SolarCare Solutions

High-Level Feasibility Study

Submitted to:

The Ministry of Digital Economy and Entrepreneurship

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Founders and investors considering this project are advised to conduct further analysis on projected adoption rates, development costs, and ongoing operational expenses. This additional scrutiny will help mitigate potential risks related to technology challenges, changes in regulations, market penetration, and competitive pressures.

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A National Entrepreneurship Policy Project

Ministry of Digital Economy and Entrepreneurship

Funded by the European Union

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Executive Summary

This feasibility study examines the potential of SolarCare Solutions, an AI-driven system for solar energy management and maintenance. SolarCare offers real-time monitoring, fault detection, and predictive maintenance, enhancing solar infrastructure performance and longevity. This study covers a comprehensive market analysis, business model, technical analysis, and financial projections.

Jordan's renewable energy sector, driven by government policies and an abundance of sunny days, presents significant growth opportunities. SolarCare targets PV plant operators and renewable energy companies, addressing challenges related to maintenance and efficiency. The AI technology distinguishes SolarCare by offering predictive maintenance, optimizing cleaning schedules, and reducing operational costs.

Financial projections indicate initial losses but positive net profits from the second year, with a net present value of JOD 92,901 and an internal rate of return of 45.64%. Sensitivity analysis shows the project's viability under various market conditions, emphasizing the importance of achieving projected revenues.

Key stakeholders include solar PV system owners, renewable energy companies, strategic partners, and regulatory bodies. Risk assessment highlights potential supply chain disruptions, market acceptance, and data security, with mitigation strategies in place.

The study concludes that SolarCare is a promising investment, recommending further analysis on demand projections and costs to mitigate risks and ensure successful implementation.

1 Introduction

SolarCare Solutions presents a new approach to solar energy management and maintenance. By integrating AI technology, SolarCare offers real-time monitoring, fault detection, and predictive maintenance for solar energy systems. This system leverages AI-driven diagnostics and predictive analytics to optimise performance and extend the lifespan of solar infrastructure. Key features of SolarCare include continuous monitoring to identify and diagnose issues promptly, sophisticated data analysis to predict maintenance needs, and coordination of robotic cleaning operations to ensure solar panels are kept clean and functioning efficiently. SolarCare is designed to integrate with existing solar energy infrastructure, providing an easy upgrade path for operators to realise the benefits of AI-driven diagnostics and predictive maintenance without significant disruption to ongoing operations. The importance of SolarCare lies in its potential to revolutionise the maintenance and management of solar energy plants, enhancing efficiency, reducing operational costs, and promoting sustainability. The scalability of SolarCare lies in its ability to be deployed across various types of solar installations, from small-scale residential systems to large commercial solar farms. The system's adaptability and advanced features make it a valuable addition to any solar energy.

1. Market Analysis

Jordan's economy is heavily reliant on imported energy sources, with oil, coal, gas making up 91% of the total energy supply in 2021[1]. This reliance makes the economy vulnerable to global market fluctuations, impacting energy prices and overall economic stability. However, Jordan is leading the region in renewable energy (RE) adoption, with solar and wind energy powering approximately 22.9% of the electricity grid[2]. The country aims to increase this to 50% by 2030 through smart grid development and energy storage projects[3].

The renewable energy sector in Jordan shows significant growth potential. The total installed capacity of renewable energy sources reached 2,577 MW in 2023 with 1,498 MW under power purchase agreements and 1,079 MW under net-metering or wheeling schemes. The government's initiatives, such as the Economic Modernization Vision, National Renewable Energy Action Plan (NREAP) and the National Energy Efficiency Action Plan (NEEAP), support this growth by promoting renewable energy and increasing energy efficiency. Jordan's average of 310 sunny days per year enhance the sector's attractiveness for investment[4].

The regulatory environment in Jordan is supportive of renewable energy development. The Renewable Energy and Energy Efficiency Law of 2012 and subsequent amendments have created a conducive environment for investments in the sector. Government policies aim to increase the share of renewable energy in the national energy mix and promote energy efficiency.

Several key economic indicators are relevant to the success of SolarCare:

- Energy Consumption: Jordan's electricity consumption has been increasing, reaching 19,306 GWh in 2021[5], highlighting the growing demand for energy solutions.
- Installed RE Capacity: The installed capacity of renewable energy sources is an important indicator, with current capacity at 2,577 MW[6].
- Government targets: Jordan's target to achieve 50% renewable energy in the electricity mix by 2030[7] sets a clear direction for market growth.
- Investment in Smart Grids and Storage: Ongoing and planned investments in smart grid technologies and energy storage solutions are vital for integrating renewable energy and ensuring grid stability.

