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INVESTMENT IN TORREFACTION VERSUS TRADITIONAL PELLET PLANTS

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CASE DESCRIPTION

This case requires students to identify the best pellet mill project available by having them analyze a number of different factors including net present value and internal rate of return. Students are given information about the pellet mills themselves, and a number of different costs to help with their analysis. Students must determine which factors are more conclusive when deciding on a project and weigh the options to eventually decide which one will be a better investment. Students may make another plant plan, different from the two described if they think it will be a better investment. This case is appropriate for junior and senior level students, as well as masters level students. Students should have some knowledge of accounting and finance principles. Students may work individually or in teams to complete this project. This case should require about 4-8 hours of outside work and about an hour of in-class discussion.

JEL: G30

KEYWORDS: Pellets, Torrefaction, Capital Budgeting

CASE INFORMATION

With rising energy prices running into more stringent environmental regulations, many European consumers and companies are turning to wood pellets to either replace or supplement fossil fuel usage (Hogan, Otterstedt, Morin, Wilde, 2012). The pellets are made from compressed biomass, most often waste wood (trimmings and scrap), and are used as a form of wood fuel. They are most like coal, being a solid, but are completely carbon neutral when sourced from forests that are sustainably managed. The process of producing these pellets depends on whether hardwood or softwood is being used and whether the mill is using a tradition process or the newer torrefaction method. Various production techniques exist to deal with the different types of woods, and, in most areas, there are not many major differences in the finished product (Houck, Clark, Christensen, 2009). If the pellets are torrefied, the end product is almost identical, regardless of whether hardwood or softwood is used. Another advantage to using wood pellets is that they are accessible to almost all markets because they are so easily transportable (Deloitte, 2008).

Traditional pellets contain around half the energy per kilogram of coal and can be co-fired in coal plants up to 10% of the fuel content. The traditional method of producing pellets is cheaper, has a lower startup cost, and has a greater output of pellets per ton of raw materials. There are residential uses for traditional pellets in replacements for wood burning stoves and heaters. They do not, however, have the ability to replace nearly as much power generating coal as the torrefied product does. Torrefied pellets can be used in an existing coal plants for as much as 70% of the fuel with little modification to the existing plant (Dutta, 2011). Torrefaction is a new method of producing pellets in which the wood is cooked at high temperatures while deprived of oxygen before it is compressed (Eyer, 2012). This produces finished pellets which are much denser and in turn have approximately the same qualities of coal, in terms of energy, density, and

material characteristics. Some of the plant designs can partially supply their own thermal input by burning off the gaseous by-products of the torrefaction process in order to heat the reactor for the process while running. There are also changes under way to convert coal plants, which would otherwise be shuttered due to carbon output, to run solely on pellet and biomass.

The disadvantages of the torrefaction process are that about 10% of the wood's energy is wasted in the conversion. More equipment is required on top of the equipment already needed for traditional pellets, although torrefied wood is generally less wearing on the processing equipment (Koppejan, Sokhansanj, Melin, Madrali, 2012). Currently, torrefied pellets are classified as charcoal under the International Maritime Dangerous Goods Code, rather than a wood product, this has the effect of limiting the ability to ship these pellet in bulk as is common for traditional wood pellets. Wood pellets also have high transportation costs and usually will only use round wood and waste wood supplied within a 50 mile radius (Wilson, 2010). This could cause problems if the supply area for one company interferes with the supply area of another. We have two projects to choose from: the Piney Woods Pellets, who propose building a plant which produces traditional wood pellets, or the Port Pellets, who propose building a plant which produces torrefied pellets. For traditional and torrefied pellets, the distribution between raw materials and production costs and delivery costs to port is about equal but the cost to produce torrefied pellets is significantly higher. The average traditional pellet mill sells about 150,000 tons per year with a production cost before taxes of about $19.2 million in the first year, while torrefied pellet mills sell about 150,000 tons per year with a production cost of about $20.5 million before taxes.

