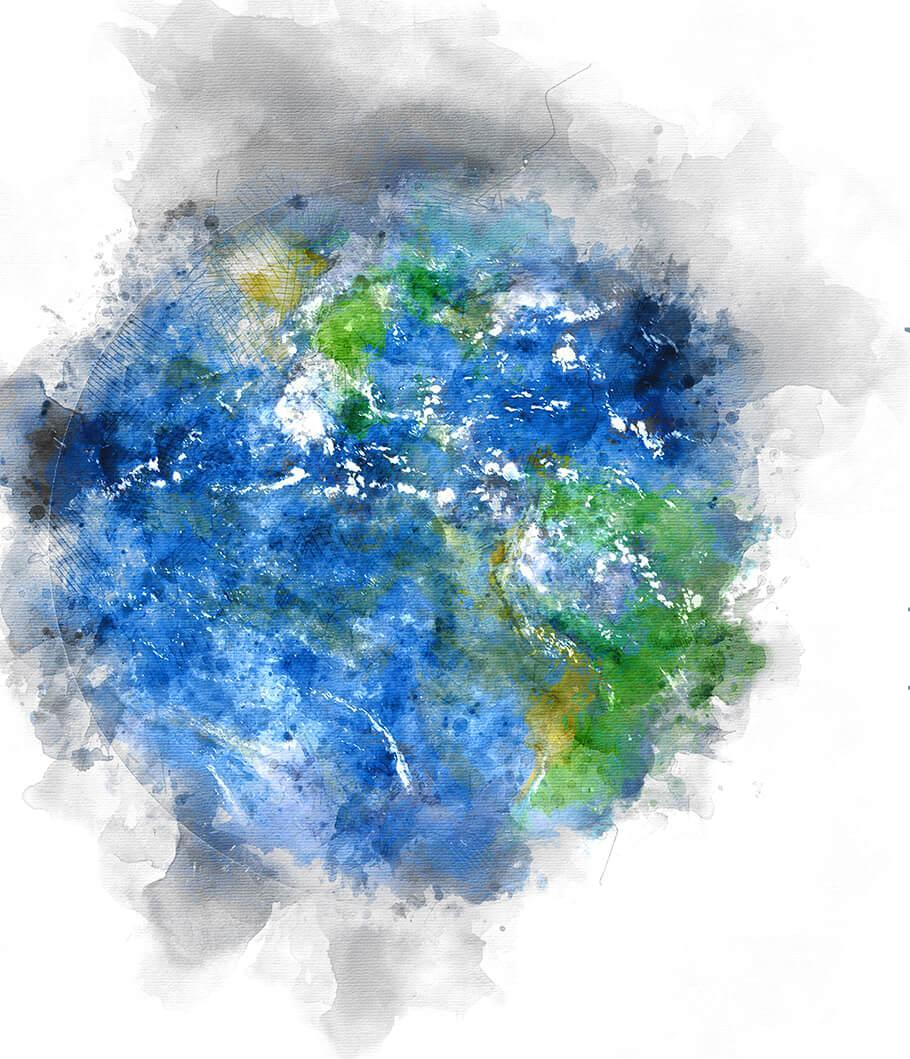


VASSILIKO
CEMENT
SINCE 1963

Vassiliko Cement: Green Energy Project

Wikler Case Competition

Sydney Dalin, Kene Nwankwo, CJ Maloney, Mina Shahmirzadi, Allie Strouse, Pat Murphy

Meet Julie

- 8 years old
- Lived in Cyprus her whole life
- Attended Vassiliko's Summer School

