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Title

« Designing and implementing an effective internationalization strategy*:* *case study of ZERGOUN Green Energy* »

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To the memory of my beloved cousin ***Celia Amnouche****, whose radiant spirit continues to inspire me every day.*

I also dedicate this work to my father Abdellah , my brother Agour and my sister Célia, whose unconditional love, constant support, and reassuring presence have carried me through this journey.

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List of Abbreviations

Abbreviation	Full Term
AC	Alternating Current
ADR	Alternative Dispute Resolution
CAPE	Capital Expenditures
CEO	Chief Executive Officer
CO_2	Carbon dioxide
CSR	Corporate Social Responsibility
DC	Direct Current
DRC	Democratic Republic of Congo
EIA	Energy Information Administration
EU	European Union
FDI	Foreign Direct Investment
FIT	Feed-in Tariff
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GVC	Global Value Chain
GW	Gigawatt
GWh	Gigawatt-hour
IEA	International Energy Agency
IMF	International Monetary Fund
Inc	Incorporated
INV	International New Venture
IPP	Independent Power Producer
ISO	International Organization for Standardization
JV	Joint Venture
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
Ltd	Limited (company type)
M&A	Mergers and Acquisitions
MENA	Middle East and North Africa
MoU	Memorandum of Understanding
MW	Megawatt
NGO	Non-Governmental Organization

OECD	Organisation for Economic Co-operation and Development
OLI	Ownership-Location-Internalization (Dunning's Eclectic Paradigm)
ONEM	Office National des Énergies Renouvelables (Algeria)
OPEX	Operational Expenditures
PESTEL	Political, Economic, Social, Technological, Environmental, Legal
PPA	Power Purchase Agreement
PV	Photovoltaic
R&D	Research and Development
RE	Renewable Energy
RM	Raw Materials
SDG	Sustainable Development Goals
SME	Small and Medium-sized Enterprise
SWOT	Strengths, Weaknesses, Opportunities, Threats
TSO	Transmission System Operator
TT	Technology Transfer
UN	United Nations
UNDP	United Nations Development Programme
Uppsala Model	Internationalization Theory by Johanson & Vahlne
USA	United States of America
WTO	World Trade Organization
ZGE	Zergoun Green Energy

List of figures

Tables list

Table of contents

Introduction

Introduction

The global strategy to combat climate change recommends an energy transition designed to drastically minimize the use of fossil fuels in favor of renewable energies; the abundance of the latter, particularly solar energy, greatly supports their expansion. This shift is becoming increasingly evident thanks to the massive investments made by major oil and gas companies in green energy, as well as their reluctance to continue exploring new fossil fuel sources. Some banking institutions are also following this trend, beginning to reduce their financial support for fossil fuel projects and instead moving toward financing renewable energy. In reality, the leading players in the fossil fuel sector now view climate risk as a financial risk.

The first solar technological achievements appeared in the 19th century, but it was truly during the second half of the 20th century that solar energy began to emerge as an important energy source, particularly with the development of photovoltaics. Impact of energy by photovoltaic plants exploits a principle of direct conversion of light energy into electrical energy called the photoelectric effect, which was discovered by BECQUEREL Edmond and was a phenomenon that classical physics could not explain during the 19th century . It was during the space race between the United States and the Soviet Union that research and development in this energy made a leap forward. Then gradually, from the 1970s, photovoltaic energy took its place in terrestrial industry. The history of solar energy cannot be understood without taking into account competing energies (mainly fossil fuels) and the economic constraints to which it is subject.

The global photovoltaic sector has seen remarkable growth in recent years, becoming central to the global energy transition. Among all players, China clearly dominates the market**,** both in terms of production capacity and technological innovation. It controls a large part of the global supply chain from raw materials to panel manufacturing making it the world's leading exporter of solar components (IEA, 2023)[1]. This dominance has helped drive down costs worldwide, boosting accessibility. Meanwhile, other countries are increasing their investments to catch up and reduce dependence on Chinese imports. The growing importance of photovoltaics reflects not only environmental concerns, but also strategic

[1]International Energy Agency. (2023). *Solar PV global supply chains*. Available in: https://www.iea.org/reports/solar-pv-global-supply-chains

economic interests. This global context creates both opportunities and challenges for emerging producers like Algeria.

Algeria is considered one of the highest solar deposits in the world. Indeed, thanks to its geographical position, this country has a potential that exceeds five billion GWh/year, with more than 2,500 hours of sunshine on average per year over a very important part of its territory. As a result, it has embarked on the path of renewable energies by launching an ambitious program aimed at reaching 22,000 MW by 2030, of which 62% will be devoted to solar energy[2] . This strategic choice is motivated by the immense solar potential that the country possesses, providing a sunshine duration equivalent to 10 times the world consumption.

- ✓ **Main research problem**

This dissertation addresses the following main research question:

« How can algerian enterprises specialized in photovoltaics develop an internationalization strategy and face international competition ? »

From this main question arise other secondary questions, namely :

- What about Algeria's production in the photovoltaic sector?
- What are the specific characteristics and main obstacles faced by the algerian enterprises activating in the photovoltaic sector when internationalizing?
- How does the national environment (solar potential, public policies, competitiveness) influence their ability to internationalize?

- ✓ **Topic selection**

The topic is closely linked to my academic background. As a student in Finance and International Trade and Considering that Internationalization represents a cornerstone of my academic field of study, which prompted me to explore how a developing country like

[2] [2]Atmania, H., & Salem, A. (2019, 30 January). Investment in renewable energies in Algeria; a step towards energy transition (case of solar energy). Journal of Renewable Energy, 12(3), 163-175.

Algeria can pursue an effective internationalization process, this reflection inspired the present research, which focuses specifically on the photovoltaic industry in Algeria.

- ✓ **Methodological approach**

The study is based on a carefully designed qualitative approach that integrates multiple sources and methods to ensure the relevance of the results . A comprehensive literature review helped build a strong theoretical framework based on key models like the Uppsala model, the OLI paradigm, and Porter's strategy theories. This framework identified the main factors influencing internationalization in the renewable energy sector. A qualitative case study was then conducted to explore these dynamics within the Algerian context, using interviews with Mr Zergoun Rahmoun and Mr Zergoun Hakim, and field observations to gain practical insights.

- ✓ **Research objectives**

My study aims to examine the processes and strategies adopted by Algerian companies, particulary those of Zergoun Green Energy when internationalizing . It also seeks to determine the means that would allow Algeria to obtain a sustainable competitive advantage in the international renewable energy market.

- ✓ **Dissertation structure**

This work is structured around three interconnected chapters that collectively address the internationalization of Algeria's solar energy sector.

First chapter , intiteld explores the key models and theories that explain how and why firms, engage in international expansion. It examines strategic approaches, market entry modes, and critical success factors for companies operating in emerging markets.

The second one focuses on Algeria's photovoltaic sector, highlighting the country's exceptional solar potential, institutional frameworks, and available financing mechanisms. This chapter also identifies structural barriers and presents a comparative perspective with China, a global leader in the solar industry.

The last one includes the case study of Zergoun Green Energy (ZGE) that provides a practical illustration of internationalization in action.

Chapter 1 : Conceptual and theoretical framework of internationalization

Introduction

In a globalized economic context, internationalization represents a crucial lever for companies seeking to ensure their growth, diversify their markets, and strengthen their competitiveness. Expanding operations beyond national borders has become an essential strategy, especially in innovative and fast-growing sectors such as the solar industry. Indeed, faced with increasing international competition and technological challenges, companies must choose modes of internationalization that align with their resources, objectives, and the unique characteristics of their target markets.

This chapter aims to provide a precise theoretical and strategic framework regarding the internationalization of companies. It begins by presenting the basic principles and various modes of entry into international markets, then examines the advantages, risks, and criteria for choosing internationalization modes. This approach will facilitate a better understanding of the strategies implemented by the main players in the solar industry, particularly through Chinese dominance and the international ambitions of Algerian companies such as Zergoun Green Energy.

Section 1: conceptual framwork

Internationalization refers to the expansion of a company's operations beyond its domestic borders. This section outlines the essential concepts associated with this undertaking, as well as the predominant internationalization strategies adopted by companies.

1.1Definitions from various authors:

1.1.1 Johanson et Vahlne (1977) :

According to Johanson and Vahlne, : « Internationalization is a gradual process through which companies acquire knowledge and experience about foreign markets, leading them to progressively expand their international operations. They suggest that internationalization occurs incrementally, step by step, based on the accumulation of resources and market-specific knowledge.»[3]

1.1.2 Cavusgil (1980) :

« Cavusgil defines internationalization as a gradual process through which companies increase their involvement in foreign markets, progressing through successive stages. This approach highlights the critical need to manage both risks and opportunities associated with international expansion **.»**[4]

1.1.3 John Dunning (1988) :

Dunning introduces the idea that the internationalization of firms is based on three key advantages: ownership advantage, location advantage, and internalization advantage. He posits that companies choose to enter foreign markets when they possess a competitive advantage that can be exploited internationally while optimizing the costs associated with cross-border transactions.»[5]

[3] Johanson, J., & Vahlne, J. E. (1977). The internationalization process of the firm , a model of knowledge development and increasing foreign market commitments. Journal of International Business Studies, 8(1), 23-32.UNITED KINGDOM .
[4] Cavusgil, S. T. (1980). On the internationalization process of firms. European Research, 8(6), 273-281.
[5] Dunning, J. H. (1988). The eclectic paradigm of international production: A restatement and some possible extensions. Journal of International Business Studies, 19(1), 1-31.USA.

1.2 The internationalization strategy :

According to Alfred Chandler, strategy is defined as: «the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals » [6](Chandler, 1962).

Specific competitive advantage refers to the element that an organization masters better than its competitors and that enables it to remain competitive , it represents a strategic asset that strengthens its market position and creates a competitive edge. Michael Porter defines it as: « Competitive advantage grows fundamentally out of value a firm is able to create for its buyers that exceeds the firm's cost of creating it. »[7] (M. Porter, 1985)

1.2.1 Internationalization strategy according to M. Porter (1985)

According to Michael Porter, the internationalization strategy can be defined as the process through which a firm expands its activities beyond national borders with the aim of creating, developing, and sustaining a competitive advantage in global markets. This approach aligns with his broader concept of competitive advantage as a «firm's ability to outperform its rivals on a sustained basis» [8] (Porter, 1985).

For Porter (1985), internationalization is a strategy that allows a company to exploit and enhance its competitive advantage based on two main dimensions:

a.Global cost advantage:

Internationalization enables a company to optimize its value chain on a global scale by locating each activity in countries that offer the most favorable conditions. Porter emphasizes that «the geographic configuration of a firm's value chain can be a major source of competitive advantage» (Porter, 1985, p. 13). This optimization may involve sourcing, production, research and development, or marketing.