Torrefied pellets, however, can be sold for up to 16% more than traditional pellets. The median price for traditional pellets in 2014 is about $160 per ton, giving Piney Woods Pellets revenues of $24 million, while torrefied pellets can sell for $190 per ton, giving Port Pellets revenues of $28.5 million. We assume there is an annual tax rate of 25%. The breakout of costs for Piney Woods Pellets to produce traditional pellets includes four parts: harvesting, transportation, depreciation and production costs. There is an initial investment is $25 million, which includes the cost of land, building, and equipment. Harvesting is the gathering of raw materials from land, which includes repairs and maintenance, diesel fuel, lube, large parts, insurance premium, and other costs (Qian, McDow, 2013). Harvesting accounts for about $5 million of the overall cost. Transportation is the cost it takes to transport the raw materials from where they were harvested to the pellet mill. Since Piney Woods Pellets will be in an area that is surrounded by woods and there are no other companies in the supply area, the transportation cost only accounts for about $1.5 million. Depreciation costs are calculated using the initial investment of $25 million divided over a 5 year useful life using the straight line depreciation method. It is calculated to be $5 million per year.

The production cost consists of variable costs, which include energy and labor costs, fixed costs, and delivery of finished goods to the port. Energy costs are $1.5 million; labor costs are $3 million; and fixed costs are $1.5 million. Since Piney Woods Pellets is so far from the nearest port, delivery to the port is $1.7 million. Using the 25% tax rate, taxes are calculated to be $1.2 million for the first year. This gives Piney Woods Pellets a net income of $3.6 million for year one. See Appendix A for the forecasted results of operations for year one of the project. Port Pellets proposes producing torrefied pellets and is very close to the delivery port, causing delivery costs to the port to be lower, but further away from densely wooded areas, causing transportation costs to be higher, therefore, the breakout is slightly different. Harvesting costs are the same $5 million but transportation of raw materials to the pellet mill is now $3.5 million because Port Pellets is not as close to wooded areas. The depreciation cost is also calculated using the initial investment, but, since torrefied plants require more machinery, the initial investment is $32 million, which includes the cost of land, building, and equipment. Depreciation is calculated to be $6.4 million per year. The production costs are also allocated differently because there is no delivery cost to the port, torrefied plants require more energy, and labor is more expensive in the area. The energy cost is $2.2 million; the labor cost is $3.5 million; and the fixed cost is $2 million. Taxes are also calculated with a 25% tax rate, which equals $1.475 million for the first year of production. This gives Port Pellets a net

income of $4.425 million for year one. For a summary of the comparative income statement for both Piney Woods Pellets and Port Pellets for the first year of operations, refer to the table below.

Forecasted Results of Operations ($ in 1,000s)

	Piney Woods Pellets	Port Pellets
Revenues	$24,000	$28,500
Harvesting	$5,000	$5,000
Transportation cost	$1,500	$3,500
Depreciation	$5,000	$6,400
Energy Cost	$1,500	$2,200
Labor Cost	$3,000	$3,500
Fixed Cost	$1,500	$2,000
Delivery Cost to Port	$1,700	$ -
Taxes	$1,200	$1,475
Net Income	$3,600	$4,425
Cash Flow	$8,600	$10,825

This table shows the estimated comparative income statements and cash flows for Piney Woods Pellets, producing traditional pellets, and Port Pellets, producing torrefied pellets, for the first year of operations. Revenues are calculated using the respective prices of traditional and torrefied pellets multiplied by the estimated number of units sold. Taxes are calculated based on a 25% tax rate.

We assume in this case that there is a constant inflation rate of 3% per year over a five year period. This will cause all of the expenses and revenues for both Piney Woods Pellets and Port Pellets to increase by 3% each year of operation. The net present value of the projects represents how much the cash flows over time are worth. The internal rate of return (IRR) however represents the rate of return used in capital budgeting to measure and compare the profitability of investments. Because IRR is a rate quantity, it is an indicator of the efficiency, quality, or yield of an investment. This is in contrast with the net present value, which is an indicator of the value or magnitude of an investment. Nathan P. Velazquez, the manager of Piney Woods Pellets, believes that net present value is a more reliable way to determine which investment to make, while Ivan R. Rodriguez, the manager of Port Pellets, believes that the internal rate of return is a more reliable approach. The payback period refers to the period of time required to earn back the funds expended in an investment. Payback period is good to consider when making a decision because it shows the investor how fast they will recover their original cost, but it should not be the only consideration. The profitability index is the ratio of net present value to initial investment of a project. It allows the investor to quantify the amount of value created per dollar invested. The rationale behind using the profitability index to influence decisions is that it gives a clear description of whether or not the project will be profitable.

QUESTIONS

1. Calculate the Net Present Value for each project described and determine which project appears more valuable based on this calculation.

2. Calculate the Internal Rate of Return for each project and determine which project appears more valuable based on this calculation.