Agenda

History

Financing

Recommendation

Meet the Team

Sydney Dalin
Accounting and Finance

Kene Nwankwo
Finance and International Business

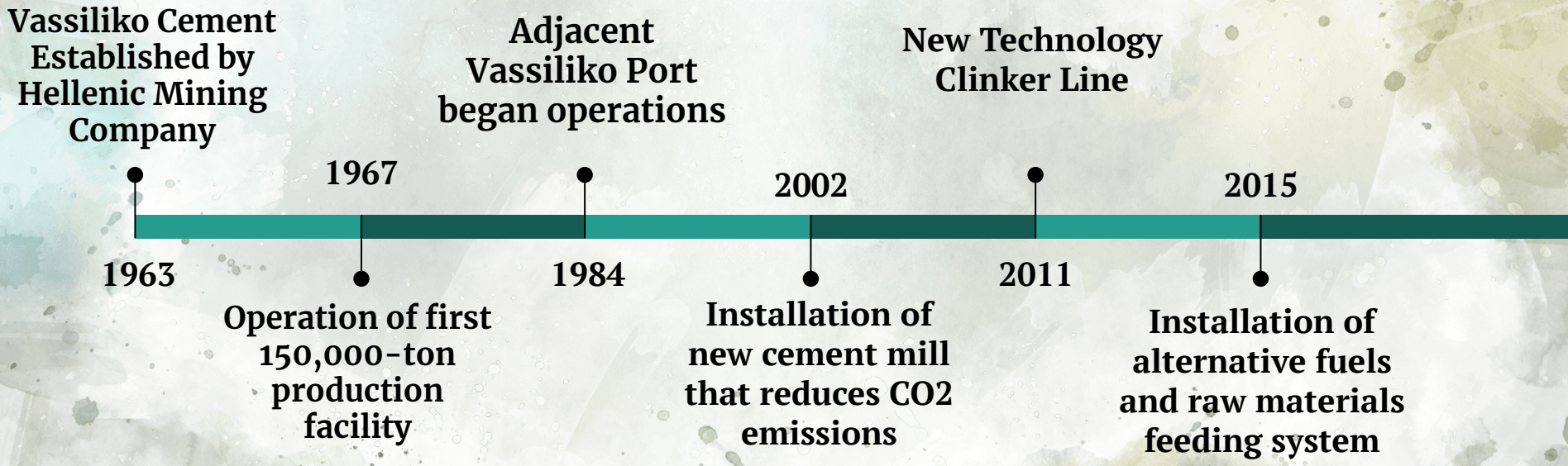
Pat Murphy
Finance and Management

Allie Strouse
Finance and OMBA

Mina Shahmirzadi
Finance and Information Systems

CJ Maloney
Finance and Information Systems

Vassiliko Cement History



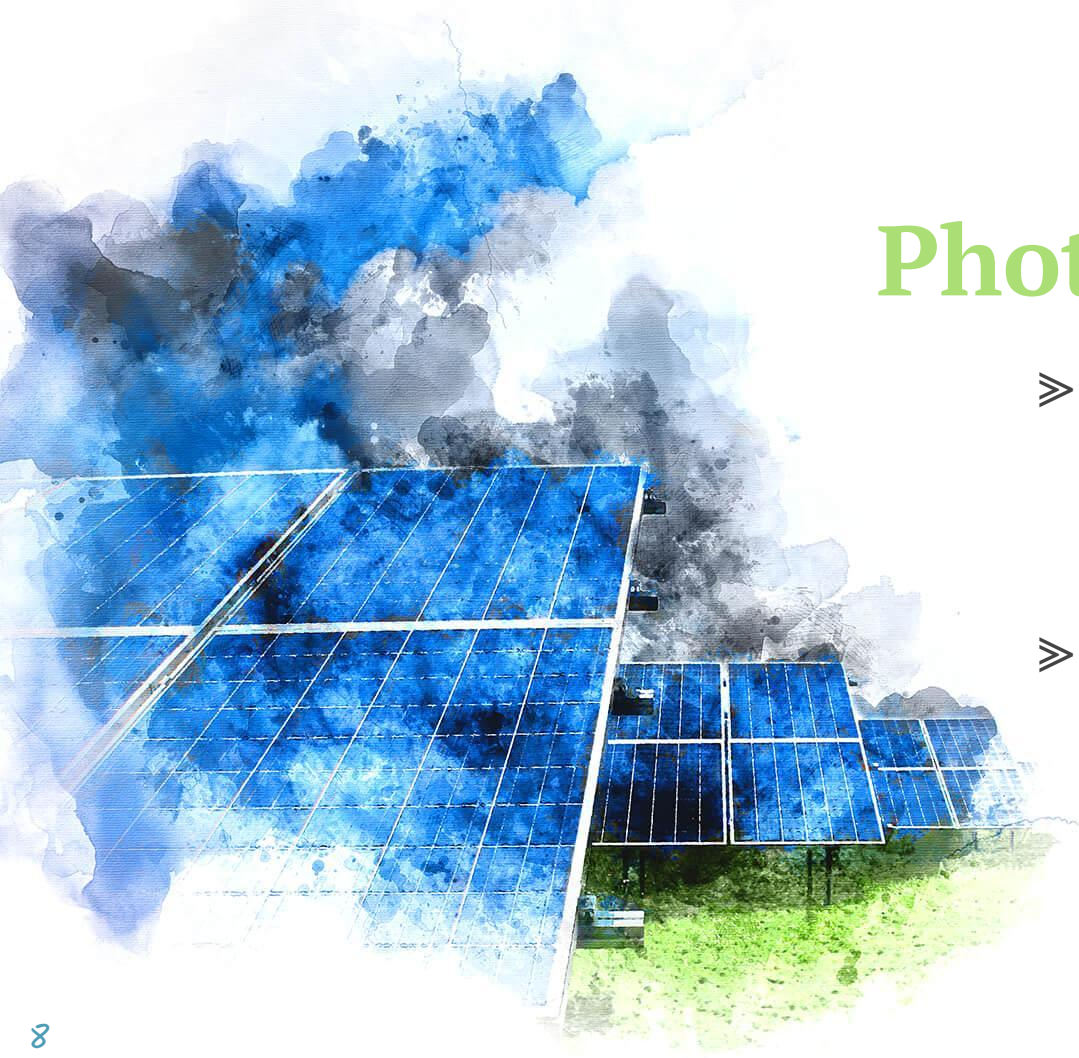
Vassiliko's Aspiration to Be Green

In 2018...

- Gold Environmental Protection Award
- Honorary distinction at the 4th Competition of Corporate Social Responsibility in the sector of volunteerism
- Honorary distinction by the Institute of the Environment & Sustainable Development
- Outstanding Alternative Fuel Project

Renewable Energy Sources (RES)

Advantages	Disadvantages
≫ Unlimited Sources of Energy	≫ Difficult to store in large quantities
≫ Environmentally Friendly	≫ Large production requires large installations
≫ Low cost	≫ Availability of RES sometimes limited
≫ Generates jobs	≫ High initial investment
≫ National energy independence	



The Amalas Photovoltaics Project

- Unused land plot of 250,000 sq. m.
  - Solar Park of 8-10 MW requires 100,000 sq. m.
- Requires approvals from **EAC**, **CERA**, & the **Cyprus Ministry of Energy, Commerce, and Industry**

The Amalas Photovoltaics Project

- State-owned electricity generation company
- EAC and CERA interested in the promotion of renewable energy
- Cyprus government behind in EU renewable energy requirements
  - Must be 13% of output
- Park to cover 8-10% of VCW's annual electricity demand
  - Zero emissions with using RES
- VCW is highest consumer of electricity in Cyprus

Investors Prefer Photovoltaic over Concentrated Solar Power

	Photovoltaic	Concentrated Solar Power