Over the period 2018 - 2022 period, the capacity of solar, wind, and hydro projects has steadily increased in Jordan. In 2022, the installed capacities were as follows: 958 MW from solar, 622 MW from wind, and a consistent capacity from hydro[8].

1 https://www.iea.org/countries/jordan
2 https://www.iea.org/countries/jordan
3 https://www.jordannews.jo/Section-109/News/Jordan-aims-to-increase-renewable-energy-contribution-to-50-by-2030-28449
4 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7033324/
5 https://jordantimes.com/news/local/electricity-consumption-reaches-new-heights-kingdom#:~:text=AMMAN%20%E2%80%94%20Total%20electricity%20consumption%20throughout,(EMRC)%20reported%20on%20Monday.
6 https://jordantimes.com/news/local/jordan-secures-top-spot-renewable-energy-capacity-potential-grow-%E2%80%94-kharabsheh#:~:text=However%2C%20in%202022%2C%20natural%20gas,sources%20stands%20at%202577%20megawatts.
7 https://www.google.com/url?q=https://www.memr.gov.jo/EBV4.0/Root_Storage/EN/EB_Info_Page/StrategyEN2020.pdf&sa=D&source=docs&ust=1720621752423911&usg=AOvVaw1gjKn5RJnb-h4VmrL41wAO
8 https://www.roedl.com/insights/renewable-energy/2023/november/jordan-energy-market-for-investors-epc

SolarCare Solutions primarily targets owners and operators of photovoltaic (PV) plants, renewable energy companies, and facilities management professionals involved in solar energy infrastructure. This market segment faces challenges related to maintenance, efficiency, and cost management, making SolarCare's AI-driven solutions highly relevant.

The renewable energy sector in Jordan is expanding rapidly, driven by government policies and increasing demand for sustainable energy solutions. By the end of 2023, Jordan had about 70,000 on-grid PV systems with a total capacity of 1058 MW[9]. The market for solar energy management solutions like SolarCare is poised for significant growth, supported by the increasing number of PV installations and the need for efficient maintenance and monitoring systems.

Consumers in the renewable energy sector are increasingly looking for solutions that can enhance efficiency and reliability of energy systems. The adoption of AI and predictive analytics in energy management is gaining traction due to its potential to provide real-time insights and proactive maintenance, minimising downtime, and optimising performance. SolarCare's integration of AI-driven diagnostics and predictive maintenance aligns well with these preferences, offering a value proposition to PV operators.

The competitive landscape for solar energy management in Jordan includes both local and international players offering various solutions for PV system maintenance and optimization. Key competitors typically provide services such as robotic cleaning systems, self-cleaning Piezo film for solar panels, and aerial thermographic inspection services. However, these services are complementary to what SolarCare offers. SolarCare differentiates itself by providing the sensors and AI technology needed to predict the needs of these service providers, making their operations more cost-efficient and effective. By integrating AI-driven diagnostics and predictive maintenance, SolarCare enhances the overall efficiency and performance of solar energy systems, setting it apart from companies that offer only cleaning services.

AI technology has transformed the way solar panels are cleaned and maintained. Traditionally solar panels require manual inspection and cleaning, involving a labour-intensive process where workers had to physically climb up to the panels and clean them using specialised tools and cleaning agents. AI-driven solutions give rise to autonomous robots that clean the panels efficiently and effectively. SolarCare equips existing systems with sensors that detect the level of dirt and dust on the panels. The collected data is sent to AI algorithms, which analyse the information to determine the best cleaning method, whether using brushes, water jets, or other tools. This ensures thorough cleaning without causing damage to the panels, enhancing their longevity. Unclean panels have reduced energy output as dirt and debris obstruct sunlight absorption. By automating the cleaning process, AI technology ensures that solar panels are regularly and thoroughly cleaned, maintaining optimum panel efficiency.