[6] Chandler, A. D. (1962). Strategy and structure: Chapters in the history of the industrial enterprise. Ed MIT Press ,(p.13) , USA .
[7] Porter, M. E. (1985). Competitive advantage: Creating and sustaining superior performance. Ed Free Press,(p.3) , USA .
[8] Porter, M. E. (1985). Competitive advantage: Creating and sustaining superior performance. Ed Free Press.(p.15) , USA .

b. International differentiation advantage:

International expansion also allows the firm to build unique differentiation through access to resources, technologies, or capabilities specific to certain markets. Porter (1985) explains that «competitive advantage stems from a firm's ability to perform the required activities at a lower cumulative cost than competitors, or to perform particular activities in a unique way, thereby creating buyer value and enabling a premium price ».

These advantages may be applied to a broad market (cost leadership or differentiation strategy) or to a niche segment (focus strategies).

1.3 Internationalization modes according to Charles W.L. Hill (2019)[9]

Charles W.L. Hill, in his reference «work International Busines» s: Competing in the Global Marketplace," provides a comprehensive analysis of entry strategies into international markets. A professor at the University of Washington and a recognized consultant in international business, Charles Hill develops a clear typology of internationalization modes, methodically analyzing the advantages and disadvantages of each approach. His theoretical perspective relies on transaction costs, internalization theory, and strategic risk analysis to offer a comprehensive analytical framework for companies seeking to internationalize.

1.3.1 Exporting: the traditional gateway

a. Direct exporting

Hill defines direct exporting as the most traditional entry mode where a company sells its products directly in a foreign country without a local intermediary . This strategy often represents the first step of internationalization for many companies.

Advantages:

Hill highlights several major advantages of direct exporting. First, it allows total control over marketing and commercial strategy, with the company retaining control over its prices, communication, and customer relationships. Second, the required initial investment is

[9] Hill, C. W. L. (2019). International business: Competing in the global marketplace (12th ed., pp. 452-507). McGraw-Hill Education. USA.

minimal, significantly reducing financial risks associated with internationalization. Third, this approach offers maximum flexibility, allowing the company to quickly withdraw from the market in case of difficulties without suffering significant losses in fixed assets .

Hill also emphasizes the aspect of gradual learning that direct exporting enables. Companies can test foreign demand, understand local preferences, and gradually develop their international expertise without massive resource commitment .

Disadvantages:

Hill identifies several critical limitations of direct exporting. Transportation costs and customs duties can make products uncompetitive in certain markets, particularly for low-value-added goods. Exposure to exchange rate fluctuations constitutes a major risk that can significantly erode the profitability of export operations .

Market distance represents a considerable challenge according to Hill. The exporting company often lacks in-depth knowledge of local preferences, distribution channels, and commercial practices, limiting its marketing effectiveness. Moreover, emerging trade barriers can quickly compromise the viability of this strategy.

b. Indirect exporting

Hill distinguishes indirect exporting as a variant where the company uses specialized intermediaries (trading companies, export management companies) to access foreign markets .

Advantages:

The expertise of intermediaries constitutes the main advantage according to Hill. They possess in-depth knowledge of local markets, established distribution networks, and expertise in export procedures . The reduction of administrative costs also represents a significant benefit, as the company avoids investing in specialized export departments.

Hill emphasizes that this approach allows rapid geographical diversification, with intermediaries simultaneously serving multiple markets . Commercial risks are also shared with experienced intermediaries.

Disadvantages:

Loss of control represents the major disadvantage according to Hill. The company no longer controls its commercial strategy, prices, or customer relationships, which can compromise the building of its international brand . Reduced margins due to intermediary compensation decrease operational profitability.

Hill also warns against the dependency created vis-à-vis intermediaries, who may develop their own strategic priorities divergent from those of the company .

1.3.2 Contractual agreements: know-how sharing

a. Licensing

Hill defines licensing as an agreement by which a company (the licensor) grants a foreign company (the licensee) the right to use its intellectual property in exchange for royalties.

Advantages:

The absence of capital investment constitutes the main advantage according to Hill. The company can generate international revenues without mobilizing significant financial resources, particularly attractive for SMEs. Royalty revenues offer a regular and predictable financial flow.

Hill emphasizes that licensing allows circumventing trade barriers, as local production avoids customs duties and import restrictions. This strategy also offers rapid geographical expansion with locally established partners.

The reduction of political risks represents another significant advantage according to Hill, as the company has no physical assets exposed in the foreign country.

Disadvantages:

Hill identifies the risk of creating future competitors as the major disadvantage of licensing. Once the contract expires, the former licensee can become a direct competitor, having acquired the necessary know-how. Intellectual property protection also poses major challenges, particularly in countries where rights enforcement is weak.

Limited quality control can compromise brand reputation, as the licensee may not necessarily have the same standards as the parent company . Limited revenues compared to potential profits from direct presence also constitute a limitation according to Hill.

b. Franchising

Hill presents franchising as a specialized form of licensing where the franchisor grants not only its brand but also its complete business model .

Advantages:

The standardization of the business model allows, according to Hill, superior quality control compared to traditional licensing, as the franchisee must respect strict operational procedures. Rapid expansion with motivated local investors accelerates international development.

Hill emphasizes that franchising generates multiple revenue sources: entry fees, ongoing royalties, and often supply of products or equipment . The motivation of the franchisee, as an investor in their own success, generally exceeds that of a simple employee.

Disadvantages:

Hill identifies control challenges similar to licensing but amplified by the complexity of the business model. Protection of operational know-how becomes more complex than simple patent protection .

Potential conflicts with franchisees over marketing strategies, prices, or innovations represent significant managerial risks according to Hill. The geographical limitation of certain franchise concepts also constitutes a constraint.

1.3.3 Strategic alliances and joint ventures

a. Strategic alliances

Hill defines strategic alliances as cooperation agreements between independent companies to share resources, competencies, or markets without creating a common entity .

Advantages:

The sharing of costs and risks represents the fundamental advantage according to Hill, particularly crucial for R&D investments or entry into uncertain markets (Hill, 2019, p. 476). Access to complementary competencies allows companies to combine their respective strengths to create synergies.

Hill emphasizes that alliances facilitate mutual learning, with each partner benefiting from the other's expertise. The flexibility of these arrangements allows rapid adaptations to market changes.

Privileged access to local markets through the partner constitutes a major advantage, particularly in countries where business relationships are crucial .

Disadvantages:

Hill warns against potential conflicts of objectives between partners, each maintaining their own strategic priorities . Coordination complexity increases with the number of partners and the diversity of their corporate cultures.

The risk of involuntary transfer of competencies to potential competitors concerns Hill, particularly in alliances with companies from emerging countries, difficulties in benefit sharing can also generate tensions.

b. Joint ventures

Hill presents joint ventures as the creation of a common legal entity between two or more companies, sharing capital, control, and profits .

Advantages:

The combination of resources and competencies allows, according to Hill, the creation of an entity stronger than each individual partner. Investment sharing reduces each partner's financial exposure, particularly important for capital-intensive projects.

Hill emphasizes that joint ventures offer privileged access to local markets, with the local partner bringing their terrain knowledge, governmental relations, and credibility . This

strategy also allows circumventing certain governmental restrictions imposed on foreign companies.

Bidirectional learning constitutes a major advantage according to Hill, with each partner developing new competencies through exposure to the other's practices .

Disadvantages:

Hill identifies governance conflicts as the main disadvantage of joint ventures. Strategic decisions can be paralyzed by disagreements between partners . Managerial complexity increases significantly compared to wholly-owned operations.

Mandatory profit sharing reduces benefits compared to a wholly-owned subsidiary, even in case of major success . Hill also warns against risks of involuntary technology transfer to potential competitors.

Cultural differences between partners can create misunderstandings and operational inefficiencies .

1.3.4 Direct investment : total control

a. Acquisitions

Hill defines acquisition as the buyout of an existing foreign company, allowing immediate market access with established assets and competencies.

Advantages:

Immediate market access constitutes the main advantage according to Hill. The company instantly acquires market shares, distribution networks, and a customer base (p. 489). Time savings compared to greenfield creation represents a crucial competitive advantage.

Hill emphasizes that acquisitions allow acquiring local competencies: market expertise, governmental relations, cultural know-how. Eliminating a competitor can also improve the acquirer's competitive position.

Potential synergy between the acquirer's and target's operations can create value superior to the sum of parts according to Hill .

Disadvantages:

Hill warns against often high acquisition costs, particularly during periods of strong demand or for attractive targets . Integration difficulties represent a major challenge, particularly at cultural and organizational levels.

Complex target evaluation poses overpayment risks according to Hill, as acquirers often overestimate potential synergies . Hidden liabilities of the acquired company can also create costly surprises.

Hill emphasizes that internal resistance in the acquired company can compromise the achievement of strategic objectives.

b. Greenfield investments

Hill presents greenfield investments as the creation of an entirely new subsidiary in a foreign country, without buying existing assets .

Advantages:

Total control constitutes the major advantage according to Hill. The company can implement exactly its strategy, systems, and culture without compromise . Optimal protection of intellectual property avoids risks of technology transfer to competitors.

Hill emphasizes that this approach allows perfect integration with the company's global operations, optimizing synergies and efficiency . Avoiding acquisition liabilities eliminates risks related to the acquired company's legacies.

Flexibility in location and sizing allows optimizing strategic choices according to specific needs .

Disadvantages:

Hill identifies very high initial investment as the main disadvantage, requiring considerable financial resources. Prolonged development time delays revenue generation and exposes the company to competitive evolution.

Political and economic risks are maximal according to Hill, as the company has significant physical assets exposed in the host country. Lack of local knowledge can lead to costly strategic errors.

« Uncertainty about market acceptance represents a major risk, as the company has no established customer base » .

1.4 Criteria for choosing the internationalization model to gain a competitive advantage

The choice of an internationalization model is crucial to maximize competitive advantage. It depends on internal factors, the characteristics of the target market, associated risks, and the company's strategic objectives.

1.4.1. Internal criteria for choosing the internationalization model

The decision to enter an international market depends not only on external opportunities but also on a series of internal factors specific to the company. These factors impact the company's ability to engage abroad and adapt its strategic model.

a. Organizational capabilities

Organizational capabilities refer to a firm's internal competencies, including managerial skills, technical expertise, and coordination mechanisms. These capabilities determine how effectively a company can manage the complexities of international operations (Barney & Hesterly, 2019)[10]. For example, companies with strong project management experience and culturally competent leadership are more likely to choose high-control modes such as subsidiaries or joint ventures.

b. Available financial resources

Strategic decisions at the international level are largely influenced by the availability of funds . Buckley & Casson (2009) emphasized that establishing subsidiaries or acquiring local companies requires significant investment. Small and medium-sized enterprises, often

[10] Barney, J. B., & Hesterly, W. S. (2019*).* Strategic Management and Competitive Advantage: Concepts and Cases *(*6th edition)

constrained by limited budgets, may prefer softer entry strategies such as partnerships, licensing, or franchising[11].

c. Organizational culture and openness to change

Organizational culture plays a vital role in a company's ability to globalize, a company that encourages adaptability, risk-taking, and learning is more willing to internationalize, accept collaboration with foreign partners, and manage intercultural complexities.

d. International experience and maturity level

Previous experience in foreign markets is a critical factor ; companies with international experience have developed specific skills such as managing country risks, intercultural negotiation, and regulatory compliance.