Stores energy		✓
Less expensive	✓	
Easier to build	✓	

Financials

- How will Vassiliko finance this project?

Advantages of Loan Financing

- **Not depleting cash on hand**
- **Ability to meet other objectives**
- **Dividend policy**

3% Loan Amortization Schedule

Principal	€6,000,000.00
Interest Rate	3%
Term	7
Annual Payment	-€963,038.12

Up front cost:	€2,000,000.00
Loan Principal	€6,000,000.00
Interest	€741,266.86
Total cost:	€8,741,266.86

7% Loan Amortization Schedule

Principal	€6,000,000.00
Interest Rate	7%
Term	7
Annual Payment	-€1,113,319.32

Up front cost:	€2,000,000.00
Loan Principal	€6,000,000.00
Interest	€1,793,235.22
Total cost:	€9,793,235.22

Power Cost Savings:

Inputs:

- Average EAC future fuel price per tonne = є 380
- Basic EAC fuel price per tonne= є 300
- Annual solar panel efficiency reduction of .5%
- First year power generation = 13,520,000 KwH

Equations:

- Net price benefit €/MWh = Electricity price in €/MWh + (Average future EAC fuel price – Basic EAC fuel price) × 0.00024 × 1000
- Power cost savings per month in Year 1 = Net price benefit × (Projected power generation per annum for the Amalas PV park / 1000 × Monthly power generation in %)

Operating Cash Flows of Project

Year 1: € 1,827,737.64
Year 2: € 1,822,248.95
Year 3: € 1,816,787.71
Year 4: € 1,811,353.77
Year 5: € 1,805,947.00
Year 6: € 1,800,567.27
Year 7: € 1,795,214.43

Annual payment 3% loan:
€ 963,038

Annual payment 7% loan:
€ 1,113,319

Projected Net Cash Flows to Equity Holders

3% loan:

€ 2,902,141.32

7% loan:

€ 2,092,232.47

Potential Risks

- Unpredictable weather causing inefficiencies
- Changes in future cost of fuel
- Unforeseen maintenance costs
- Higher than expected initial installation costs

