'base date';** usually Day 1 of Year 1.
4. Normally, we assume that within each year the outflow of cash for capex, opex and taxes and the inflow of cash from sales **average about mid year**.
5. This means that the net cashflow in Year 1 is discounted back half a year – very close to 4% so it is worth 0.96 of a dollar held on Day 1 of Year 1, the net cashflow in Year 2 is discounted by 1.5 years so is worth 0.89 of a dollar held on Day1 of Year 1, Year 3 is 0.82 … etc
6. **The 'net present value' ("NPV")** is the sum of these discounted cashflows (present values) over all the years. (Below NPV is $1 280 000)

Cashflow and NPV

Cashflows

	units	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cashstream 1: Revenue	$ 000 Real	83,000	0	7,000	10,000	12,000	12,000	12,000	12,000	12,000	6,000	0
Cashstream 2: Capital Costs	$ 000 Real	17,500	12,000	3,000	500	500	500	500	500		0	0
Cashstream 3: Operating Costs	$ 000 Real	49,800	0	4,200	6,000	7,200	7,200	7,200	7,200	7,200	3,600	0
Cashstream 4: Taxes	$ 000 Real	8,370	0	0	1,050	1,290	1,290	1,290	1,290	1,440	720	0
year-by-year net cashflows			-12,000	-200	2,450	3,010	3,010	3,010	3,010	3,360	1,680	0

NPV - net present value

	units	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Discount Rate	% Real		8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Discount Factor			0.96	0.89	0.82	0.76	0.71	0.65	0.61	0.56	0.52	0.48
year-by-year net present values			-11,547	-178	2,021	2,299	2,129	1,971	1,825	1,887	873	0
NPV	$ 000 .	1,280		aggregate								
Cumulative NPV	$ 000 .		-11,547	-11,725	-9,704	-7,405	-5,276	-3,305	-1,479	407	1,280	1,280

Make NPV easy to understand …

Always remember that you are creating a model for others to readily understand, and to use if they want.
(The model is not your exclusive domain and definitely not a 'trophy' of your Excel/Google modelling abilities.)

Some of the people looking at your model will be in important positions – management, operations and specialist - but do not really understand how NPV is computed. If you use Excel/Google NPV functions in your model you will alienate them and reduce your status in their eyes to a 'computer jockey' who does mathematical computations.

But if you have your NPV in easy-to-follow little steps then these important people can sneak a look and find they readily do understand the concept of NPV. Their focus can instead turn to the critical data: the quality of the data in the four cash streams.

Everyone around you should see your role as <u>the one expert </u>who brings all the team's knowledge together in an easy-to-follow model (that well may become long and detailed).
They see you as being <u>one of the key persons </u>to steer and improve the business.

Make yourself much more than the person with the Excel/Google spreadsheet doing computations in the back office!

Do not use the NPV Functions…

Most important: Do not take the short cut of using Excel/Google functions of NPV because : –

1. It is easy to select the wrong NPV function and hard to recognise your own silly error
   Over the years, too many experienced people have made mistakes when using these Excel/Google functions.
2. Less experienced people will not visually discover the simple concept that is NPV.
3. Colleagues must take your end result at face value and thus risk get alienated.
4. You cannot shows graphs of NPV and cumulative, year-by-year NPV.

Simply put, you would be arrogant!

Cashflow and NPV

Cashflows

	units	Total	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cashstream 1: Revenue	$ 000 Real	83,000	0	7,000	10,000	12,000	12,000	12,000	12,000	12,000	6,000	0
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Cashstream 3: Operating Costs	$ 000 Real	49,800	0	4,200	6,000	7,200	7,200	7,200	7,200	7,200	3,600	0
Cashstream 4: Taxes	$ 000 Real	8,370	0	0	1,050	1,290	1,290	1,290	1,290	1,440	720	0
Cashflow	$ 000 Real	7,330	-12,000	-200	2,450	3,010	3,010	3,010	3,010	3,360	1,680	0
NPV - net present value												
Discount Rate	% Real		8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Discount Factor			0.96	0.89	0.82	0.76	0.71	0.65	0.61	0.56	0.52	0.48
Discounted Cashflow	$ 000 .	1,280	-11,547	-178	2,021	2,299	2,129	1,971	1,825	1,887	873	0
NPV	$ 000 .											
Cumulative NPV	$ 000 .		-11,547	-11,725	-9,704	-7,405	-5,276	-3,305	-1,479	407	1,280	1,280