1.4..2 External criteria influencing the selection of the internationalization model

Beyond internal capabilities, a company's international expansion also depends on various external factors specific to the target country's environment. These factors define not only the attractiveness of the international market but also the risks, opportunities, and regulatory constraints involved. Examining these criteria is essential to choose the most appropriate entry method.

a. PESTEL analysis of target countries

The PESTEL framework (Political, Economic, Social, Technological, Environmental, and Legal) allows for an analysis of the macro-environmental contexts of target countries. Politically, government stability, openness to foreign investment, and economic diplomacy are critical. Economic factors such as GDP, growth rates, and inflation influence the capacity of companies and consumers to adopt new technologies. Social elements like demographics, education levels, and public opinion on renewable energy also play a crucial role in the energy sector (Cavusgil et al., 2020)[12]. Technological progress, including innovation levels and digital infrastructure, affects the integration and maintenance of energy systems. Finally,

[11]Buckley, P. J., & Casson, M. C. (2009). The internalization theory of the multinational enterprise: A review of the progress of a research agenda after 30 years. Journal of International Business Studies, (p 1563)
[12] Cavusgil, S. T., Knight, G., Riesenberger, J. R., Rammal, H. G., & Rose, E. L. (2020). International Business: The New Realities (4th edition),p29,UK.

environmental and legal factors such as carbon emission regulations, safety standards, and tax policies can either encourage or hinder market entry.

b. Local and international competition

The intensity of competition and entry barriers are strongly influenced by the presence of key established players in the target country. Companies like Tesla Energy, First Solar, or Enphase Energy dominate certain markets, making it difficult for new, undifferentiated entrants (Porter, 1980)[13]. This situation encourages companies to adopt entry methods that favor local collaboration or strategic differentiation, such as joint ventures or acquiring well-established local firms.

c. Local demand for renewable energy

A critical factor is the size and growth potential of the local renewable energy market. In countries where demand for green energy is rising (for exemple : Algeria , China and Germany), it is often advisable to pursue deeply localized entry methods to capture a significant market share. Conversely, in niche or less developed markets, simpler approaches such as exporting or licensing may suffice to assess market attractiveness (Cavusgil et al., 2020)[14].

d. Local regulations

It is essential to consider tax regulations, financial incentives, and intellectual property protection as fundamental legal elements. Some countries offer subsidies, tax breaks, or feed-in tariffs that make direct investment more attractive. Conversely, stringent regulations, excessive bureaucracy, or legal uncertainty may discourage companies from fully committing to the market. Furthermore, protecting patents, trademarks, and know-how is crucial in the solar technology sector to prevent counterfeiting or illegal appropriation of innovations.

[13] Porter, Michael E. (1980) Extracts from Competitive Strategy: techniques for analyzing industries and competitors: with a new introduction (p;4) New York , USA .
[14] Cavusgil, S. T., Knight, G., Riesenberger, J. R., Rammal, H. G., & Rose, E. L. (2020). International Business: The New Realities (4th edition.) , USA .

Section 2 : theoretical framework

This section presents the main theoretical frameworks of internationalization, namely :

2.1 The Uppsala Model: Progressive internationalization theory

The Uppsala model, initially developed by Jan Johanson and Jan-Erik Vahlne at Uppsala University in Sweden, is one of the most influential theories explaining the internationalization process of firms. This behavioral approach proposes a gradual and sequential view of international expansion, contrasting with classical economic theories that favor a rational and optimizing approach [15].

The model is based on two fundamental concepts. The first key concept is physical distance, defined as the sum of factors that hinder information flows between the firm and the foreign market. This distance includes linguistic, cultural, political, educational, and economic development differences between the home country and the target market [16].

The second fundamental concept is experiential learning ; unlike economic models that assume perfect information, the Uppsala model considers that firms progressively acquire knowledge about foreign markets through direct experience. This experiential knowledge is difficult to transfer and constitutes a firm-specific competitive advantage .

2.1.1 Stages of the Uppsala model

a .First stag : Irregular export activities

This initial phase is characterized by irregular sales abroad, often in response to unsolicited orders, the firm then has limited knowledge of foreign markets and commits only minimal resources to international activities[17] .

b. Second stage: Export via independent agents

The firm establishes contractual relationships with local intermediaries who possess better knowledge of the target market. This allows the firm to acquire market information without committing significant resources.

[15] Buckley, P. J., & Ghauri, P. N. (Eds.). (2004).The internationalization of the firm: A reader(2e éd).,(p. 45-67,). Éd Thomson Learning. Royaume-Uni.
[16] Penrose, E. T. (1959). The theory of the growth of the firm. éd Basil Blackwell. (P. 65), UK.
[17] Buckley, P. J., & Casson, M. (1976). « The future of the multinational enterprise ».ed Macmillan Press. (UK)

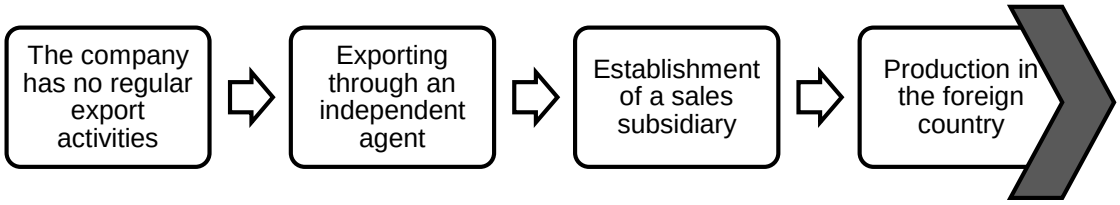
c. Third stage: Establishment of sales subsidiaries

The accumulation of experience and knowledge leads the firm to set up its own marketing structures in the foreign market. This stage marks a greater commitment in terms of resources and risks[18].

d. Fourth stage: Foreign production

The final stage corresponds to establishing production units in the foreign market, representing the highest level of commitment. This decision results from in-depth market knowledge and confidence in development prospects [19].

Figure 01: Uppsala internationalization model



Source : adapted by Johansson and Valhne, 1977.

2.1.2 Critiques and limitations

Although the Uppsala model has shaped much of the thinking on internationalization, it has faced several strong criticisms. One key issue is its overly linear and deterministic approach it suggests that firms internationalize in a fixed, gradual way. However, many real-life cases show companies skipping steps or even retreating from international markets. Another criticism is its limited relevance in today's globalized economy. With digital technologies, easier global communication, and fewer trade barriers, firms can enter foreign markets more rapidly and flexibly than the model suggests.

2.2 The three pillars of the OLI Paradigm according to Dunning, J. H. (2001)[20]

[18] Root, F. R. (1987). « Entry strategies for international markets ».ed Lexington Books. (USA)
[19] Vernon, R. (1966). International investment and international trade in the product cycle. « The quarterly Journal of Economics », 80(2), 190-207. (USA)
[20] Dunning, J. H. (2001). The eclectic (OLI) paradigm of international production: past, present and future. « International Journal of the Economics of Business », 8(2), 173-190

2.2.1. Ownership advantages:

Ownership advantages are the unique strengths a company has that give it a competitive edge in foreign markets. These might include advanced technologies, patents, or exclusive technical know-how. Strong internal management and well-structured organizations also count as key assets. Often, these are the result of years of learning and are hard for local firms to copy. Brand reputation, established distribution networks, and marketing skills also play a vital role, especially in consumer-focused industries. Lastly, better access to funding helps the company handle the costs and risks of going international.

2.2.2. Location advantages :

Location advantages refer to the specific features of a country that make producing there more attractive than exporting. This includes lower labor costs, local resources, or a growing domestic market. Political stability, strong institutions, and clear legal systems also help attract foreign investment. Cultural factors like language, consumer habits, or work culture can make it easier to adapt products and manage local teams. Being geographically close to major markets or transport routes is also an advantage. These elements help firms reduce costs and operate more efficiently abroad.

2.2.3. Internalization advantages

Internalization helps explain why some firms choose to retain direct control over their competitive advantages instead of licensing or franchising them. This logic is based on transaction cost theory by Williamson. Essentially, when the costs and risks of dealing with external partners are higher than managing things internally, firms prefer to internalize. This is especially true when there's information asymmetry, risk of knowledge theft, or difficulties in enforcing contracts. For tech companies, keeping control protects their innovation and reputation. It also ensures consistent quality standards and better brand image across markets.

2.2.4.Critiques and limitations

Although widely accepted, the OLI paradigm has been criticized for being too broad and lacking predictive accuracy. It works more as an explanatory tool after decisions are made rather than a guide for future investments. Measuring the three types of advantages especially ownership advantages is difficult since they're often intangible. Another key limitation is its static nature: it captures internationalization at a specific moment but doesn't

account for how strategies evolve over time. That makes it less relevant in today's fast-changing global markets.

2.3 Born Global firms

The concept of born global has multiple definitions, highlighting its early international orientation, competitive advantages, and modes of internationalization , namely :

Born Global firms are primarily defined by Knight and Cavusgil (2004, p.124) as « entrepreneurial start-ups that, from their inception or shortly thereafter, seek to derive a substantial proportion of their revenues from the sale of products in international markets »[21], this definition highlights three fundamental elements: the entrepreneurial nature, the rapid pace of internationalization, and a significant reliance on international revenues.

Secondly, Oviatt and McDougall (1994, p.49) offer a complementary perspective by defining Born Globals as « a business organization that, from its inception, seeks to gain a significant competitive advantage from the use of resources and the sale of products in multiple countries. »[22]

Finally, academic literature distinguishes several temporal thresholds to qualify a firm as Born Global; generally, these companies internationalize within the first three years following their creation, with the percentage of international revenues ranging between 25% and 75% depending on the study[23].

2.3.1 Internationalization strategies of born global firms

a. Niche strategies

Born Global firms frequently adopt niche strategies, focusing on specialized market segments at the international level, this approach allows them to avoid direct competition with large multinationals and to develop distinctive expertise.[24]

[21] Cavusgil, S. T., & Knight, G. (2015). « The born global firm: An entrepreneurial and capabilities perspective on early and rapid internationalization ». Journal of International Business Studies, 46(1), 3-16. USA.
[22] Oviatt, B. M., & McDougall, P. P. (1994). Toward a theory of international new ventures. « Journal of International Business Studies », 25 (1), 45-64. USA.
[23] Cavusgil, S. T., & Knight, G. (2015). « The born global firm: An entrepreneurial and capabilities perspective on early and rapid internationalization ». Journal of International Business Studies, 46(1), 3-9. USA.
[24] Knight, G. A., & Cavusgil, S. T. (2004). Innovation, organizational capabilities, and the born-global

b. Intensive use of digital technologies

The exploitation of digital technologies is a central strategy for Born Global firms, these companies use online platforms, social networks, and e-commerce to directly reach their international customers and reduce internationalization costs

c. Strategic partnerships and alliances

Born Global firms often favor strategic partnerships and alliances over foreign direct investments. This approach enables them to benefit from the resources and expertise of local partners while limiting their investments and risks[25] .