Discount Rate Sensitivity Analysis

IRR 3% Loan: 11.163%

7%->6%: NPV:+32.105%

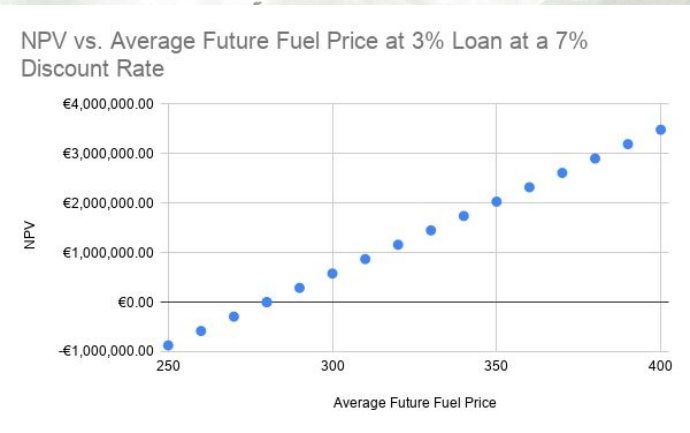
7%->8%: NPV:-28.503%

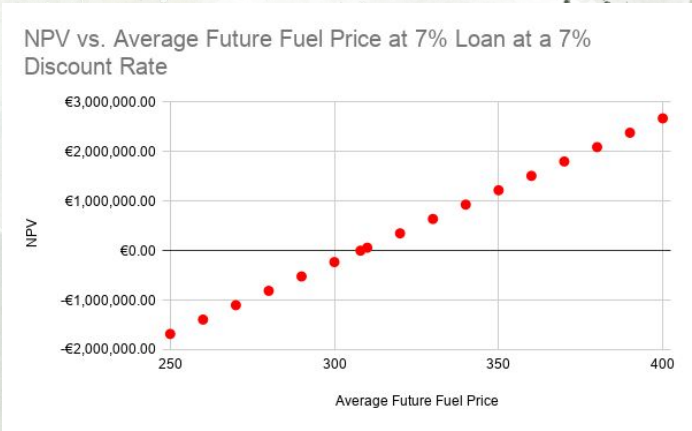
IRR 7% Loan: 9.914%

7%->6%: NPV:+43.146%

7%->8%: NPV:-38.223%

Average Future Cost of Fuel Sensitivity Analysis





NPV = 0 at 280.0484

Coefficient of Slope: 29,035.47

NPV = 0 at 307.94217

Coefficient of Slope: 29,035.47

Final Recommendation

- **Finance the Amalas Photovoltaic project using a 3% loan**

VASSILIKO CEMENT

Remember Julie?

Let Julie grow up in a house on the edge of the island with her kids and grandchildren without worrying about floods or other unnatural weather disasters that could cost them their future

"It's not option A, B, or C; it's option A+B+C"

–BCC Environment Correspondent Matt McGrath

Q&A

Thanks for listening!

VASSILIKO CEMENT

Appendix A: Loan Amortization Schedule 3% interest

Principal	€6,000,000.00
Interest Rate	3%
Term	7
Annual Payment	-€963,038.12

Up front cost:	€2,000,000.00
Loan Principal	€6,000,000.00
Interest	€741,266.86
Total cost:	€8,741,266.86

Year #	Date	Principal	Interest	Payment	Balance
0	2019				6,000,000
1	2020	-€783,038.12	-€180,000.00	-€963,038.12	5,216,962
2	2021	-€806,529.27	-€156,508.86	-€963,038.12	4,410,433
3	2022	-€830,725.14	-€132,312.98	-€963,038.12	3,579,707
4	2023	-€855,646.90	-€107,391.22	-€963,038.12	2,724,061
5	2024	-€881,316.31	-€81,721.82	-€963,038.12	1,842,744
6	2025	-€907,755.79	-€55,282.33	-€963,038.12	934,988
7	2026	-€934,988.47	-€28,049.65	-€963,038.12	0
			-€741,266.86		

Appendix B: Loan Amortization Schedule 7% interest

Principal	€6,000,000.00
Interest Rate	7%
Term	7
Annual Payment	-€1,113,319.32

Up front cost:	€2,000,000.00
Loan Principal	€6,000,000.00
Interest	€1,793,235.22
Total cost:	€9,793,235.22