3. Which manager is using the most appropriate method for determining which project to choose from and why?

4. Calculate the payback period and the profitability index for each project. Explain what significance these values have in relation to the decision at hand.

5. Are there any other options that should be considered when choosing a project? There are no barriers preventing Piney Woods Pellets or Port Pellets from producing either traditional or torrefied pellets.

6. If there are other options considered, make the same calculations (NPV, IRR, payback period, profitability index) and compare the new options to the two already presented. For Piney Woods Pellets to produce torrefied pellets or for Port Pellets to produce traditional pellets, we can assume that harvesting, transportation, labor, fixed cost, and delivery cost will remain constant. For either plant to produce torrefied pellets or for either plant to produce traditional pellets, the initial investment, energy cost, and depreciation will be the same.

7. Which project should investors choose and which values or ratios had a higher priority in your decision?

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TEACHING NOTES

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CASE DESCRIPTION

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GENERAL COMMENTS

This case requires students to accurately analyze financial information and make a decision based on this information about which investment is better. Furthermore, students must consider any other possibilities for an investment, aside from the two presented in this case, and determine if their alternative would be a safer investment. There are a number of factors to consider, including net profit, net present value, internal rate of return, payback period, etc. Students must understand and analyze each of these values and decide which values or rates better show the investor which project to choose. This is the type of challenge that managers and executives will be faced with on a regular basis, so it is important for students to understand the decision making process. While students should provide visual aids to present their solution to this case study, visual aids are not provided here. The following provides a sample solution to this case study. There is no one correct solution since the case is open-ended; therefore student's solutions will probably differ from what is presented here. The solutions presented are based on the assumption that the student will choose neither of the projects presented, but instead determine their own project idea. The numbers presented are based on educated assumptions related to the numbers presented in the case.

QUESTIONS

Question 1: Calculate the Net Present Value for each project described and determine which project appears more valuable based on this calculation.

Solution 1: To calculate net present value, students must use the 3% inflation rate to estimate the future cash flows for all five years of each project. This can be done with an excel spreadsheet shown below.

Table 1: Piney Woods Pellets Revenues and Expenses Producing Traditional Pellets ($ In 1,000s)

Year	0	1	2	3	4	5
Revenues		$24,000.00	$24,750.00	$25,500.00	$26,250.00	$27,000.00
Harvesting		$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00
Transportation cost		$1,500.00	$1,545.00	$1,591.35	$1,639.09	$1,688.26
Depreciation		$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00
Energy Cost		$1,500.00	$1,545.00	$1,591.35	$1,639.09	$1,688.26
Labor Cost		$3,000.00	$3,090.00	$3,182.70	$3,278.18	$3,376.53
Fixed Cost		$1,500.00	$1,500.00	$1,500.00	$1,500.00	$1,500.00
Delivery Cost to Port		$1,700.00	$1,751.00	$1,803.53	$1,857.64	$1,913.36
Taxes		$1,200.00	$1,329.75	$1,457.77	$1,584.00	$1,708.40
Net Income		$3,600.00	$3,989.25	$4,373.30	$4,752.00	$5,125.19
Cash Flow	-$25,000.00	$8,600.00	$8,989.25	$9,373.30	$9,752.00	$10,125.19

This table shows the estimated revenues, expenses, and cash flows for the first five years of operations for Piney Woods Pellets, producing traditional pellets. Revenues are based on a price of $160 (increasing 3% each year) and sales of 150,000 per year. Harvesting, depreciation, and fixed costs remain constant, while all other expenses increase 3% each year. The initial investment of $25 million includes the cost of land, building, and equipment.

Table 2: Port Pellets Revenues and Expenses Producing Torrefied Pellets ($ In 1,000s)

Year	0	1	2	3	4	5
Revenues		$28,500.00	$29,400.00	$30,300.00	$31,200.00	$32,100.00
Harvesting		$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00
Transportation cost		$3,500.00	$3,605.00	$3,713.15	$3,824.54	$3,939.28
Depreciation		$6,400.00	$6,400.00	$6,400.00	$6,400.00	$6,400.00
Energy Cost		$2,200.00	$2,266.00	$2,333.98	$2,404.00	$2,476.12
Labor Cost		$3,500.00	$3,605.00	$3,713.15	$3,824.54	$3,939.28
Fixed Cost		$2,000.00	$2,000.00	$2,000.00	$2,000.00	$2,000.00
Delivery Cost to Port		$0.00	$0.00	$0.00	$0.00	$0.00
Taxes		$1,475.00	$1,631.00	$1,784.93	$1,936.73	$2,086.33
Net Income		$4,425.00	$4,893.00	$5,354.79	$5,810.18	$6,258.99
Cash Flow	-$32,000.00	$10,825.00	$11,293.00	$11,754.79	$12,210.18	$12,658.99