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[9] https://thesolarest.com/%D8%A5%D8%AD%D8%B5%D8%A7%D8%A6%D9%8A%D8%A7%D8%AA-%D8%A3%D9%86%D8%B8%D9%85%D8%A9-%D8%A7%D9%84%D8%B7%D8%A7%D9%82%D8%A9-%D8%A7%D9%84%D8%B4%D9%85%D8%B3%D9%8A%D8%A9-%D8%A7%D9%84%D9%85%D8%B1%D8%A8%D9%88/

Additionally, SolarCare's intelligent monitoring systems powered by AI continuously monitor the panels' performance, detect any anomalies or malfunctions, and alert maintenance personnel in real-time. This proactive approach helps prevent potential operation issues.

The MENA region, including Jordan, is the dustiest in the world. The Mediterranean parts of Egypt, Jordan, Iraq, and northern Arabian Peninsula experience dust storms mainly during the spring season. This environmental condition significantly impacts solar panel efficiency as dust and debris obstruct sunlight absorption. SolarCare's AI-driven cleaning solutions are particularly relevant in this context despite the challenging environmental conditions. Research shows that PV panels, when left uncleaned for 20 and 30 days, produce 5% and 7% less power, respectively. Cleaning panels after 15 days is found to be the most feasible, reducing losses to 4%[10]. A study by Hammad et al. recommends a cleaning frequency of 12-15 days for PV panels in Jordan to maintain optimum efficiency[11].

The regulatory environment in Jordan is favourable for renewable energy development. The Renewable and Energy Efficiency Law of 2012 and subsequent amendments have created a supportive framework for investments in renewable energy projects. The government's commitment to increasing the share of renewables in the energy mix and promoting energy efficiency creates a conducive atmosphere for the adoption of solutions like SolarCare. Additionally, policies supporting net-metering and wheeling schemes further incentivise the adoption of solar energy systems, enhancing market opportunities for SolarCare.

Several factors are crucial for the success of SolarCare in the Jordanian market:

- Technology: Leveraging AI and predictive analytics to provide real-time monitoring and proactive maintenance.
- Market Demand: Addressing the growing need for efficient and reliable solar energy management solutions.
- Regulatory Support: Aligning with government policies promoting renewable energy and energy efficiency.
- Customer Relationships: Building strong relationships with PV panel producers, PV system designers and operators, energy utilities, PV cleaning providers, and facilities management professionals to ensure market penetration and customer retention.

2. Business Model

SolarCare's business model is designed to leverage AI technology to optimise solar energy management. By offering comprehensive solutions for real-time monitoring, predictive maintenance, and traditional/automated cleaning coordination, SolarCare aims to enhance the efficiency and reliability of solar energy systems while generating revenue through its service offerings.

[10] Shenouda, R., Abd-Elhady, M.S. & Kandil, H.A. A review of dust accumulation on PV panels in the MENA and the Far East regions. *J. Eng. Appl. Sci.* 69, 8 (2022). https://doi.org/10.1186/s44147-021-00052-6

[11] Hammad, B., Al–Abed, M., Al–Ghandoor, A., Al–Sardeah, A., & Al–Bashir, A. (2018). Modeling and analysis of dust and temperature effects on photovoltaic systems' performance and optimal cleaning frequency: Jordan case study. *Renewable and Sustainable Energy Reviews*, 82(P3), 2218-2234. doi:10.1016/j.rser.2017.08.070

A range of services are provided to customers to enhance the performance and efficiency of solar energy systems.

An AI-powered real-time monitoring system tracks the performance of solar panels, detecting anomalies or malfunctions and alerting maintenance personnel. This proactive approach ensures prompt issue resolution, minimising downtime. Advanced data analysis predicts maintenance needs based on factors such as weather conditions, dust accumulation, and overall panel performance. This capability allows for scheduling of maintenance tasks, ensuring panels are cleaned and services before performance is affected. Predictive maintenance increases yield by enabling early fault detection, reducing operating costs, and making cleaning easier to plan based on weather forecasts.

The AI-driven system efficiently schedules maintenance tasks to minimise downtime and maximise productivity. By predicting the best times for maintenance based on environmental conditions and panel performance, the system maintains panel efficiency with minimal interruption. Additionally, unnecessary site visits are reduced by filtering and analysing alarm messages, saving both time and money.

Coordination of cleaning operations is optimised by AI, determining the best cleaning method and timing. This integration ensures that panels are kept free from dirt and debris. The system caters to thorough cleaning without damaging the panels, enhancing their longevity. Seamless integration of AI-driven diagnostics and predictive analytics into existing solar energy is provided by SolarCare. This ensures that the transition to the new system is smooth.