2.3.2 Challenges and limitations

According to Cavusgil, S. T., & Knight, G. (2004): « Born Global firms, despite their dynamism and ability to internationalize rapidly, face significant resource constraints »[26] ; their relatively modest size often limits their investment capacity as well as their access to financial markets, which can slow down their international development. Furthermore, managing multiple foreign markets simultaneously represents a major challenge for these small organizations. They must navigate the complexity of local regulations, cultural differences, and exchange rate fluctuations obstacles that make international management particularly complex.

2.4 Porter's five forces according to his work « Competitive Advantage» Porter, M. E. (1985)

Michael Porter revolutionized strategic analysis by developing the five competitive forces model in his foundational work « Competitive Advantage: Creating and Sustaining Superior Performance». This model constitutes a structural analysis tool allowing the evaluation of an industry's attractiveness and the determination of potential sources of competitive advantage.

firm. « Journal of International Business Studies », 35(2), 124-141. USA.

[25] Cavusgil, S. T., & Knight, G. (2015). « The born global firm: An entrepreneurial and capabilities perspective on early and rapid internationalization ». Journal of International Business Studies, 46(1), 10-16. USA.

[26] Knight, G. A., & Cavusgil, S. T. (2004). Innovation, organizational capabilities, and the born-global firm. « Journal of International Business Studies », 35(2), 124-141. USA.

2.4.1 The threat of new entrants

New players bring more competition, but entry barriers like high costs or strong brands can protect established firms. However, if these barriers drop due to tech or regulation new rivals can enter quickly. That's why companies must stay alert and adapt

2.4.2 The bargaining power of suppliers

When suppliers are few or offer unique products, they can raise prices or lower quality. Their power grows if they can sell directly to customers. To reduce this risk, companies often diversify suppliers or seek alternatives.

2.4.3 The bargaining power of buyers

Buyers gain power when they are concentrated or buy in large volumes. They can demand better deals or even produce the goods themselves. To stay competitive, firms must stand out through quality, service, or brand loyalty

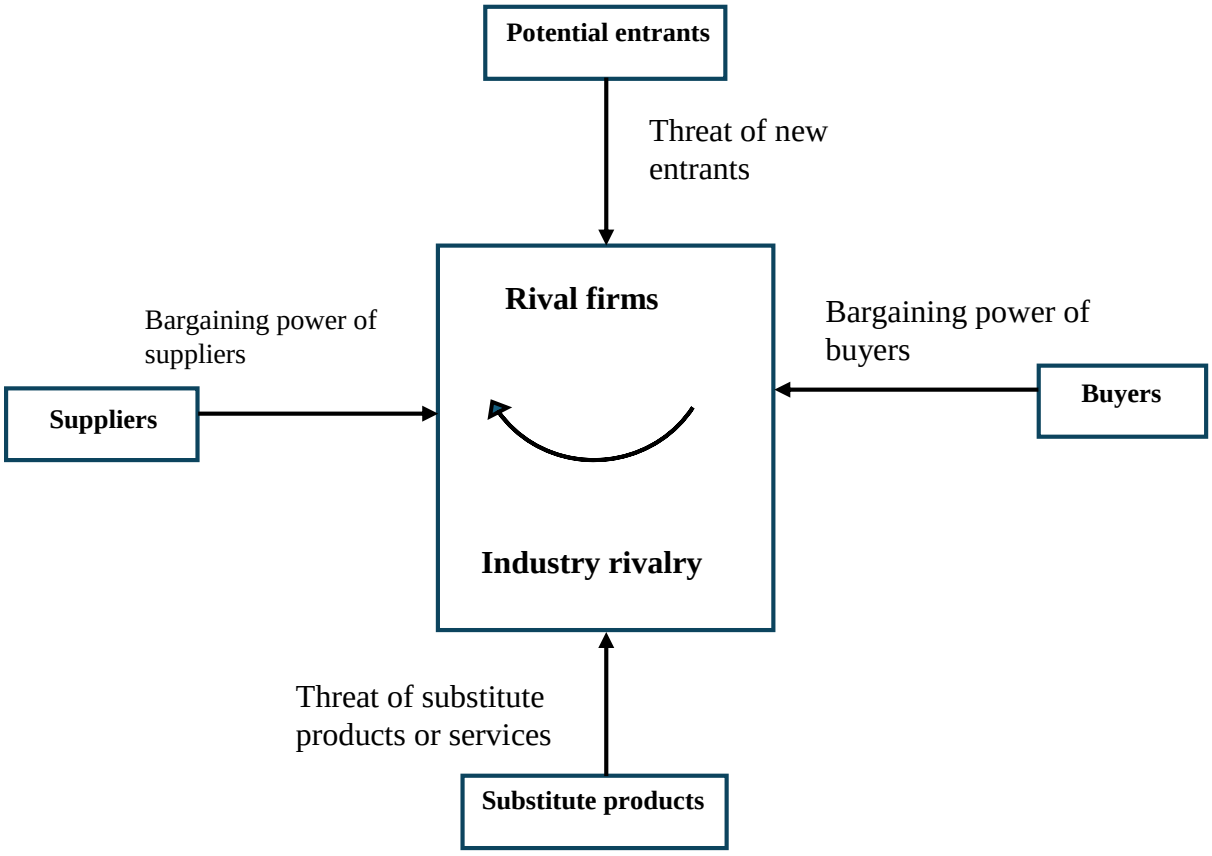
2.4.4 The threat of substitute products

Substitute products offer different solutions to the same need, often at better value. This limits how much a company can charge. Firms must look beyond direct competitors and watch trends to anticipate these threats.

2.4.5 Rivalry among established competitors

When many similar firms compete in a slow-growing market, rivalry intensifies. Price wars, aggressive marketing, and high exit costs raise pressure. Without strong product differentiation, margins often suffer.

Figure 02 : The five forces of competition that determine sector profitability



Source : Porter, Michael E. (1986) « Avantage concurrentiel : comment devancer ses concurrents et maintenir son avance » ed Donud , (p;15) , New York .[27]

[27] Porter, Michael E. (1986) « Avantage concurrentiel : comment devancer ses concurrents et maintenir son avance » ed Donud , (p;15), New York, USA .

Conclusion

In conclusion, internationalization is an essential step for any company seeking growth and diversification, it provides access to new markets, reduces dependence on a single territory, and allows for better distribution of economic risks. Expanding internationally also enhances the company's overall competitiveness by opening up growth opportunities and optimizing its resources. However, this process requires time, experience, and strong adaptability to local specificities.

Therefore, successful internationalization relies on a clear strategy, deep knowledge of foreign markets, and rigorous risk management related to this expansion .

Chapter 2 : Algeria's photovoltaic industry overview

Introduction

This chapter focuses on the financing mechanisms of Algeria’s solar sector, a crucial factor for the sustainable development of this strategic industry. While the country boasts exceptional solar potential, its success largely depends on its ability to mobilize the necessary financial resources. Various stakeholders public and private, local and international play specific roles in funding solar projects. Understanding these mechanisms helps assess the current strengths and limitations, as well as the prospects for accelerating Algeria’s energy transition.

It aims to analyze the key financing mechanisms supporting Algeria’s solar sector, including public, private, and international contributions. It also seeks to identify the challenges and opportunities related to funding the country’s renewable energy transition.

Section 01 : Solar potential of Algeria and its accessible resources

Thanks to its favorable geographic location, Algeria benefits from remarkable solar potential, with high solar irradiation and long hours of sunshine across almost its entire territory , and this potential is a major asset for the country's energy transition and sustainable development

1.1 Solar potential of Algeria

Algeria enjoys exceptional solar potential due to its favorable geographic location, with high levels of solar irradiation and long hours of sunshine across nearly the entire country. This abundant resource represents a key advantage for Algeria's energy transition and sustainable development efforts.

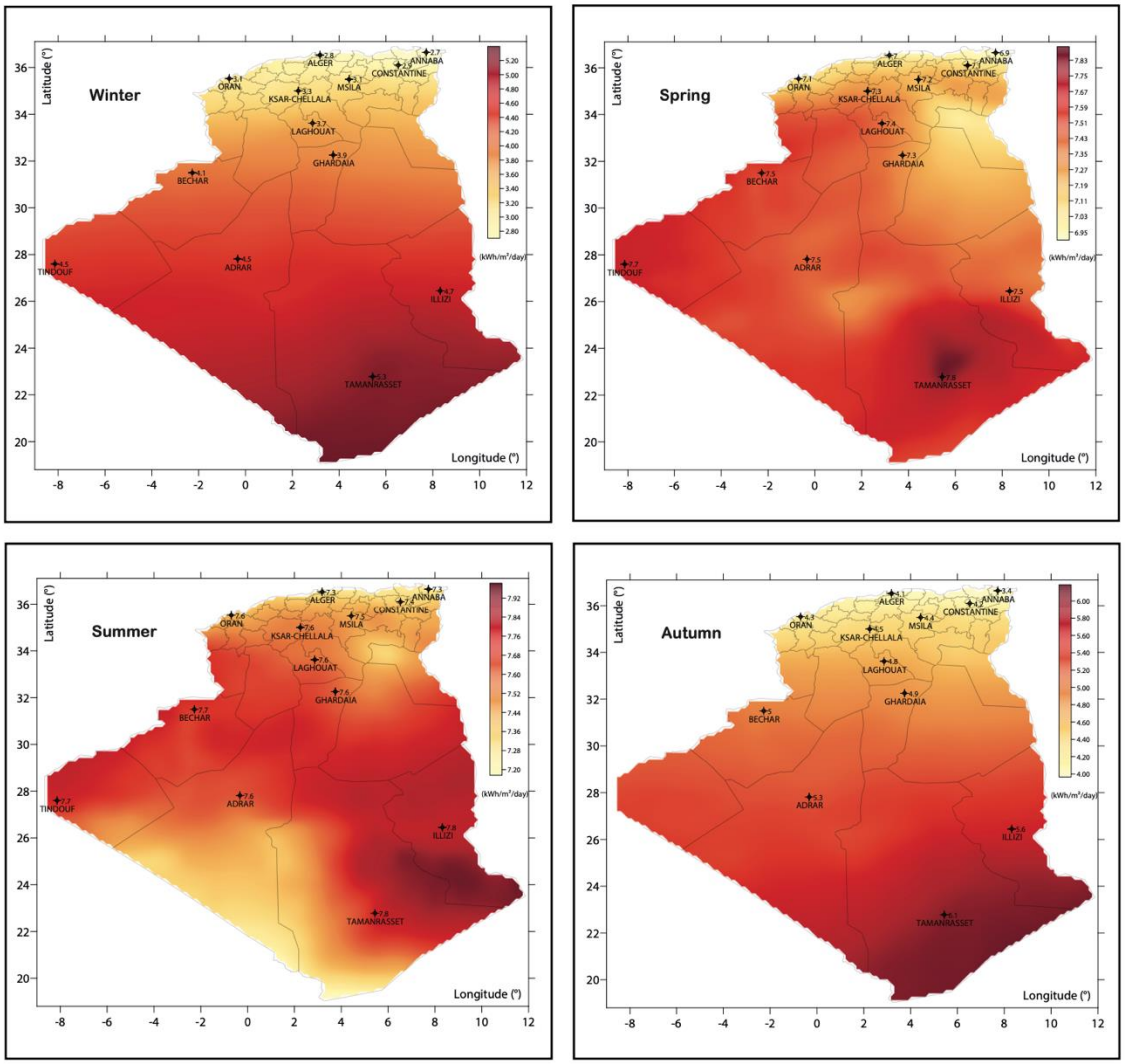
The country is recognized as having one of the world's largest solar reserves. With over 2,500 hours of sunshine annually across most regions and up to 3,800 hours in the high plateaus and the Sahara Algeria's solar energy potential exceeds 5 billion GWh per year.