Year #	Date	Principal	Interest	Payment	Balance
0	2019				6,000,000
1	2020	-€693,319.32	-€420,000.00	-€1,113,319.32	5,306,681
2	2021	-€741,851.67	-€371,467.65	-€1,113,319.32	4,564,829
3	2022	-€793,781.29	-€319,538.03	-€1,113,319.32	3,771,048
4	2023	-€849,345.98	-€263,973.34	-€1,113,319.32	2,921,702
5	2024	-€908,800.20	-€204,519.12	-€1,113,319.32	2,012,902
6	2025	-€972,416.21	-€140,903.11	-€1,113,319.32	1,040,485
7	2026	-€1,040,485.34	-€72,833.97	-€1,113,319.32	0
			-€1,793,235.22		

Appendix C: Operating Cash Flows of Project

			Yearly decrease	0.50%			
			Tax rate	12.50%			
Operating Cash Flows of Project	2020 (year 1)	2021	2022	2023	2024	2025	2026
Total power Cost Savings	$1,254,557.30	$1,248,284.52	$1,242,043.09	$1,235,832.88	$1,229,653.72	$1,223,505.45	$1,217,387.92
Operating Expenses	$80,000.00	$80,000.00	$80,000.00	$80,000.00	$80,000.00	$80,000.00	$80,000.00
EBIT	$1,174,557.30	$1,168,284.52	$1,162,043.09	$1,155,832.88	$1,149,653.72	$1,143,505.45	$1,137,387.92
EBIT(1-T)	$1,027,737.64	$1,022,248.95	$1,016,787.71	$1,011,353.77	$1,005,947.00	$1,000,567.27	$995,214.43
Depreciation	$800,000.00	$800,000.00	$800,000.00	$800,000.00	$800,000.00	$800,000.00	$800,000.00
Operating Cash Flow	$1,827,737.64	$1,822,248.95	$1,816,787.71	$1,811,353.77	$1,805,947.00	$1,800,567.27	$1,795,214.43

Appendix D: FCF 3% Loan

3% Loan Free Cash Flows												
Discount Rate	7%											
	2019 (year 0)	2020 (year 1)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating CFs		$1,827,737.64	$1,822,248.95	$1,816,787.71	$1,811,353.77	$1,805,947.00	$1,800,567.27	$1,795,214.43	$1,789,888.36	$1,784,588.92	$1,779,315.97	$ 974,069.39
(CapEx)	$ (8,000,000.00)											
Net Debt		$ (963,038.12)	$ (963,038.12)	$ (963,038.12)	$ (963,038.12)	$ (963,038.12)	$ (963,038.12)	$ (963,038.12)				
FCF	$ (8,000,000.00)	$ 864,699.52	$ 859,210.83	$ 853,749.59	$ 848,315.65	$ 842,908.88	$ 837,529.14	$ 832,176.31	$1,789,888.36	$1,784,588.92	$1,779,315.97	$ 974,069.39
NPV	$ 2,902,141.32											

https://docs.google.com/spreadsheets/d/1IysyeQIv372MbaK7aSN6Bm6neKgVHN5k10icB-jJUXc/edit#gid=1850569136

Appendix E: FCF 7% Loan

7% Loan Free Cash Flows												
Discount Rate	7.00%											
	2019 (year 0)	2020 (year 1)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating CFs		$ 1,827,737.64	$ 1,822,248.95	$ 1,816,787.71	$ 1,811,353.77	$1,805,947.00	$ 1,800,567.27	$ 1,795,214.43	$1,789,888.36	$1,784,588.92	$1,779,315.97	$ 974,069.39
(CapEx)	$ (8,000,000.00)											
Net Debt		$ (1,113,319.32)	$ (1,113,319.32)	$ (1,113,319.32)	$ (1,113,319.32)	$ (1,113,319.32	$ (1,113,319.32)	$ (1,113,319.32)				
FCF	$ (8,000,000.00)	$ 714,418.32	$ 708,929.64	$ 703,468.39	$ 698,034.45	$ 692,627.68	$ 687,247.95	$ 681,895.11	$1,789,888.36	$1,784,588.92	$1,779,315.97	$ 974,069.39
NPV	$ 2,092,232.47											

https://docs.google.com/spreadsheets/d/1IysyeQIv372MbaK7aSN6Bm6neKgVHN5k10icB-jJUXc/edit#gid=1850569136