Revenue is generated through a subscription-based model, ensuring a sustainable and scalable business approach. The subscription services provide real-time monitoring, predictive maintenance, and maintenance scheduling. Customers pay a monthly fee that is proportional to the size of the solar PV project in megawatts (MW).

SolarCare's pricing strategy is designed to cater to various customer needs while maximising value and accessibility. A pricing strategy based on the size of the solar installations is employed. Larger installations with higher energy production needs are charged a high subscription fee, reflecting the increased value provided.

SolarCare's operational structure is centred around key activities that are necessary for effective service delivery. Key activities include data pre-processing, which involves collecting and cleaning data from various sensors to ensure high-quality input for AI algorithms. This also includes the installation of sensors necessary to collect system performance and weather data, which feed the analysis processes. AI algorithm development is another critical activity, where advanced algorithms are created and refined to analyse data, predict maintenance needs, and optimise cleaning schedules. System integration ensures the incorporation of AI-driven diagnostics and predictive analytics into existing solar energy infrastructure. Maintenance coordination is also a key activity, involving the scheduling of cleaning operations and maintenance tasks based on predictive insights. These activities supported by technology, skilled personnel, and a robust data infrastructure, form the backbone of SolarCare's operational structure ensuring the delivery of its services. Additionally, partnerships with cleaning providers and data sensor suppliers are integral to integrating AI-driven maintenance coordination and ensuring high-quality data collection tools.

SolarCare's management and operational procedures encompass the development and refinement of AI algorithms, data pre-processing, integration of AI-driven diagnostics into solar energy infrastructure, and the coordination of cleaning operations. Marketing and sales strategies target owners and operators of photovoltaic (PV) systems, renewable energy companies, energy utilities, and facilities management professionals, highlighting the benefits of AI-driven predictive maintenance and cleaning. Customer service procedures include providing real-time support, handling inquiries, and resolving issues promptly, with the AI-driven monitoring system helping to filter alarm messages and reduce false alarms.

In conclusion, SolarCare's business model focuses on providing an advanced solution to increase the efficiency of solar energy systems.

Table 1: Revenue projection

Description / Year	1	2	3	4	5
Projected Demand (Quantity) Annual subscriptions	30	70	110	140	160
Price / Unit Annual subscription	3,000	3,000	3,000	3,000	3,000
Sub-total Annual subscription	90,000	210,000	330,000	420,000	480,000
Total Revenues (JOD)	90,000	210,000	330,000	420,000	480,000

Figure 1: Product Mix by Quantity

Figure 2: Product Mix by Revenue

3. Technical Analysis

In terms of Cost of Goods Sold (COGS), there are no costs associated with each sales transaction. All costs are categorised either as capital expenditures (CapEx) or operating expenses (OpEx).

Description / Year	1	2	3	4	5
Projected Demand (Quantity) Annual subscription	30	70	110	140	160
COGS / Unit Annual subscription	1,500	1,500	1,500	1,500	1,500
Sub-total Annual subscription	45,000	105,000	165,000	210,000	240,000
Total COGS (JOD)	45,000	105,000	165,000	210,000	240,000

The manpower plan for SolarCare is well-balanced and aligns with the company's projected growth phases. It ensures operational needs are met without overextending resources prematurely by gradually increasing the workforce in line with the company's expansion. The plan's key positions include a consistent Chief Technology Officer to maintain stable leadership in technology development, a Business Development Manager to support market presence initially, and an additional one from the fourth year to drive client acquisition. The introduction of a Technical Officer in the third year ensures technical support as client deployments increase. The consistent presence of an IT Officer ensures robust support for IT infrastructure. This approach demonstrates scalability and cost efficiency by not overstaffing in the initial years.

Table 2 : Manpower recruitment plan – five-year projection:

Title / Year	1	2	3	4	5
Chief Technology Officer	1	1	1	1	1
Business Development Manager	1	1	1	2	2
Technical Officer(s)	0	0	1	1	1
IT Officer	1	1	1	1	1

Cumulative Number of HR	**3**	**3**	**4**	**5**	**5**

The total HR cost for SolarCare is estimated, beginning at JOD 39,288 in year one and increasing to JOD 71,415 by year five.