According to Atmania, H., & Salem, A (2019, p.163)[28] : « If Algeria's solar potential is compared to its natural gas reserves, it is equivalent to around 37,000 billion cubic meters of gas more than eight times the country's current reserves. Moreover, solar energy is renewable, unlike natural gas [29].

International studies further confirm Algeria's outstanding solar resources, ranking the country among those with the highest solar irradiation levels worldwide. These conditions position Algeria as a strong candidate for large-scale solar energy development.

[28]Atmania, H., & Salem, A. (2019, 30 January). Investment in renewable energies in Algeria; a step towards energy transition (case of solar energy). Journal of Renewable Energy, 12(3), 163-175.

Figure 03: Seasonal global horizontal irradiance map highlighting Algeria's solar energy potential (2020)



source : Algerian Renewable Energy Resource Atlas,https://www.cder.dz/download/ATLAS%20final.pdf [30](consulted on May 2,2025)

[30]Centre for Renewable Energy Development (CDER). **(**2019**).** Algerian Renewable Energy Resource Atlas (1st ed.**).** Bouzaréah, Algiers , p. 12, https://www.cder.dz/download/ATLAS%20final.pdf (consulted on May 2,2025)

1.2 Algeria's resources in the photovltaic sector

Algeria possesses several accessible and abundant solar resources, which have facilitated its development in the solar industry, the main resources are presented in the table below :

Table 01: The different solar resources accessible in Algeria

Types of resources	Accessible resources	Example
Natural resources.	Sunshine	« Algeria has the world's largest solar field, with 3,000 hours of sunshine per year. »[31] **Source** :https://www.horizons.dz/?p=205167 , (consulted on April 12 , 2025)
	Vast energy territory	« More than 80% of Algeria's territory is covered by the Sahara Desert, offering vast, unobstructed areas ideally exposed to sunlight, perfect for large-scale solar plant installation. »[32] **Source** :https://www.ayecoenergy.com/energie-solaire-en-algerie/ , (consulted on April 12 , 2025)
	Solar potential	« Algeria's solar potential is equivalent to 37,000 billion cubic meters per year, over eight times the country's natural gas reserves. »[33] **Source** :https://www.horizons.dz/?p=205167 , (consulted on April 13, 2025)
Humain and infrastructural resources	Human resources	« Algeria leverages its national expertise and diaspora to support innovation and industrial development in the solar sector . »[34] **Source** :https://www.horizons.dz/?p=205167 , (consulted on April 13, 2025)
		« The country collaborates with international companies for the construction and operation of solar plants,

[31] https://www.horizons.dz/?p=205167 (consulted on April 12 , 2025)
[32] https://www.ayecoenergy.com/energie-solaire-en-algerie/ (consulted on April 12 , 2025)
[33] https://www.horizons.dz/?p=205167 (consulted on April 13, 2025)
[34] https://www.horizons.dz/?p=205167 , (consulted on April 13, 2025)

	International partnerships	benefiting from technology transfer and local industrial development. »[35] **Source** :https://www.ayecoenergy.com/energie-solaire-en-algerie/ (consulted on April 13, 2025)
	Government support	« The Algerian government has established a favorable regulatory framework for renewable energy producers, including subsidies, tax exemptions, and international tenders to attract foreign investment. » [36] **Source** :https://www.ayecoenergy.com/energie-solaire-en-algerie/ , (consulted on April 13, 2025)

source : prepared by author « my self » based on various source.

1.3 Structural weaknesses of Algeria in the development of the photovoltaic industry

Algeria possesses exceptional solar potential, particularly in its Saharan regions. However, numerous obstacles hinder the development of its photovoltaic sector. A thorough analysis by Teggar, M., Elbar, A., Laouer, A., Atia, A., Mechraoui, A., Mekhilef, S., Ismail, K. A. R., Mezaache, E. H., Souici, M., & Lino, F. A. M. (2024), in their « Challenges and Prospects of Concentrated Solar Power Deployment in Algeria » published in *the* European Journal of Sustainable Development Research, highlights several structural and institutional weaknesses that prevent the emergence of a truly sustainable solar industry.

1.3.1 High cost of solar technologies

The initial investment required to develop solar technologies, particularly concentrated solar power (CSP) plants, remains extremely high compared to Algeria's financial capabilities. This makes access to international funding or public-private partnerships essential , yet these mechanisms are slow to materialize.

1.3.2 Energy prices distorted by subsidies

[35] https://www.ayecoenergy.com/energie-solaire-en-algerie/ (consulted on April 13, 2025)
[36]https://www.ayecoenergy.com/energie-solaire-en-algerie/ , (consulted on April 13, 2025)

The Algerian electricity market is heavily influenced by fossil fuel subsidies, which artificially maintain electricity prices at very low levels. This distorts competition and undermines the economic attractiveness of solar energy for both consumers and investors.

1.3.3 Excessive water consumption of csp technologies

CSP systems require large amounts of water for cooling and mirror cleaning. In a country facing water scarcity, this requirement significantly limits the deployment of such infrastructure, particularly in desert regions with the highest solar potential.

1.3.4 Lack of a local solar equipment industry

Algeria is heavily dependent on imports for photovoltaic equipment such as solar panels, inverters, and storage systems. This dependence raises project costs and exposes the country to logistical and geopolitical risks.

1.3.5 Shortage of specialized technical skills

There is a significant shortage of qualified human resources in the solar energy sector. The lack of engineers, technicians, and grid-integration specialists constitutes a major bottleneck, hindering both project implementation and ongoing maintenance.

1.3.6 Inadequate regulatory and administrative framework

The authors also underline gaps in Algeria's legal and regulatory environment for renewable energy. The absence of dedicated financial mechanisms, adapted bank guarantees, and streamlined project approval procedures discourages private investment.

1.3.7 Outdated electrical infrastructure

The current Algerian power grid is not designed to handle the variability of solar power generation. The lack of storage infrastructure and smart grid technologies limits the effective integration of solar energy into the national electricity network.

1.3.8 Dependency on hydrocarbons and institutional inertia

Algeria's economy remains heavily reliant on hydrocarbon revenues. This dependency creates political and institutional inertia that hampers the energy transition especially when oil prices are high, reducing the perceived urgency to diversify energy sources.

Section 2 : Photovoltaic sector competitiveness: a comparative study between Algeria and china and an analysis of Algeria's financing mechanisms

2.1 Comparative analysis of solar sector competitiveness : Algeria vs china

The comparative analysis of competitiveness between Algeria and the Chinese solar industry highlights the strengths and weaknesses of each country in this sector. While China stands out for its vast industrial capacity, full integration of the value chain, and strong government support, Algeria possesses remarkable solar potential and is demonstrating growing political will to develop its local industry .

2.1.1 Production capacities and industrial development

Table 02: Industrial capacities and solar infrastructure development in Algeria and China

Criteria	Algeria	China	Observations
Installed solar capacity	Around 437 MW at end of 2023, rapid growth expected	Over 1,000 GW (1 TW) projected by 2026	China has massive industrial capacity; Algeria is in a ramp-up phase.
Local industry	Emerging, partnership with LONGi for local production	Mature industry, fully vertically integrated	Algeria seeks to develop a local industry through strategic partnerships.
Panel imports	Record imports (460 MW in Q1 2025, mostly Chinese)	Dominant local production, major exporter	Algeria still largely depends on Chinese imports.
Ongoing projects	20 solar plants planned for 3,000 MW in coming years	Multiple large-scale projects, continuous innovation	Algeria is accelerating projects but remains far from China's scale.

Source : Energy News Pro, « L'expansion solaire en Algérie : les projets chinois au premier plan », 2024. https://energynews.pro/lexpansion-solaire-en-algerie-les-projets-chinois-au-premier-plan/[37] (consulted on April 30, 2025)

2.1.2 Government support and energy policy

Table 03: Public policies and government strategies in the Algerian and Chinese solar sector

Criteria	Algeria	China	Observations
National targets	15,000 MW solar by 2035; 27% renewables in energy mix by 2030	Ambitious targets with massive support	Algeria shows strong political will, but China has a longer-established, integrated industrial strategy.
Tenders	Recent launches of several GW through tenders	Regular tenders with high competitiveness	Algeria draws inspiration from international, notably Chinese, models to structure its market.
Financial support	Massive public investments, international partnerships	Strong subsidies, state and private financing	China benefits from a more mature and diversified financial ecosystem.

Source: Algérie360, « Record imports of solar panels: Focus on Algeria's energy transition, ».[38] (consulted on May 4 , 2025)

2.1.3. Technology and innovation

Table 04: Technological level and innovation capabilities in the Algerian and Chinese solar industries

Criteria	Algeria	China	Observations
Technological level	Dependence on imported technologies, ongoing transfer with LONGi	Global leader in solar R&D and innovation	Algeria is beginning to integrate advanced technologies through its partnerships.

[37] Energy News Pro, « L'expansion solaire en Algérie : les projets chinois au premier plan», 2024. Available at : https://energynews.pro/lexpansion-solaire-en-algerie-les-projets-chinois-au-premier-plan/(consulted on April 30 , 2025)

[38] Algérie360, « Record imports of solar panels: Focus on Algeria's energy transition, »(consulted on May 4, 2025) .

Vertical integration	In development	Full value chain integration (silicon, wafers, cells, modules)	China controls the entire chain, reducing costs and increasing competitiveness.
Quality and performance	Imported products of recognized quality (LONGi)	High standards, strong capacity for continuous innovation	Algeria benefits from Chinese quality but needs to develop its own R&D.

Source: Radio Algérie, « Fabrication de panneaux solaires : le groupe chinois LONGI intéressé par l'Algérie, » available in : https://www.aps.dz/economie/185632-fabrication-de-panneaux-solaires-le-groupe-chinois-longi-souhaite-investir-en-algerie .April 18, 2025.[39] (consulted on May 4 , 2025)

2.1.4.Costs and economic competitiveness

Table 05: Cost analysis and economic competitiveness in the Algerian and Chinese solar sector

Criteria	Algeria	China	Observations
Cost of solar Panels	Competitive prices thanks to Chinese Imports	Very low costs due to mass production	Algeria benefits from Chinese prices but remains dependent.
Installation and operating Costs	Still high costs, underdeveloped residential market	Costs optimized by economies of scale and innovation	China benefits from an optimized industrial chain.
Subsidies and incentives	Improving subsidies, evolving legislative framework	Massive and stable support for the solar industry	Algeria needs to strengthen its incentive mechanisms to boost local demand.