**Using a Excel/Google NPV function = 12 800 is like a mystery result coming out of a blue fog**

Give your senior people a quick _visual_ understanding of the business/project: -

Cashflow and NPV

Cashflows

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Cashstream 1: Revenue	$ 000 Real	83,000	0	7,000	10,000	12,000	12,000	12,000	12,000	12,000	6,000	0
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Cashstream 3: Operating Costs	$ 000 Real	49,800	0	4,200	6,000	7,200	7,200	7,200	7,200	7,200	3,600	0
Cashstream 4: Taxes	$ 000 Real	8,370	0	0	1,050	1,290	1,290	1,290	1,290	1,440	720	0
Cashflow	$ 000 Real	7,330	-12,000	-200	2,450	3,010	3,010	3,010	3,010	3,360	1,680	0

NPV - net present value

Discount Rate	% Real		8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Discount Factor			0.96	0.89	0.82	0.76	0.71	0.65	0.61	0.56	0.52	0.48
Discounted Cashflow	$ 000 .	1,280	-11,547	-178	2,021	2,299	2,129	1,971	1,825	1,887	873	0
NPV	$ 000 .	1,280										
Cumulative NPV	$ 000 .		-11,547	-11,725	-9,704	-7,405	-5,276	-3,305	-1,479	407	1,280	1,280

year by year net present value

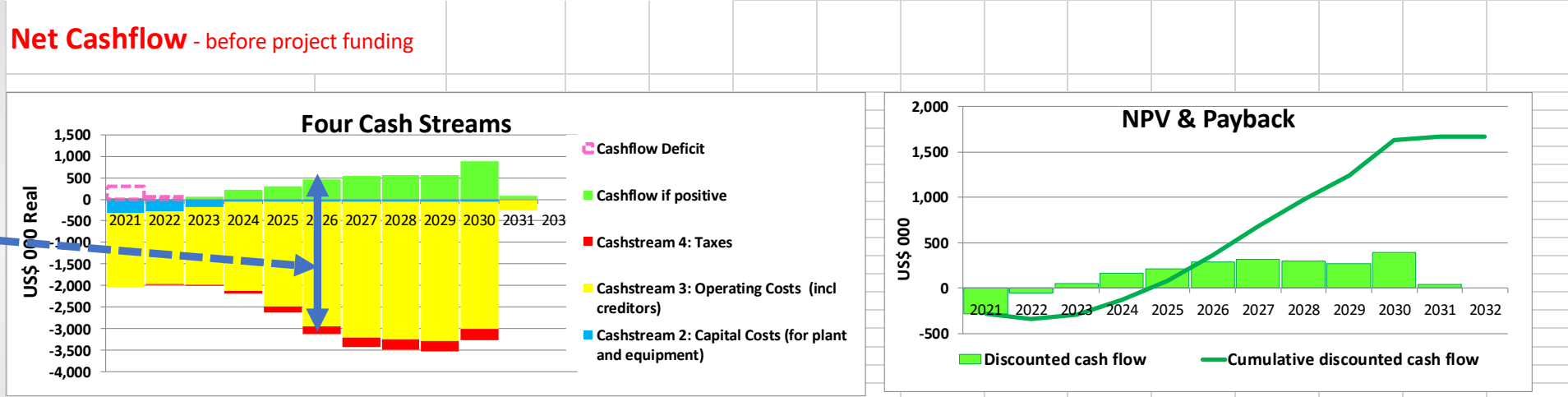Here is the NPV – as contributed each year