Table 3: Manpower total cost – five-year projection

Title / Year	1	2	3	4	5
Chief Technology Officer	14,400	15,120	15,876	16,670	17,503
Business Development Manager	9,600	10,080	10,584	22,226	23,338
Technical Officer(s)	-	-	5,400	5,670	5,954
IT Officer	9,600	10,800	12,000	13,200	14,400
Total HR Salaries	**33,600**	**36,000**	**43,860**	**57,766**	**61,195**
Social Security Cost	4,788	5,130	6,250	8,232	8,720
Health Insurance Cost	900	900	1,200	1,500	1,500
Total HR Cost	**39,288**	**42,030**	**51,310**	**67,498**	**71,415**

The operational expenditures (OpEx) table for SolarCare shows a stable and conservative cost structure with consistent expenditures in key areas such as rent, electricity, and advertising. The gradual increase in total OPEX from JOD 50,169 in year one to JOD 85,508 in year five reflects planned scaling of operations and the inclusion of other costs, ensuring financial prudence while supporting growth.

Table 4: Operational Expenditures – five-year projection

Description / Year	1	2	3	4	5
Electricity	300	300	300	300	300
Rent	2,000	2,000	2,000	2,000	2,000
Water	30	30	30	30	30
Stationary	30	30	30	30	30
Maintenance	100	100	100	100	100
Telecommunication	100	100	100	100	100
Website Charges	10	10	10	10	10
Advertising	2,000	2,000	2,000	2,000	2,000
Cleaning Material & Consumbles	50	50	50	50	50
Hospitality Exp.	900	900	900	900	900
Legal & Accounting Fees	800	800	800	800	800
Sub-total OpEx	**45,608**	**48,350**	**57,630**	**73,818**	**77,735**
Other Costs	4,561	4,835	5,763	7,382	7,773
Total OpEx	**50,169**	**53,185**	**63,393**	**81,200**	**85,508**

The CapEx table indicates an initial investment in platform development, starting with JOD 5,000 in year 0, followed by JOD 20,000 in year 1 and JOD 15,000 in year 2. This phased approach ensures focused allocation of resources for development, supporting the platform's scalability and functionality enhancements.

Table 5: Capital Expenditures Cost – five-year projection

Description / Year	0	1	2	3	4	5
Platform Development	5,000	20,000	15,000			
Total CapEx	**5,000**	**20,000**	**15,000**			

4. Financial Analysis

4.1 Financial Study Assumptions

The feasibility study is based on the following key assumptions:

Discount Rate: The study employs a conservative discount rate of 14%, reflecting a cautious approach to valuation.

Financing Structure: The project is entirely financed by equity. This conservative approach avoids the financial leverage and thus underestimates project value, given the lower cost of debt compared to equity.

Terminal Value: The project assumes a zero-terminal value at the end of year five, aligning with the study's conservative outlook.

Cash Flow Projection: Cash flows beyond year five are excluded from the analysis, focusing on the initial project phase.

Tax Rate: The assumed tax rate of 20% complies with Jordan's income tax law.

Depreciation Rate: Capital expenditure (CapEx) is depreciated at an annual rate of 20%. Any deviation from this rate may impact projected profitability but not project feasibility, as depreciation is a non-cash expense.

Working Capital Assumptions

Operational liquidity requirements are guided by the following assumptions:

- **Cash Reserves:** The project will maintain cash equivalent to 30 days of projected annual operational expenses, ensuring robust liquidity management.
- **Accounts Receivable (A/R) Collection Period:** The average collection period for receivables is 45 days, reflecting expected credit sales conversion into cash.
- **Accounts Payable (A/P) Payment Period:** The average payment period for payables is 0 days, indicating the timeframe for settling supplier obligations.
- **Inventory Management:** Inventory levels will be maintained to cover an average of two months of sales quantity, ensuring optimal stock levels to meet demand efficiently.

Capital expenditures expected to be incurred in the first year were included as part of the initial costs of the project.

Provisions were made within the initial cost to cover any potential negative net free cash flow that may arise during the first five years of operation, if needed.

4.2 Financial Study:

4.2.1 Projected Working Capital

Table 6: Working capital projection (JOD)

Description / Year	1	2	3	4	5
Cash	4,181	4,432	5,283	6,767	7,126
Accounts Receivable (A/R)	11,250	26,250	41,250	52,500	60,000
Inventory	7,500	17,500	27,500	35,000	40,000
Net Working Capital	22,931	48,182	74,033	94,267	107,126
Change in Working Capital	-	25,251	25,851	20,234	12,859

This table shows that the net working capital needed for the project for the first year of operation is JOD 22,931, which has to increase steadily year over year to reach JOD 107,126 in the fifth year of operation. The steady increase in the working capital comes to cover the rapid increase in the project operations and mainly the increase in the projected revenues.