Appendix F: Electricity Savings

Kg Fuel Consumed Per MWh	245			Begining Year	2019													
MWh Per Tonne	4.081632653			Discount Rate	0.07													
Price of Fuel per Tonne	300																	
Price of Fuel Per MWh	73.5																	
Electricity price in €/MWh	73.5																	
Average future EAC fuel price	380																	
Basic EAC fuel price	300																	
Coefficient of fuel adjustment	0.00024																	
Net price benefit, or power cost savings €/MWh	92.7																	
Net price benefit, or power cost savings €/MWh	92.7																	
Projected power generation per annum	13,520,000																	
Efficency Reduction	0.005				1	2	3	4	5	6	7	8	9	10	11	12		
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
					6.30%	6.60%	8.30%	8.60%	8.90%	9.70%	10.30%	10.00%	9.40%	8.30%	7.10%	6.60%	100.00%	
PV Jan 2019	$1,095,778.94	1	2020		$78,958.15	$82,718.06	$104,024.23	$107,784.14	$111,544.06	$121,570.49	$129,090.31	$125,330.40	$117,810.58	$104,024.23	$88,984.58	$82,718.06	$1,254,557.30	
PV Jan 2019	$1,018,972.00	2	2021		$78,563.36	$82,304.47	$103,504.11	$107,245.22	$110,986.34	$120,962.64	$128,444.86	$124,703.75	$117,221.52	$103,504.11	$88,539.66	$82,304.47	$1,248,284.52	
PV Jan 2019	$947,548.73	3	2022		$78,170.54	$81,892.95	$102,986.59	$106,709.00	$110,431.40	$120,357.82	$127,802.64	$124,080.23	$116,635.42	$102,986.59	$88,096.96	$81,892.95	$1,242,043.09	
PV Jan 2019	$881,131.76	4	2023		$77,779.69	$81,483.49	$102,471.66	$106,175.45	$109,879.25	$119,756.03	$127,163.62	$123,459.83	$116,052.24	$102,471.66	$87,656.48	$81,483.49	$1,235,832.88	
PV Jan 2019	$819,370.19	5	2024		$77,390.79	$81,076.07	$101,959.30	$105,644.57	$109,329.85	$119,157.25	$126,527.80	$122,842.53	$115,471.98	$101,959.30	$87,218.20	$81,076.07	$1,229,653.72	
PV Jan 2019	$761,937.70	6	2025		$77,003.84	$80,670.69	$101,449.50	$105,116.35	$108,783.20	$118,561.47	$125,895.17	$122,228.32	$114,894.62	$101,449.50	$86,782.10	$80,670.69	$1,223,505.45	
PV Jan 2019	$708,530.85	7	2026		$76,618.82	$80,267.34	$100,942.26	$104,590.77	$108,239.29	$117,968.66	$125,265.69	$121,617.17	$114,320.14	$100,942.26	$86,348.19	$80,267.34	$1,217,387.92	
PV Jan 2019	$658,867.48	8	2027		$76,235.73	$79,866.00	$100,437.54	$104,067.82	$107,698.09	$117,378.82	$124,639.36	$121,009.09	$113,748.54	$100,437.54	$85,916.45	$79,866.00	$1,211,300.98	
PV Jan 2019	$612,685.18	9	2028		$75,854.55	$79,466.67	$99,935.36	$103,547.48	$107,159.60	$116,791.92	$124,016.16	$120,404.04	$113,179.80	$99,935.36	$85,486.87	$79,466.67	$1,205,244.47	
PV Jan 2019	$569,739.95	10	2029		$75,475.27	$79,069.34	$99,435.68	$103,029.74	$106,623.80	$116,207.96	$123,396.08	$119,802.02	$112,613.90	$99,435.68	$85,059.44	$79,069.34	$1,199,218.25	
PV Jan 2019	$529,804.91	11	2030		$75,097.90	$78,673.99	$98,938.50	$102,514.59	$106,090.68	$115,626.92	$122,779.10	$119,203.01	$112,050.83	$98,938.50	$84,634.14	$78,673.99	$1,193,222.16	
PV Jan 2019	$492,669.05	12	2031		$74,722.41	$78,280.62	$98,443.81	$102,002.02	$105,560.23	$115,048.79	$122,165.21	$118,607.00	$111,490.58	$98,443.81	$84,210.97	$78,280.62	$1,187,256.05	
PV Jan 2019	$458,136.17	13	2032		$74,348.80	$77,889.22	$97,951.59	$101,492.01	$105,032.43	$114,473.54	$121,554.38	$118,013.96	$110,933.13	$97,951.59	$83,789.91	$77,889.22	$1,181,319.77	
PV Jan 2019	$426,023.83	14	2033		$73,977.05	$77,499.77	$97,461.83	$100,984.55	$104,507.26	$113,901.18	$120,946.61	$117,423.89	$110,378.46	$97,461.83	$83,370.96	$77,499.77	$1,175,413.17	
PV Jan 2019	$396,162.34	15	2034		$73,607.17	$77,112.27	$96,974.52	$100,479.63	$103,984.73	$113,331.67	$120,341.88	$116,836.77	$109,826.57	$96,974.52	$82,954.11	$77,112.27	$1,169,536.11	
PV Jan 2019	$368,393.95	16	2035		$73,239.13	$76,726.71	$96,489.65	$99,977.23	$103,464.81	$112,765.01	$119,740.17	$116,252.59	$109,277.43	$96,489.65	$82,539.34	$76,726.71	$1,163,688.42	
PV Jan 2019	$342,571.95	17	2036		$72,872.94	$76,343.08	$96,007.20	$99,477.34	$102,947.48	$112,201.19	$119,141.47	$115,671.33	$108,731.05	$96,007.20	$82,126.64	$76,343.08	$1,157,869.98	
PV Jan 2019	$318,559.90	18	2037		$72,508.57	$75,961.36	$95,527.17	$98,979.95	$102,432.74	$111,640.18	$118,545.76	$115,092.97	$108,187.39	$95,527.17	$81,716.01	$75,961.36	$1,152,080.63	
PV Jan 2019	$296,230.93	19	2038		$72,146.03	$75,581.55	$95,049.53	$98,485.05	$101,920.58	$111,081.98	$117,953.03	$114,517.51	$107,646.46	$95,049.53	$81,307.43	$75,581.55	$1,146,320.23	
PV Jan 2019	$275,467.08	20	2039		$71,785.30	$75,203.65	$94,574.28	$97,992.63	$101,410.98	$110,526.57	$117,363.27	$113,944.92	$107,108.22	$94,574.28	$80,900.89	$75,203.65	$1,140,588.63	
Total PV Jan 2019	$11,978,582.89																	