and the cumulative NPV

NPV

Discounted Cashflow — Cumulative NPV
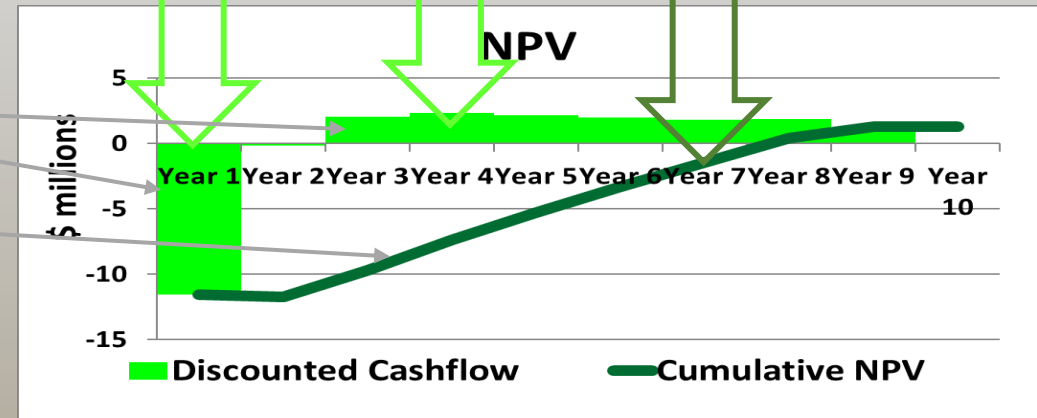
For any new business/project, I look first at the graphs of Cashflow & NPV: -

Net Cashflow - before project funding

The height of this column is the revenue in 2026.
This is spent as: -
- capex in blue,
- opex in yellow and
- taxes in red.

The green above zero is what is left as free cashflow

Four Cash Streams

Legend:
- Cashflow Deficit
- Cashflow if positive
- Cashstream 4: Taxes
- Cashstream 3: Operating Costs (incl creditors)
- Cashstream 2: Capital Costs (for plant and equipment)

NPV & Payback

- Discounted cash flow
- Cumulative discounted cash flow

First read this.

For me, these two graphs are a most valuable part of a business model!

Immediately I can see in this example:

- **In this example the free cashflow (green) is thin**. The business is vulnerable. The forecasts of price and volumes are super-important. How much confidence in them? If prices drop only a little and/or if costs increase just a little the business will bleed and become cash negative. Equally, if prices a lift a little and/or costs drop a little, NPV will jump: even double.
- **The capex** (blue) is relatively minor – deserves less attention.
- **The opex** consumes most of the revenue. The business needs to focus on how much confidence there is in the estimates of fixed and variable costs. If it is high in fixed costs then the business in dangerous territory.   Focus on the likelihood of costs increasing or being improved!
- **Tax** is a follower so deserves less attention.
- The **business bleeds cash** in the first two years which require injections of money from the owners (boxes with pink frames).

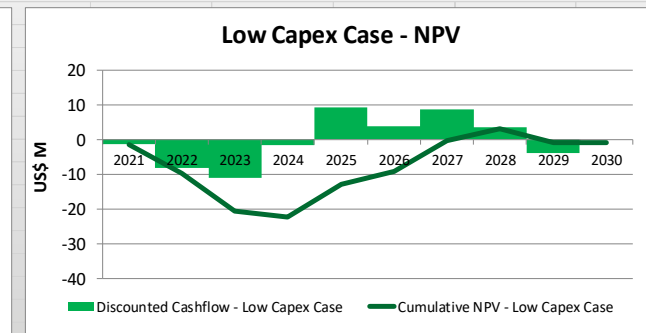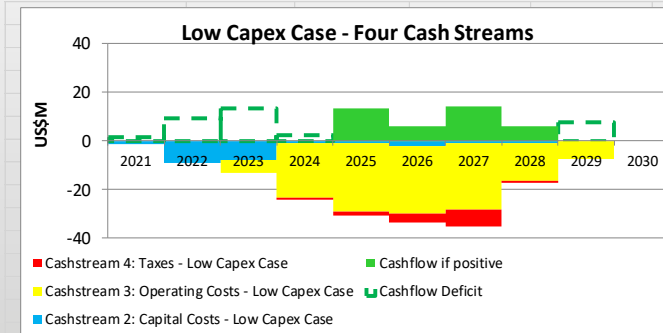# Immediately, I can decide how robust or vulnerable the business looks …-