4.2.2 Project Initial Cost

5. The project's initial cost is projected to be JOD 53,100, comprising JOD 25,000 as CapEx, JOD 5,169 as provisions for the first-year negative free cash flow and JOD 22,931 as net working capital.

Table 7: Initial Cost Summary (JOD)

Description / Year	JOD
CapEx	25,000
Provisions for first year(s) negative free cash flows	5,169
Net Working Capital	22,931
Total Initial Cost	**53,100**

5.1.1 Projected Income Statement

The projected income statement indicates that the project will experience a loss of JOD 10,169 in the first year of operation. However, net profits are expected to be positive and increase gradually over the study period starting from the second year of operation, reaching JOD 117,193 in the fifth year of operation.

Table 8: Projected Income Statement (JOD)

Description / Year	1	2	3	4	5
Total Revenues	9,000	210,000	330,000	420,000	480,000
COGS	45,000	105,000	165,000	210,000	240,000
Gross Profit	**45,000**	**105,000**	**165,000**	**210,000**	**240,000**
OpEx	50,169	53,185	63,393	81,200	85,508
Net Profit Before Tax and Depreciation	**-5,169**	**51,815**	**101,607**	**128,800**	**154,492**
Depreciation	5,000	8,000	8,000	8,000	8,000
Net Pprofit Before Tax	**-10,169**	**43,815**	**93,607**	**120,800**	**146,492**
Tax Expense	-	6,729	18,721	24,160	29,298
Net Profit	**-10,169**	**37,086**	**74,886**	**96,640**	**117,197**

In the first year of operation, the project is expected to generate negative profit margins of 11.3%. However, the gross and net profit margins in the following years are expected to be positive and increase gradually. In the fifth year of operations, the gross profit margin is expected to be 50.0%, and the net profit margin is 24.4%.

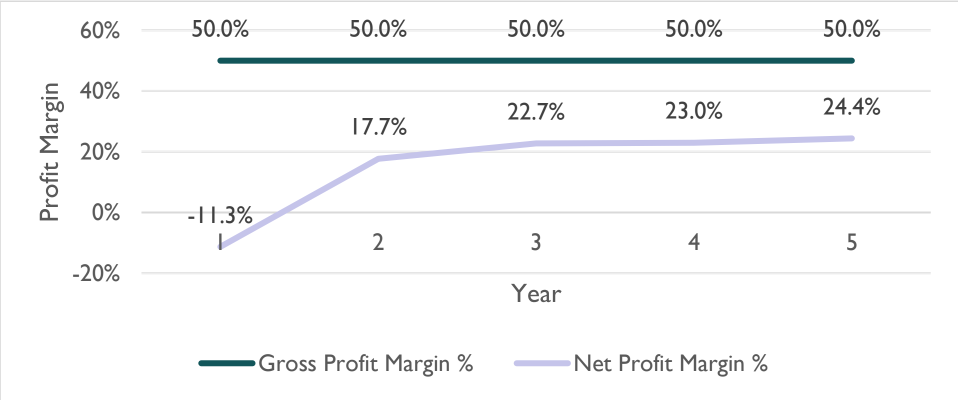

Figure 3: Gross vs Net Profit Margin

On the asset management side, the study shows that the return on investment will increase steadily from -21.2% in the first year of operation to 186.2% in the fifth year.