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Appendix G: Discount Rate Sensitivity Analysis

Sensitivity Analysis Discount Rate 3% Loan			Sensitivity Analysis Discount Rate 7% Loan					
Discount Rate	NPV		Discount Rate	NPV				
0%	€12,801,266.41		0%	€11,749,298.05				
1%	€10,761,648.03		1%	€9,750,526.92				
2%	€8,987,105.54		2%	€8,014,486.99				
3%	€7,437,704.44		3%	€6,501,410.07				
4%	€6,080,164.21		4%	€5,178,168.26				
5%	€4,886,661.81		5%	€4,017,078.70				
6%	€3,833,863.78		6%	€2,994,936.83		0.3210465506		0.4314550954
7%	€2,902,141.32		7%	€2,092,232.47		-0.2850342932		-0.3822330843
8%	€2,074,931.52		8%	€1,292,512.00				
9%	€1,338,216.32		9%	€581,858.15				
10%	€680,096.13		10%	-€51,535.67				
11%	€90,439.94		11%	-€617,714.55				
12%	-€439,402.53		12%	-€1,125,249.31				
13%	-€916,838.39		13%	-€1,581,473.57				
14%	-€1,348,228.12		14%	-€1,992,679.70				
15%	-€1,739,048.61		15%	-€2,364,281.46				
11.163%	0	IRR	9.914%	0	IRR			

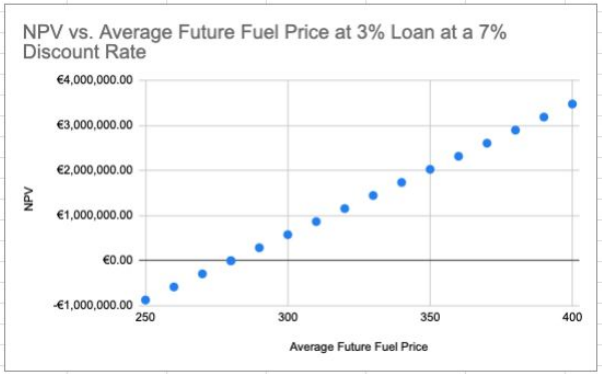
https://docs.google.com/spreadsheets/d/1IysyeQIv372MbaK7aSN6Bm6neKgVHN5k10icB-jJUXc/edit?usp=sharing