Source: observalgerie.com[40] (consulted May 4, 2025)

2.1.5. Market and exports

[39]Radio Algérie, « Fabrication de panneaux solaires : le groupe chinois LONGI intéressé par l'Algérie, » available in : https://www.aps.dz/economie/185632-fabrication-de-panneaux-solaires-le-groupe-chinois-longi-souhaite-investir-en-algerie .April 18, 2025.[39] (consulted on May 4 , 2025)

[40] observalgerie.com (consulted on May 4 , 2025)

Table 6: Positioning in domestic and international markets (opportunities and challenges for Algeria Compared to China)

Criteria	Algeria	China	Observations
Domestic market	Rapidly growing, but solar capacity still low	Mature and very large market	Algeria still needs to develop its domestic market.
Export potential	Ambition to become a regional hub between Africa and Europe	World's largest solar panel exporte	Algeria aims to export but must first consolidate its local production.
International partnerships	Strategic cooperation with China (LONGI)	Global partnerships and technological leadership	Sino-Algerian collaboration is a key lever for Algeria.

Source: energynews.pro[41] (consulted May 5, 2025)

2.2 Financing mechanisms in the Algerian solar sector

The development of Algeria's solar energy sector relies on a diverse range of financing mechanisms, including public loans, private partnerships, and international support. These mechanisms aim to mobilize the necessary resources to accelerate renewable energy growth in the country .

2.2.1 Role of the state and public financing

The Algerian government plays a central role in financing the initial stages of renewable energy development. According to Mohamed Arkab, Algeria's Minister of Energy and Mines (Algerie Eco, 2023)[42], the National Bank of Algeria (BNA) will finance the first phase

[41] energynews.proc (consulted on May 5 , 2025)
[42] Arkab, M. (2023). Statement on renewable energy financing. Algerie Eco. Available at: https://www.algerie-eco.com/

of the national renewable energy program through a substantial loan. This phase targets the production of 3 GW of solar power, with an estimated cost of $3 billion.

Public financing is thus the cornerstone for launching the program, with future expansion relying on private-sector involvement through the Independent Power Producer (IPP) model. Under this model, private entities are responsible for project development, financing, and operations, illustrating a shift toward public-private collaboration (Arkab, 2023)[43].

2.2.2 Local bank loans

In the current phase, local bank loans, particularly those provided by the National Bank of Algeria, remain the preferred financing instrument. The program targets the generation of approximately 3,300 MW of solar power, requiring around 413 billion Algerian dinars (3$ billion) (Ministry of Energy, 2023)[44].

Additional financing may be sought from other Algerian financial institutions to supplement this loan. Long-term plans include fostering a balanced financing ecosystem combining public and private funding to guarantee the sustainability and resilience of the solar sector (BNA, 2023)[45].

2.2.3 Green funds and international financing

International funding mechanisms, including green funds, play an increasingly important role in supporting Algeria's renewable energy ambitions. These mechanisms help bridge financing gaps and introduce technical and regulatory expertise to the sector (UNDP, 2022)[46].

[43] REN21. (2023). *Renewables 2023 Global Status Report*. Paris: REN21 Secretariat. Available at: https://www.ren21.net/reports/global-status-report/
[44] Ministry of Energy and Mines of Algeria. (2023). National Renewable Energy *Program*. Available at: https://www.energy.gov.dz/
[45] IRENA. (2021). Renewable Energy Finance. International Renewable Energy Agency. Available at: https://www.irena.org/finance
[46] United Nations Development Programme (UNDP). (2022*).* Financing Green Energy in Africa. Available at: https://www.undp.org/content/undp/en/home/librarypage/environment-energy/sustainable-energy/financing-green-energy.html

2.2.4 Role of the World Bank

The World Bank has established a strategic partnership with Algeria to support the energy transition. This partnership emphasizes the promotion of solar self-generation and the establishment of regulatory frameworks to facilitate distributed generation by individuals and companies (World Bank, 2023)[47].

The World Bank's involvement supports Algeria's broader goals of energy diversification and reducing carbon emissions through renewable energy deployment.

2.2.5 Green Climate Fund (GCF)

The Green Climate Fund (GCF) has allocated $150 million to the Desert to Power G5 Sahel initiative(GCF, 2023)[48], led by the African Development Bank (AfDB), aiming to finance solar projects across the Sahel region. This initiative targets the installation of 10 GW of solar capacity by 2030 using a combination of grid-connected and off-grid solutions, mobilizing nearly $1 billion through public, private, and carbon finance (AfDB, 2023)[49].

Although Algeria has significant solar potential, it has yet to formalize active participation in this regional initiative. This situation illustrates Algeria's evolving solar financing framework, which blends state investment, local banking, and gradual integration of international and private capital.

Conclusion

Algeria is truly blessed with incredible solar resources, thanks to its vast sunny deserts and ideal geographic location. This gives the country a unique chance to shift away from fossil fuels and embrace cleaner, renewable energy. The government has made encouraging moves with policies and projects aimed at boosting solar power, but there are still hurdles to clear. High costs, reliance on imported technology, and a lack of skilled workers slow things

[47] World Bank. (2023). Algeria Energy Transition Partnership. Washington, DC: World Bank Group. Available at: https://www.worldbank.org/en/country/algeria/overview

[48] Green Climate Fund (GCF). (2023). Desert to Power Initiative.*Available* at: https://www.greenclimate.fund/projects/programmes/desert-to-power

[49] African Development Bank (AfDB). (2023). G5 Sahel Solar Projects. Available at: https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/desert-power-programme

down. Plus, subsidies for fossil fuels and water shortages make it even tougher. When compared to solar giants like China, Algeria is still finding its footing, but partnerships and political commitment are growing stronger. Financing comes from a mix of local banks, public funds, and international support, which is promising. By addressing these challenges and fostering local industry, Algeria can truly unlock its solar potential and build a cleaner, greener future for its people.

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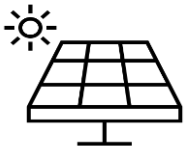
Chapter 3 : Case Study of Zergoun Green Energy (ZGE)



Introduction

This chapter offers an in-depth case study dedicated to ZERGOUN Green Energy (ZGE), a major player in renewable energy in Algeria , as a subsidiary of the historic ZERGOUN Brothers group, ZGE has distinguished itself through its capacity to produce innovative photovoltaic modules thanks to its automated factory in Ouargla.

The objective of this chapter is to concretely analyze how ZGE addresses the challenges of renewable energy development in Algeria. It aims to understand the organizational structure, implemented strategies, actions taken, and results achieved, based on real data and testimonials..

Section 01 : Presentation of ZERGOUN Green Energy

ZERGOUN Green Energy (ZGE) is a private company established in 2014 and a subsidiary of the historic ZERGOUN Brothers group, founded in 1948. Specializing in renewable energies, it focuses particularly on the production of photovoltaic (PV) modules, with an annual capacity exceeding 200 MW thanks to a highly automated factory located in Ouargla and equipped with advanced European technologies.

Initially focused on drilling works and oil transportation, the group diversified into public works in 1995, which led to the creation of this subsidiary in 2014 to meet the growing demand for solar energy in Algeria. The main activities of ZERGOUN Green Energy include manufacturing high-performance PV modules (ranging from 300 Wp to 600 Wp depending on the production lines), constructing and operating ground-mounted and rooftop solar power plants, as well as mining development with exploration projects for rare metals in Tamanrasset and the exploitation of deposits such as celestine in Beni Mansour.

Financially, the company has made significant investments, notably in its Ouargla factory, financed equally by equity and bank loans. It targets an ambitious national market (22 GW of renewable energy by 2030) with export potential to Africa and beyond. Its competitive advantage lies in local production, which reduces import dependence, vertical integration that optimizes costs, and the use of advanced technologies ensuring high module performance. However, ZERGOUN Green Energy faces increased competition, price volatility of raw materials like silicon, and regulatory risks specific to the Algerian context.

Its development strategy aims to increase production capacity, diversify activities towards energy storage and other renewables, while forging international and academic strategic partnerships to foster innovation.

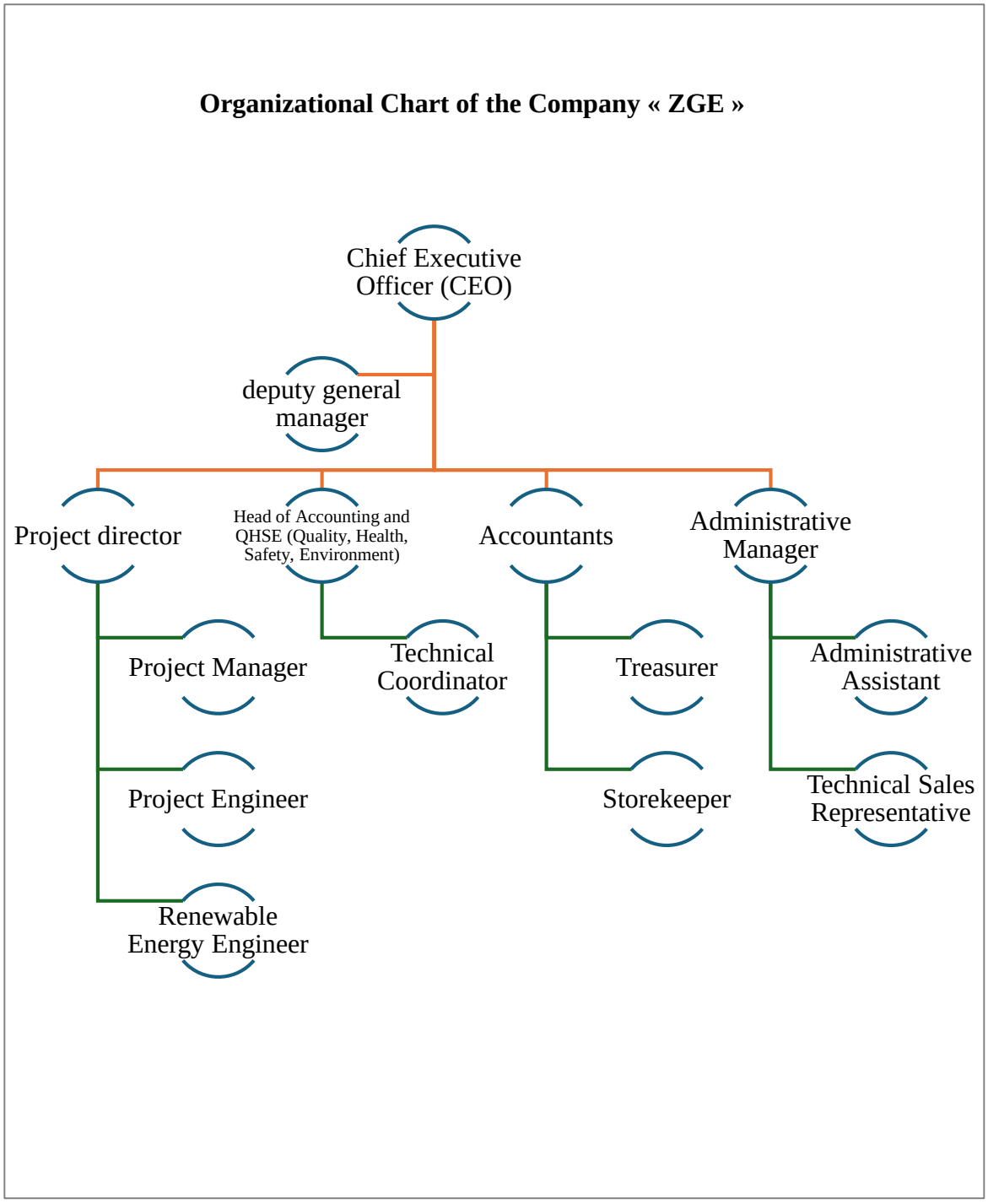
On the international trade front, the company imports advanced European equipment, manages logistics and financial aspects related to these imports, while developing the export potential of its modules to Africa. It also explores international financing to support its projects, with active management of associated financial risks.