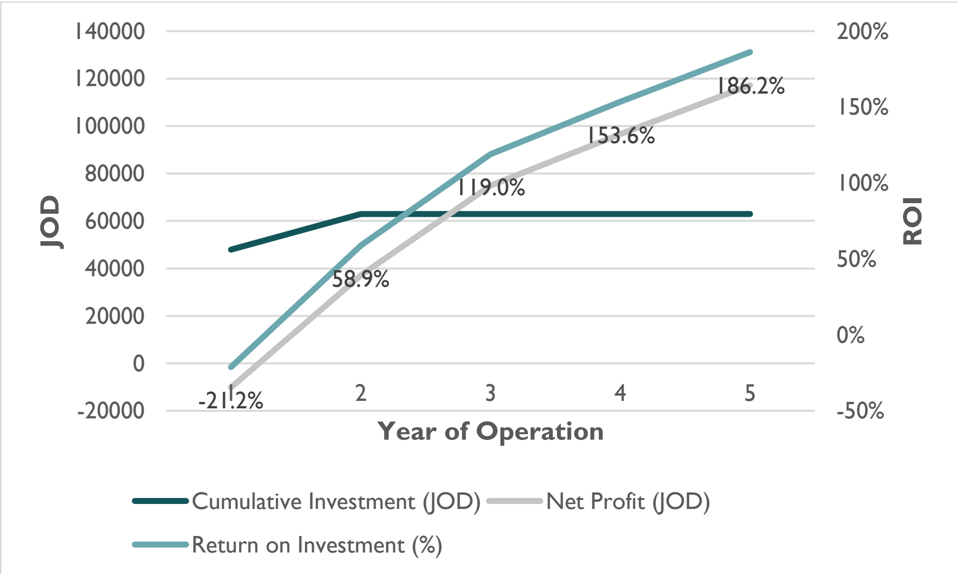

Figure 4: Return on Investment

5.1.2 Projected Free Cash Flow Statement

The table below demonstrates that the project will generate a negative free cash flow in its first year of operation, JOD 5,169. However, in the following years, it is expected to generate positive free cash flows that increase gradually to reach JOD 112,334 in its fifth year of operation.

Table 9: Free Cash Flow (FCF) Projection (JOD)

Description / Year	0	1	2	3	4	5
Cash-In Flow						
Net Profit	-	-10,169	37,086	74,886	96,640	117,193
Depreciation	-	5,000	8,000	8,000	8,000	8,000

Injected Capital	53,100	-	-	-	-	-
Total Cash-In Flow	**53,100**	**-5,169**	**45,086**	**82,886**	**104,640**	**125,193**
Cash-Out Flow						
Initial Cost	47,931	-	15,000	-	-	-
Changes in Working Capital	-	-	25,251	25,851	20,234	12,859
Total Cash-Out Flow	**47,931**	**-**	**40,251**	**25,851**	**20,234**	**12,859**
Free Cash Flow	**5,169**	**-5,169**	**4,834**	**57,035**	**84,406**	**112,334**

Based on these results, the project's feasibility indicators demonstrate its viability, with a net present value of JOD 92,901.4 and a profitability index of 2.75. Moreover, the project's internal rate of return (IRR) is expected to be 45.64%, indicating feasibility is not sensitive to changes in market conditions.

Feasibility Indicators	
Net Present Value (NPV)	92,901
Profitability Index (PI)	2.75
Internal Rate of Return (IRR)	45.64%

5.2 Sensitivity Analysis

To assess the project's sensitivity to market conditions, a sensitivity analysis was conducted involving six unfavourable scenarios:

- Decrease projected revenues by 5% while keeping other variables constant.
- Decrease projected revenues by 10% while keeping other variables constant.
- Increase operational expenditure by 5% while keeping other variables constant.
- Increase operational expenditure by 10% while keeping other variables constant.
- Increase initial costs by 5% while keeping other variables constant.
- Increase initial costs by 10% while keeping other variables constant.

Table 10: Sensitivity analysis outcomes

Sensitivity Scenario	Net Present Value (NPV)	Profitability Index (PI)	Internal Rate of Return (IRR)
Original Case	92,901	2.75	45.64%
Drop in revenue by 5%	47,189	1.78	29.72%
Drop in revenue by 10%	-15,692	0.81	9.40%
Increase in OpEx by 5%	81,230	2.46	40.90%
Increase in OpEx by 10%	69,559	2.19	36.44%
Increase in initial cost by 5%	85,077	2.40	40.83%
Increase in initial cost by 10%	74,540	2.04	35.46%

The sensitivity analysis shows that, in general, the project is feasible and not sensitive to unfavourable market conditions. Apart from the 10% drop in the revenue's scenario, the project's economic feasibility is strong and viable under all the above-mentioned scenarios. The drop in revenues has a more dramatic impact on the project viability than the increase in the OpEx or initial cost by the same magnitude. It is recommended that investors check and further study the market to ensure that the projected revenues are achievable within the thresholds of the proposed initial cost and operational expenditures.