This table shows the estimated revenues, expenses, and cash flows for the first five years of operations for Port Pellets, producing torrefied pellets. Revenues are based on a price of $190 (increasing 3% each year) and sales of 150,000 per year. Harvesting, depreciation, and fixed costs remain constant, while all other expenses increase 3% each year. The initial investment of $32 million includes the cost of land, building, and equipment.

Revenues are calculated by increasing the price of the pellets 3% each year (rounded to the nearest dollar) and multiplying it by the expected sales of 150 units per year (in 1,000s). Harvesting, depreciation, and fixed costs will not be affected by inflation. The initial investments for Piney Woods Pellets and Port Pellets of $25 million and $32 million respectively are based on the estimated cost of land, buildings, equipment, and any other costs incurred to begin operations. After the future cash flows are calculated, the Excel "NPV" function can be used to find the net present value of each project. Net present value is $7,623.32 for Piney Woods Pellets and $8,929.91 for Port Pellets (in 1,000s). Based on this value alone, Port Pellets would be the better investment because the net present value is higher.

Question 2: Calculate the Internal Rate of Return for each project and determine which project appears more valuable based on this calculation.

Solution 2: To calculate the internal rate of return, students will again use the projected future cash flows, calculated in Question 1. This value can also be calculated easily using the "IRR" function in Microsoft Excel. Internal rate of return is 25% for Piney Woods Pellets and 24% for Port Pellets. Based on this rate alone, Piney Woods Pellets is the better investment.

Question 3: Which manager is using the most appropriate method for determining which project to choose from and why?

Solution 3: To determine which investment is better, several values must be considered. Nathan P. Velazquez of Piney Woods Pellets believes that the net present value is a better indicator of which investment to make. The net present value for Piney Woods Pellets is $7.62 million while the net present value for Port Pellets is $8.93 million. This shows that after the five year period, the cash flows of Port Pellets will have a higher value. If this is the only value considered, the investor would choose Port Pellets. An investor must keep in mind, though, that net present value does not scale the value for the size of the initial investments. Ivan R. Rodriguez of Port Pellets, however, believes that the internal rate of return is a better indicator of which project to choose. The internal rate of return for Piney Woods Pellets and Port Pellets is 25% and 24% respectively. This shows that Piney Woods Pellets has a higher rate of return than Port Pellets and the investor should choose Piney Woods Pellets. Neither of these values should be used as the only deciding factor when determining which project to choose. The net present value gives valuable information because it shows the value over time of the project's cash flows. The internal rate of return also gives valuable information because it shows a percentage rate of how much return the investor will gain on their investment. The two should both be considered when making a decision.

Question 4: Calculate the payback period and the profitability index for each project. Explain what significance these values have in relation to the decision at hand.

Solution 4: To calculate the payback period for each investment, students must determine, in years, how long it will take for the cash flows of the project to equal the initial investment. For Piney Woods Pellets, the initial investment will be paid back in the third year of operations. It only takes a fraction of the year to equal the initial investment; therefore the payback period is 2.79 years. The payback period for Port Pellets is calculated in the same manner, and equals 2.84 years.

The profitability index is calculated by dividing the net present value by the initial investment to show how much return will be gained per dollar invested. Piney Woods Pellets has a profitability index of 30%, while Port Pellets has a profitability index of 28%. Based on this value, the investor should favor Piney Woods Pellets because the profitability index is higher, showing that it has more profit per dollar initially spent.

Question 5: Are there any other options that should be considered when choosing a project? There are no barriers preventing Piney Woods Pellets or Port Pellets from producing either traditional or torrefied pellets.