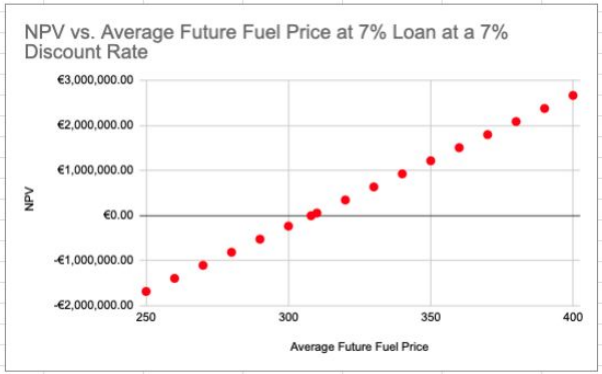
Appendix H: Average Future Cost of Fuel Sensitivity Analysis

Sensitivity Analysis Average Future Cost of Fuel 3% Loan at a 7% D	
Average Future I	NPV
280.0484	€0.00
250	-€872,469.09
260	-€582,114.44
270	-€291,759.80
280	-€1,405.15
290	€288,949.50
300	€579,304.14
310	€869,658.79
320	€1,160,013.44
330	€1,450,368.09
340	€1,740,722.73
350	€2,031,077.38
360	€2,321,432.03
370	€2,611,786.67
380	€2,902,141.32
390	€3,192,495.97
400	€3,482,850.61

Sensitivity Analysis Average Future Cost of Fuel 7% Loan at a 7% Discount Rate	
Average Future I	NPV
307.94217	€0.00
250	-€1,682,377.94
260	-€1,392,023.29
270	-€1,101,668.65
280	-€811,314.00
290	-€520,959.35
300	-€230,604.71
310	€59,749.94
320	€350,104.59
330	€640,459.23
340	€930,813.88
350	€1,221,168.53
360	€1,511,523.17
370	€1,801,877.82
380	€2,092,232.47
390	€2,382,587.11
400	€2,672,941.76

€29,035.47		€29,035.47





https://docs.google.com/spreadsheets/d/1IysyeQIv372MbaK7aSN6Bm6neKgVHN5k10icB-jJUXc/edit#gid=1850569136

Appendix I: Why Solar Power Instead of Other RES?

- While in Cyprus, there is mainly exploitation of solar, wind and biomass / biogas energy, solar energy offers arguably the greatest potential given that Cyprus is such a sunny nation. According to Cyprus Renewable Energy Roadmap, the island will be able to produce 25% to 40% of its total electricity via solar power by 2030
- The peak of power generation by solar panels was expected in summer months, which were also the peak production months for cement industry and the peak price electricity tariff, and that was a very good match.

Appendix J: Key Inputs for FCF Projections

Average future EAC fuel price per ton	€ 380
Basic EAC fuel price per ton used as the basis for electricity rates	€ 300
Projected power generation for the 8 MW PV park in year 1, in KWh (kilowatt-hour) per annum	13,520,000
Yearly decrease in power generation due to solar panels degradation	0.5%
Annual operating expenses	€ 80,000
Capex	€ 8,000,000
Annual depreciation for 10 years	€ 800,000
Tax rate	12.5%
Discount rate	7.0%

Appendix J: EAC Fuel Cost

Figure 2. EAC Fuel Cost (January 2015 – October 2018)

Source: Created by the author based on the EAC Fuel Cost (n.d.)

Appendix L: Monthly Production Profile

Table 2. Monthly Production Profile of a Sample Solar Park (Historical Data)

	Current monthly power generation, in KWh	Monthly power generation in % to total per year	Electricity price during PV park generation, per MWh (megawatt-hour) – before grid charges, taxes and levies	Net price benefit/power cost savings, per MWh (megawatt-hour) – before grid charges, taxes and levies
Jan	550,000	6.3%	€ 72.71	€ 91.91
Feb	575,000	6.6%	€ 72.71	€ 91.91
Mar	725,000	8.3%	€ 72.71	€ 91.91
Apr	750,000	8.6%	€ 72.71	€ 91.91
May	775,000	8.9%	€ 72.71	€ 91.91
Jun	850,000	9.7%	€ 114.07	€ 133.27
Jul	900,000	10.3%	€ 114.07	€ 133.27
Aug	875,000	10.0%	€ 114.07	€ 133.27
Sep	825,000	9.4%	€ 114.07	€ 133.27
Oct	725,000	8.3%	€ 72.71	€ 91.91
Nov	625,000	7.1%	€ 72.71	€ 91.91
Dec	575,000	6.6%	€ 72.71	€ 91.91
Total	8,750,000	100.0%		

Source: From Company's Materials