6. Integration with Other Sectors

SolarCare's AI-driven technology extends beyond the solar energy sector, offering integration opportunities with other industries. By leveraging predictive maintenance and real-time monitoring, SolarCare can enhance the operational efficiency of various infrastructure systems. In the manufacturing and industrial sectors, integrating SolarCare's AI solutions can improve energy management by optimising the usage of solar energy, reducing operational costs, and increasing overall productivity. The healthcare sector can also benefit from SolarCare's technology by ensuring uninterrupted power supply through efficient solar energy management. By bridging these sectors, SolarCare not only enhances the efficiency solar energy systems but also drives broader technological advancement and sustainability across diverse sectors.

7. Entrepreneur Persona

The entrepreneur persona who can lead SolarCare is a visionary with a strong technical background and management skills. This individual should possess a deep understanding of AI and renewable energy technologies, complemented by experience in deploying innovative solutions. A degree in engineering, computer science, or a related field is essential along with experience in the solar energy sector. The entrepreneur must have a track record of successful project management, demonstrating the ability to oversee complex technical projects and lead multidisciplinary teams. Strategic thinking and business acumen are crucial, enabling them to identify market opportunities and drive growth. Additionally, strong communication and leadership skills are needed to build partnerships with key stakeholders, including technology providers, regulatory bodies, and clients. Passionate about sustainability and technology, this entrepreneur will be committed to advancing SolarCare's mission of optimising solar energy management through cutting-edge AI solutions.

8. Stakeholders

SolarCare's success hinges on the collaboration and engagement of various stakeholders, each playing a pivotal role in the project's lifecycle. Key stakeholders include solar PV system owners and operators, who are the primary beneficiaries of SolarCare. Renewable energy companies and energy utilities are stakeholders as well, as they integrate SolarCare's technology into their infrastructure. Strategic partners such as cleaning providers and component manufacturers, supply essential components and services that enable integration. Government and regulatory bodies are vital stakeholders, ensuring compliance with industry standards and supporting sustainable energy initiatives. Additionally, investors and financial institutions provide the necessary capital and financial backing for the development and expansion of SolarCare's operations. Finally, the internal team is crucial for executing SolarCare's mission in enhancing solar energy management.

9. Risk Assessment and Mitigation

The following table highlights the key risks associated with SolarCare's operations, their potential impact, the likelihood of occurrence, and the techniques to mitigate these risks.

Risk	Impact	Likelihood (High/Medium/Low)	Risk Mitigation Technique
Supply Chain Disruptions	High	Medium	Diversify suppliers, establish robust supply chain agreements
Quality Control Issues	Medium	Low	Implement stringent quality assurance processes
Market Acceptance	High	Medium	Conduct extensive market research and customer education
Data Security and Privacy	High	High	Implement advanced security measures and compliance
Regulatory Compliance	High	Medium	Stay updated with regulations, engage with regulators
Technological Dependencies	High	Medium	Continuously innovate and invest in R&D
Financial Risks	High	Medium	Maintain diverse funding sources, and implement sound financial management
Competition	High	High	Focus on unique value proposition and early market penetration
Environmental factors	Medium	Medium	Develop responsive

(sudden changes in weather, dust storms, …)			cleaning and maintenance schedules

Given the promising feasibility indicators of the SolarCare project, several recommendations are crucial to ensure its successful implementation and risk mitigation. First, the sensitivity analysis highlights that a 10% drop in revenues results in a negative Net Present Value (NPV), indicating the need for a strong focus on market acceptance and revenue generation. To address this, extensive market research and customer acquisition and awareness campaigns should be conducted to ensure projected revenues are achievable. Additionally, maintaining diverse funding sources and implementing sound financial management can mitigate financial risks.

To further safeguard the project's viability, robust risk mitigation strategies are recommended. Supply chain disruptions can be managed by diversifying suppliers and establishing strong supply chain agreements. Quality control issues should be addressed by implementing stringent quality assurance processes. Technological dependencies require continuous innovation and investment in research and development (R&D). Moreover, advanced security measures and compliance protocols are essential to mitigate data security and privacy risks. Lastly, environmental factors such as sudden weather changes can be managed by developing responsive cleaning and maintenance schedules. By adopting these measures, SolarCare can enhance its resilience against potential risks and improve its chances of sustained success.

10. Conclusion

In conclusion, the project demonstrates promising feasibility indicators under very restrictive assumptions. Nonetheless, investors are advised to conduct additional analysis on projected demand, initial costs, and operational expenses to mitigate potential risks associated with adverse market conditions that could jeopardize its viability.