Solution 5: When analyzing the two options presented, it is important to notice that there are two other options that are not described here. Piney Woods Pellets could produce torrefied pellets, and Port Pellets could produce traditional pellets. To analyze these additional options, a number of estimations and calculations must be made. For Piney Woods Pellets to produce torrefied pellets, we can assume that certain costs would be equal, regardless of whether the plant is producing traditional or torrefied pellets. These costs include the harvesting cost ($5 million), transportation cost ($1.5 million), labor cost ($3 million), fixed cost ($1.5 million), and delivery cost to port ($1.7 million). The cost breakout for these particular costs would also be the same for Port Pellets to produce traditional pellets. These costs include harvesting cost ($5 million), transportation cost ($3 million), labor cost ($3.5 million), fixed cost ($2 million), and delivery cost to port ($0). The initial investment would change from the options presented in the case because torrefied pellets require more machinery. The initial investments are $32 million for Piney Woods Pellets and $25 million for Port Pellets. This would change the annual depreciation expense as well, making it $6.4 million for Piney Woods Pellets and $5 million for Port Pellets, using the same straight line depreciation over five years. Revenues would also change from the original amounts because torrefied pellets sell for $190 while traditional pellets sell for $160. Revenues are calculated to be $28.5 million for Piney Woods Pellets and $24 million for Port Pellets. The energy cost for Piney Woods Pellets would now

be $2.2 million while the energy cost for Port Pellets is now $1.5 million. The following table shows (in 1,000s) a projected income statement for the first year of operations for these two options.

Table 3: Forecasted Results of Operations ($ In 1,000s)

	Piney Woods Pellets	Port Pellets
Revenues	$28,500	$24,00
Harvesting	$5,000	$5,000
Transportation cost	$1,500	$3,500
Depreciation	$6,400	$5.000
Energy Cost	$1,500	$2,200
Labor Cost	$3,000	$3,500
Fixed Cost	$1,500	$2,000
Delivery Cost to Port	$1,700	$-
Taxes	$1,800	$875
Net Income	$5,400	$2,625
Cash Flow	$11,800	$7,625

This table shows the estimated comparative income statements and cash flows for Piney Woods Pellets, producing torrefied pellets, and Port Pellets, producing traditional pellets, for the first year of operations. Revenues are calculated using the respective prices of traditional and torrefied pellets multiplied by the estimated number of units sold. Taxes are calculated based on a 25% tax rate.

We will again assume that there is a constant inflation rate of 3% per year over a five year period and a tax rate of 25%. This will cause all of the expenses and revenues for both Piney Woods Pellets and Port Pellets to increase by 3% each year. For Piney Woods Pellets, the net present value is now $12.5 million while the net present value for Port Pellets is now $4.1 million. The internal rate of return for Piney Woods Pellets is now 28% while the internal rate of return for Port Pellets is now 19%. The payback period for Piney Woods Pellets and Port Pellets is calculated to be 2.62 years and 3.12 years, respectively. Comparing both of these options to each other and to the two options presented in the case, it is clear that producing torrefied pellets at Piney Woods Pellets is the best investment of the four. This project has a significantly higher net present value and internal rate of return, while also having an ideal payback period. All things considered, this is the best possible option.

Question 6: If there are other options considered, make the same calculations (NPV, IRR, payback period, profitability index) and compare the new options to the two already presented. For Piney Woods Pellets to produce torrefied pellets or for Port Pellets to produce traditional pellets, we can assume that harvesting, transportation, labor, fixed cost, and delivery cost will remain constant. For either plant to produce torrefied pellets or for either plant to produce traditional pellets, the initial investment, energy cost, and depreciation will be the same.

Solution 6: To calculate the net present value of the two extra options explored, students will again need to find the projected cash flows for all five years of the project using the same 3% inflation rate. The future cash flows are as follows.

Table 4: Piney Woods Pellets Revenues and Expenses Producing Torrefied Pellets ($ In 1,000s)

Year	0	1	2	3	4	5
Revenues		$28,500.00	$29,400.00	$30,300.00	$31,200.00	$32,100.00
Harvesting		$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00
Transportation cost		$1,500.00	$1,545.00	$1,591.35	$1,639.09	$1,688.26
Depreciation		$6,400.00	$6,400.00	$6,400.00	$6,400.00	$6,400.00
Energy Cost		$2,200.00	$2,266.00	$2,333.98	$2,404.00	$2,476.12
Labor Cost		$3,000.00	$3,090.00	$3,182.70	$3,278.18	$3,376.53
Fixed Cost		$1,500.00	$1,500.00	$1,500.00	$1,500.00	$1,500.00
Delivery Cost to Port		$1,700.00	$1,751.00	$1,803.53	$1,857.64	$1,913.36
Taxes		$1,800.00	$1,962.00	$2,122.11	$2,280.27	$2,436.43
Net Income		$5,400.00	$5,886.00	$6,366.33	$6,840.82	$7,309.29
Cash Flow	-$32,000.00	$11,800.00	$12,286.00	$12,766.33	$13,240.82	$13,709.29

This table shows the estimated revenues, expenses, and cash flows for the first five years of operations for Port Pellets, producing torrefied pellets. Revenues are based on a price of $190 (increasing 3% each year) and sales of 150,000 per year. Harvesting, depreciation, and fixed costs remain constant, while all other expenses increase 3% each year. The initial investment of $32 million includes the cost of land, building, and equipment.