Thus, ZERGOUN Green Energy has established itself as a key player in solar development in Algeria, combining vertical integration, advanced technologies, and growth ambitions, making it a relevant case study in finance and international trade

The company "ZERGOUN Green Energy", like any other business, follows a general organizational chart in managing its operations. This structure enables it to control and monitor its activities effectively. The organizational chart is represented by the figure 2 .

Figure 2: Organizational chart of the company Zergoun green energy

Source: Responsable of GRH



The organizational chart of ZERGOUN GREEN ENERGY features a centralized hierarchical structure centered around the Chief Executive Officer (CEO), who sits at the top of the decision-making pyramid. Directly reporting to the CEO is the Deputy General Manager, who oversees several key divisions within the company. Under their leadership, the company is organized into multiple units: a Project Director responsible for a team including a Project Manager, a Project Engineer, and a Renewable Energy Engineer; a Head of Accounting and QHSE (Quality, Hygiene, Safety, Environment) who also manages a Technical Coordinator; an accounting department led by Accountants, supported by a Treasurer and a Storekeeper; and finally, an administrative department headed by an Administrative Manager, assisted by an Administrative Assistant and a Technical Sales Representative.

Section 02 : Research methodology

To effectively conduct this study, I employed a qualitative research approach centered on two structured interviews. I personally visited the company's headquarters in Kouba as well as its manufacturing facility in Ouargla to engage directly with key organizational stakeholders, including the Chief Executive Officer and the Production Manager. Throughout these in-depth interviews, I meticulously recorded detailed notes, ensuring the accurate capture of nuanced insights. This rigorous data collection process was instrumental in obtaining comprehensive and precise information, which is critical for thoroughly understanding the company's operational challenges, strategic priorities, and overall organizational context.

2.1 Guide d'entretien directif n°01 avec ZERGOUN GREEN ENERGY

Déroulement de l'entretien :

L'entretien directif a été conduit au siège de l'entreprise situé à Kouba, en présence du PDG. La collecte des données s'est effectuée par prise de notes minutieuse tout au long de l'échange, permettant ainsi de saisir les informations clés pour l'analyse.

En-tête académique :

Titre du mémoire : **«** Internationalization strategy of Algerian Smes specialized in the photovoltaic industry **,** case study of ZGE **»**
Étudiante : HADDADJ Thanina
Université : Université Mouloud Mammeri Tizi-ouzou
Encadrante : DJELLOUT Fatima
Répondant : M. ZERGOUN Rahmoun , PDG de ZERGOUN Green Energy
Date de l'entretien : 01 MAI 2025
Lieu : au niveau de leur siège social a kouba , alger
Durée estimée : 57 minutes
Langue : français
Confidentialité : Accord donné pour inclusion dans le mémoire.
Type d'entretien : Semi-directif

Introduction

Bonjour et merci d'avoir accepté cet entretien. Il s'inscrit dans le cadre de mon mémoire de Master 2 en finance et commerce international à Université Mouloud Mammeri Tizi-Ouzou.

L'objectif est de comprendre le processus d'internationalisation de Zergoun Green Energy, en tant que PME innovante du secteur des énergies renouvelables.

Cet échange durera environ 45 à 60 minute , vos réponses sont confidentielles, et vous pouvez choisir de ne pas répondre à certaines questions. Je vous propose de démarrer par quelques questions générales sur l'entreprise, puis nous aborderons les aspects liés à l'internationalisation.

Rubriques	Questions / réponses
1. Profil. de l'entreprise	**Question 1.1 : Quand a été fondée Zergoun Green Energy et dans quel contexte ?** *Réponse 1.1 : ZGE a été fondée en 2014 , en réponse à la révolution des énergies renouvelables suite à la demande de l'État.* **Question 1.2 : Quelle est la mission de ZGE ?** *Réponse 1.2 : nous avons pour mission principale la protection de l'environnement , en diminuant le $C0_2$ et le gaz à effet de serre (GES) ,la promotion de l'énergie propre , faire face au déclin de nos ressources fossiles et réduire notre dépendance aux hydrocarbures .* **Question 1.3 : quels sont vos objectifs ?** *Réponse 1.3 : nous avons pour objectif principal l'augmentation de de nos production de panneaux photovoltaïque et améliorer nos usines, ensuite satisfaire une grande partie de la production nationale , devenir une boite de production d'électricité avec des centrales de panneaux photovoltaïques pour aider notre partenaire la Sonalgaz à la production .* **Questions 1.4 : quelles sont vos prospectives pour l'avenir de votre entreprise ?** *Réponse 1.4 : alors , nous aimerions nous adapter à la concurrence internationale , acquérir plus de technologies de pointes , offrir plus de formation et de recherches à notre personnel et enfin nous ouvrir sur la fenêtre étrangère , soit nous internationaliser sur le marché africain dans moins d'une année , car nous aurons moins de taxes à l'export allant jusqu'à 45% d'exonérations .*

2. Ressources, expertise et financement	**Question 2.1 : en plus de vos ressources naturelles abondantes , quelles ressources humaines mobilisez-vous pour de les exploiter efficacement ?** *Réponse 2.1 : nous avons des ingénieurs formés à l'international, et nous sommes actuellement entrain de former des étudiant fraichement diplômés sur nos chantiers à Ouargla.* **Question 2.2 : Quelles sont vos principales sources de financement ?** *Réponse 2.2 : Nos principales sources de financement reposent essentiellement sur nos fonds propres et des crédits bancaires contractés auprès d'institutions locales. Actuellement, l'entreprise est constituée en SARL (Société à Responsabilité Limitée), ce qui nous a permis de démarrer avec une structure souple adaptée aux PME. Mais, un changement de statut est en cours : nous deviendrons une SPA (Société par Actions) d'ici la fin du mois de juin, ce qui nous permettra d'ouvrir notre capital, de diversifier nos sources de financement et éventuellement d'attirer de nouveaux investisseurs ou partenaires.* **Question 2.3 : Quelle est la position actuelle de ZGE dans la chaîne de valeur mondiale de production de panneaux photovoltaïques ?** *Réponse 2.3: l'entreprise se positionne sur les deux parties, en amont car nous somme fabricants, nous prenons en charge l'ingénierie et la production. En aval, car nous assurons la distribution et l'installation avec des sous traiteurs et vendeurs (vente) .* **Question 2.4 : Bénéficiez-vous de soutiens gouvernementaux ?** *Réponse 2.4 : Peu de subventions mais avantages fiscaux notables ; exonérations de la TVA, facilités douanières a l'import des matières premières, tel que la mise en place d'une ligne verte ; elle permet de faciliter le paiement à l'import, en bénéficiant de 10% de réduction à chaque sortie de matière première (paiment par tranche) .*

3. Marchés , cibles et partenariats	**Questions 3.1 : Qui sont vos clients?** *Réponse 3.1 : au niveau national nous avons : Sonelgaz, projets agricoles, institutions publiques ; et le marché africain au niveau international .* **Question 3.2 : Quels types de partenaires recherchez-vous ?** *Réponse 3.2 : nous sommes à la recherche de partenaires européens comme les allemands et nous essayons de renforcer nos relations avec les chinois pour leur maitrise des technologie de pointe et de qualité supérieure des matières premières .* **Question 3.3 : Avez-vous des partenariats ? Qui sont vos partenaires principaux ?** *Réponse 3.3 : oui , au niveau national nous avons comme partenaire Carl Câble (pour le câblage) , quant au niveau international il y'a Mondragon entreprise espagnole(pour les machines automatisées à 98%), Sandro entreprise chinoise(pour les cellules) et avec une entreprise indienne (pour la couche EVA ; qui permet de protéger les cellules solaires des facteurs externes qui peuvent les endommager .* **Question 3.4 : Qui a initié ces partenariats ?** **(avantage concurrentiel)** *Réponse 3.4 : c'est les partenaires qui initient nos relations car ils sont attirés par le taux d'intégration verticale de 70 % , sachant qu'au niveau national et africain nous sommes les seul a le détenir* **Questions 3.5 : Avez-vous des accords avec l'Union Européenne ?** *Réponse 3.5 : actuellement non, mais nous sommes en cours de négociation.* **Question 3.6 : Quels avantages tirez-vous de ces partenariats ?** *Réponse 3.6: nous bénéficions d'un transfert technologique, formation de qualité, accès à des machines de pointes.*

4. Stratégie d'internationali-sation	**Question 4.1 : Quels sont vos objectifs en matière d'internationalisation ?** *Réponse 4.1 : Accroître les volumes de production et profiter des économies d'échelle.* **Question 4.2 : Quel mode de pénétration souhaitez-vous utiliser ?** *Réponse 4.2 : on utilisera l'export mais seulement avec appuie par des aides à l'export en baissant les taxes qui s'élèvent a 45%.* **Question 4.3 : quels moyens avez-vous mobilisé pour atteindre votre objectif d'internationalisation ?** *Réponse 4.3 : la certification des produits par l'Etat, une équipe d'ingénierie locale et une logistique export adaptée.*

5. Stratégie face à la concurrence	**Question 5.1 : Quels sont vos principaux concurrents au niveau national et international ?** *Réponse 5.1 : bah , au niveau national nous sommes les leader car il n'y a pas encore une forte concurrence , quant au niveau international nous avons la chine .* **Question 5.2 : comment apercevez-vous la menace chinoise ?** *Réponse 5.2: La Chine représente une concurrence déloyale, principalement à travers des subventions massives et des facilitations importantes accordées à ses entreprises, ce phénomène est qualifié de dumping chinois.* **Question 5.3 : Quels sont vos atouts face à cette concurrence ?** *Réponse 5.3 : nous disposons d'une équipe qualifiée, nous somme ancré localement et nous offrant une garantie de 25ans de garantie sur nos produits contre à 10 ans de garantie pour les produits chinois .* **Question 5.4 : Quelles sont vos faiblesses face à cette concurrence ?** *Réponse 5.4 : nos ressources financières sont limitées, une faible aide gouvernementale et absence de soutien financier à l'export .* **Question 5.5: Comment comptez-vous améliorer votre compétitivité ?** *Réponse 5.5: avec une aide de l'État nous pourrions renforcer nos ressources humaines et améliorer nos outils de production.*
6. Contraintes	**Question 6.1 : Quelles sont les contraintes rencontrées au niveau du marché local ?** *Réponse 6.1 : La lenteurs administratives et une réglementation assez floue.* **Question 6.2 : D'après votre expérience avec les partenaires étrangers quel type de contraintes rencontrez-vous à l'international ?** *Réponse 6.2 : Problèmes bancaires et tout ce qui est paiement en ligne.*

2 .2 Guide d'entretien directif n°02 avec ZERGOUN GREEN ENERGY

Déroulement de l'entretien :

L'entretien directif a été conduit à l'usine situé à Ouargla , en présence du chef de production. La collecte des données s'est effectuée par prise de notes minutieuse tout au long de l'échange, permettant ainsi de saisir les informations clés pour l'analyse.