The 'base case' looks robust:
- large upfront investment (blue capex),
- very good margins over five years of operations (green)
- Discounted cashflow breaks-even in 6th year
- NPV $16 million IRR 23%
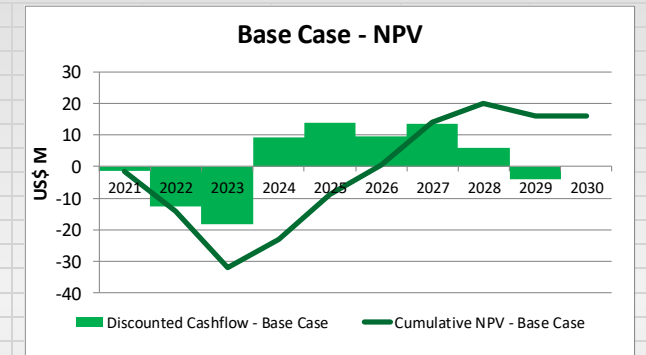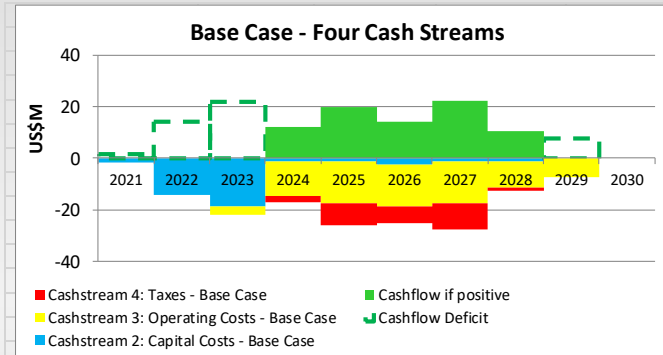
The 'low capex case' looks poor: -
- 40% less upfront investment (blue capex)
- Thin margins (green)
- NPV -$1 million and IRR 7%

The 'high grading case' deserves some consideration: -
- 20% less upfront investment (blue capex)
- Very good margins but a short life
- Discounted cashflow breaks-even after 5 years
- NPV $3 million IRR 13%
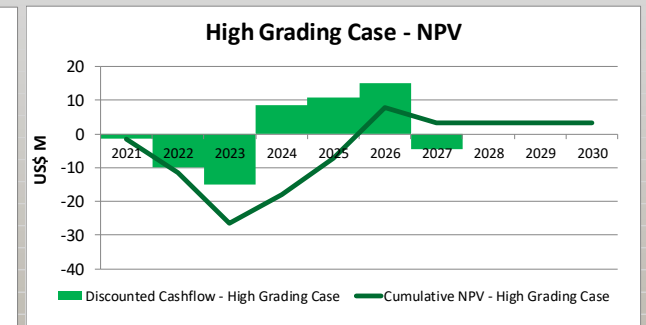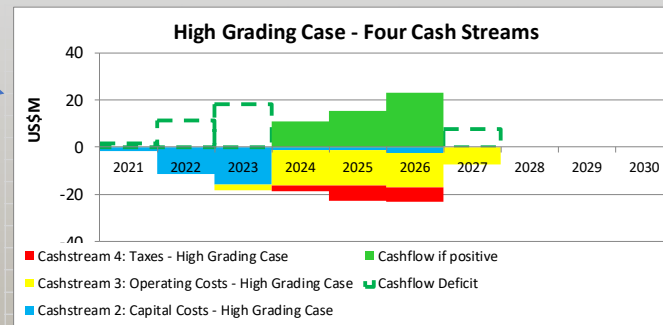
If the business is worried about the industry becoming over-supplied and very competitive, then the next step might be to investigate if it can begin with the 'high grading case' (so lower risk) **and transform into the longer life, higher NPV 'Base Case' - with delayed capex investment – when there is more confidence in the market.**

You can make economic evaluation the best job of all!!!

End of Module

Mordialloc Jetty – a lucky photo whilst out fishing.