Table 5: Port Pellets Revenues and Expenses Producing Traditional Pellets ($ In 1,000s)

Year	0	1	2	3	4	5
Revenues		$24,000.00	$24,750.00	$25,500.00	$26,250.00	$27,000.00
Harvesting		$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00
Transportation cost		$3,500.00	$3,605.00	$3,713.15	$3,824.54	$3,939.28
Depreciation		$5,000.00	$5,000.00	$5,000.00	$5,000.00	$5,000.00
Energy Cost		$1,500.00	$1,545.00	$1,591.35	$1,639.09	$1,688.26
Labor Cost		$3,500.00	$3,605.00	$3,713.15	$3,824.54	$3,939.28
Fixed Cost		$2,000.00	$2,000.00	$2,000.00	$2,000.00	$2,000.00
Delivery Cost to Port		$0.00	$0.00	$0.00	$0.00	$0.00
Taxes		$875.00	$998.75	$1,120.59	$1,240.46	$1,358.29
Net Income		$2,625.00	$2,996.25	$3,361.76	$3,721.37	$4,074.88
Cash Flow	-$25,000.00	$7,625.00	$7,996.25	$8,361.76	$8,721.37	$9,074.88

This table shows the estimated revenues, expenses, and cash flows for the first five years of operations for Port Pellets, producing torrefied pellets. Revenues are based on a price of $190 (increasing 3% each year) and sales of 150,000 per year. Harvesting, depreciation, and fixed costs remain constant, while all other expenses increase 3% each year. The initial investment of $32 million includes the cost of land, building, and equipment.

Net present value is the calculated to be $12,473.62 for Piney Woods Pellets and $4,079.60 for Port Pellets. Comparing these values to the two options presented in the case, Piney Woods Pellets producing torrefied pellets is clearly the best investment of the four. The internal rate of return for Piney Woods Pellets and Port Pellets is calculated to be 28% and 19% respectively. Based on these rates, Piney Woods Pellets is again the best investment. The payback period for Piney Woods Pellets producing torrefied pellets is 2.62 years, and the payback period for Port Pellets producing traditional pellets is 3.12 years. Between the four options, Piney Woods Pellets producing torrefied pellets is the superior option, but all of the payback periods are relatively close together. This gives the payback period a lower priority when making the overall decision. The profitability index, however, was very significantly different between the four options. For Piney Woods Pellets to produce torrefied pellets, the profitability index is 39% while it is only 16% for Port Pellets to produce traditional pellets.

Question 7: Which project should investors choose and which values or ratios had a higher priority in your decision?

Solution 7: To determine which project to choose from, students must analyze the results of their calculations and determine which calculations are more appropriate to use when making these decisions. A summary of the findings is shown below.

Table 6: Results and Comparison of the Four Potential Projects

		NPV ($ In 1,000s)	IRR	Profitability Index	Payback Period (In Years)
Piney Woods Pellets	Traditional	7,632.32	25%	30%	2.79
	Torrefied	12,473.62	28%	39%	2.62
Port Pellets	Traditional	4,079.60	19%	16%	3.12
	Torrefied	8,929.91	24%	28%	2.84

The table shows the net present value, internal rate of return, profitability index, and payback period for all four of the project options. The results of each project have been compared and the shaded region represents the optimal investment based on each value or rate. Piney Woods Pellets is clearly the ideal project since it has the best results in every category.

Since the net present value of Piney Woods Pellets producing torrefied pellets is significantly higher than the other three options, we should place the highest value on this project. The internal rate of return and profitability index are also significantly higher for Piney Woods Pellets producing torrefied pellets, therefore we will again place a higher value on this project. The payback period is only significantly different for Port Pellets producing traditional pellets; therefore we will place the lowest value on this project. The other three projects' payback periods are within two months of each other, therefore this value is not indicative of which project to choose. Overall, Piney Woods Pellets producing torrefied pellets is the best option for investors to choose.

BIOGRAPHY

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