En-tête académique :

Titre du mémoire : **«** Internationalization strategy of Algerian Smes specialized in the photovoltaic industry **,** case study of ZGE **»**
Étudiante : HADDADJ Thanina
Université : Université Mouloud Mammerie Tizi-ouzou
Encadrante : DJELLOUT Fatima
Répondant : M. ZERGOUN Hakim , Chef de production à l'usine ZGE Ouargla
Date de l'entretien : 25 MAI 2025
Lieu : au niveau de leur siège social a kouba , alger
Durée estimée : environ 35 minutes
Langue : français
Confidentialité : Accord donné pour inclusion dans le mémoire.
Type d'entretien : Semi-directif

Introduction :

Bonjour et merci de m'accueillir aujourd'hui au sein de votre usine de production de panneaux photovoltaïques à Ouargla. Cet entretien fait suite à un échange réalisé avec le PDG de Zergoun Green Energy à Kouba sur Alger, dans le cadre de mon mémoire de fin d'études.

Il a pour objectif d'explorer plus spécifiquement la dimension industrielle de l'entreprise, en s'intéressant à l'organisation de la production, aux technologies utilisées, à la gestion de l'approvisionnement , aux contraintes rencontrées liés à l'environnement et aux marchés internationaux.

L'entretien est directif, et dure environ 30 à 50 minutes , vos réponses seront utilisées uniquement à des fins académiques et resteront confidentielles , je vous remercie d'avance pour votre collaboration.

Rubriques	Questions / réponses
1.Organisation de la production	**Question 1.1 : Pouvez-vous me décrire l'organisation générale de la chaîne de production dans cette usine ?** *Réponse 1.1 : En période de high production, lorsque la demande est importante, tous les employés sont mobilisés. Quant à la période de low production, avec une demande réduite, seule la moitié du personnel est sollicitée .*
2. Stratégie de production et optimisation	**Question 2.1 :Quelle stratégie de production et d'optimisation des processus avez-vous mise en place pour maximiser l'efficacité, réduire les coûts et garantir une qualité constante ?** *Réponse 2.1 : Les deux usines sont automatisées : La première utilise une technologie M3 avec un automatisme à 50 % , La nouvelle usine utilise la technologie M10, automatisée à 98 %. ,*
3.Gestion de la chaîne d'approvisionnement	**Question 3.1 : Quelle est votre approche pour gérer la chaîne d'approvisionnement et minimiser les risques liés aux fluctuations internationales et aux contraintes d'approvisionnement ?** *Réponse 3.2 : Utilisation de couvertures d'assurance, notamment avec la SAA (Société Nationale d'Assurance), pour sécuriser les approvisionnements.*
4. Adaptation aux marchés internationaux	**Question 4.1 : Comment l'usine s'adapte-t-elle aux exigences des marchés internationaux en matière de satisfaction des produits ?** *Réponse 4.1 : Conformité aux normes ISO, notamment la norme ISO 50001, qui permet d'intégrer l'efficacité énergétique dans les activités, réduisant ainsi les coûts et les émissions de carbone.*
5.Positionnement Concurrentiel	**Question 5.1 : Selon vous, quels sont les principaux atouts de cette usine qui vous permettent de vous différencier des autres sites de production ?** *Réponse 5.1 : La technologie M10, détenue exclusivement par l'entreprise. En comparaison à : Miltech utilise une technologie M6, Condor une technologie M3 et ENIEM une technologie M2.*

6. Innovation et formation	**Question 6.1 : Disposez-vous d'un centre de recherche et développement ?** *Réponse 6.1 : Non .* **Question6.2 : Comment assurez-vous la formation continue de vos employés (ingénieurs) ?** *Réponse 6.2 : Formations à l'étranger (Espagne) et formations au IFAG (Institut de Formation aux Affaires et à la Gestion) à Blida.*
7. Obstacles de production	**Question 7.1 : Quels sont les principaux obstacles rencontrés dans la production ?** *Réponse 7.1 : Fragilité des cellules et matières premières, qui nécessitent un stockage à 25°C et la durée de vie limitée des matières premières.* **Question 7.2 : . Quelles sont vos contraintes sur le terrain (en milieu désertique) ?** *Réponse 7.2 : Contraintes météorologiques : notamment les tempêtes de sable et la défaillance des panneaux photovoltaïques lorsqu'ils sont recouverts de sable.*

Section 03 : Analyze and interpret the results

3.1 Analyze and interpretations of the results of interview guide n°01

Axis 01: Company Profile

Zergoun Green Energy relies on a strategy focused on green energy and rapid internationalization, leveraging process optimization and export tax exemptions as key drivers of growth.

Axis 02: Resources, Expertise, and Financing

With internationally trained engineers, diversified financing, and full vertical integration of its value chain a crucial competitive advantage that is sustainable and difficult for competitors to replicate ,ZGE optimizes its internal resources to ensure quality and strategic autonomy.

Axis 03: Markets, Targets, and Partnerships

The company targets African markets through key technological partnerships (see appendix 03 p78 and appendix 04 p79) and a high level of vertical integration, enhancing its competitiveness and attracting interest from international actors such as the European Union.

Axis 04: Internationalization Strategy

ZGE adopts export as its main mode of internationalization, aiming to benefit from economies of scale while relying on certified production, dedicated logistics, and qualified local resources, supported by favorable tax incentives.

Axis 05: Competitive Strategy

In the face of Chinese competition, ZGE stands out through its advanced technology, long-term product warranties, and strong local presence despite the need for greater public support to strengthen its financial resources.

Axis 06: Constraints

Despite its strong potential, the company is held back by administrative and banking constraints, which limit the optimal use of its resources and slow down its integration into international markets.

3.2 Interpretations of the results of interview guide n°02

Axis 01: Production Organization

Production adapts to demand: full staff is mobilized during peak periods, and only half during low-demand phases. This flexibility helps reduce costs and optimize both storage and resources.

Axis 02: Production Strategy and Optimization

The company uses automated technologies (M3 at 50%, M10 at 98%), ensuring efficiency, consistency, and cost control, while maintaining a strong technological position. (See Appendix 05 p. 80 ; Appendix 06 p. 81and Appendix 07, p. 82).

Axis 03: Supply Chain Management

ZGE secures its supply chain through insurance provided by SAA, mitigating risks linked to international fluctuations and ensuring logistical continuity.

Axis 04: Adaptation to International Markets

The factory complies with ISO 50001 standards, integrating energy efficiency into its processes. This compliance strengthens its credibility for export and reduces its carbon footprint.

Axis 05: Competitive Positioning

ZGE holds exclusive rights to M10 technology, which is significantly more advanced than that of its Algerian competitors, positioning the company as a local industrial leader.

Axis 06: Innovation and Training

Despite lacking an in-house R&D center, ZGE invests in human capital by training its engineers abroad and at IFAG (in Blida), supporting innovation and skills development.

Axis 07: Production Obstacles

The company faces challenges such as fragile raw materials and harsh desert conditions (sand, heat), which require specific technical and logistical adaptations.

Conclusion

This chapter highlights the inspiring journey of ZERGOUN Green Energy, an Algerian SME that embodies both technological innovation and environmental commitment in a key sector for the future: renewable energy. Founded in the context of the energy transition, ZGE has built a strong and agile organization capable of combining local expertise with international openness. Its unique positioning combining advanced technology, vertical integration, and strategic partnerships gives it a real competitive advantage despite the challenges posed by global competition and local constraints.

Beyond the numbers and strategies, it is above all the well-trained engineers, dedicated teams, and visionary leaders of this company who carry the collective ambition to contribute to a more sustainable future. Their ability to adapt, learn, and innovate in sometimes difficult environments is the key to the company's success. By leveraging its internal strengths and cultivating alliances, ZGE perfectly illustrates how an Algerian SME can face the challenges of internationalization while actively participating in the national and regional energy transition.

Thus, this case study goes beyond an economic or technical analysis: it tells a human story, a societal project, and a beacon of hope for responsible, competitive, and sustainable industrial development.

ZERGOUN Green Energy is more than an economic actor it is a « Symbol of the future for Algeria and Africa, at the crossroads of environmental, technological, and social challenges».

General conclusion

General conclusion

This dissertation has explored a central and timely question : How can Algerian enterprises specialized in photovoltaics develop an internationalization strategy and compete on the global stage ? Through a qualitative approach and the case study of Zergoun Green Energy (ZGE), it becomes clear that successful internationalization hinges on a delicate balance between internal capabilities, regional opportunities, and strategic adaptation to the structural constraints of the national environment.

Algeria benefits from exceptional solar potential, yet national production remains limited due to technological dependency, a still-developing industrial ecosystem, and underdeveloped infrastructure. However, ZGE illustrates that local initiatives can rise to the challenge. With advanced automation, a production capacity exceeding 200 MW, and 70% vertical integration, the company proves that competitive, internationally compliant solar production is indeed achievable within Algeria.

Companies like ZGE encounter common challenges: administrative delays, lack of banking support for international transactions, and limited export assistance. Nevertheless, ZGE mobilizes highly skilled human resources, benefits from targeted tax incentives, and has built strong technological partnerships (with Spain, China, and India). Its model demonstrates that internationalization is feasible when built on quality certifications, tailored export logistics, and sound governance.

The Algerian environment presents some clear locational advantages (as outlined in Dunning's OLI model), such as high solar irradiance, export tax exemptions, and low production costs. However, the lack of a consistent industrial policy and unclear regulations significantly hinder progress. ZGE's case shows that, even in a difficult context, SMEs can leverage these assets, provided they strengthen their internal structures, invest in innovation, and target proximate markets such as Africa.

This study shows that there is no universal blueprint for internationalization applicable to Algerian solar entreprises. A hybrid model is needed one that blends gradual learning , firm-specific advantages ,and strategic differentiation . ZGE's experience suggests that mastering internal resources, building robust technological alliances, and smartly leveraging existing incentives are key success factors.

Conclusion

This study presents certain limitations that are important to acknowledge. Its qualitative and exploratory nature, based on a limited number of interviews within a single company, restricts the generalizability of the findings. The Algerian context, with its specific economic and regulatory characteristics, may also limit the applicability of the conclusions to other regions. Additionally, the fast-paced evolution of the renewable energy sector could quickly shift some of the observed dynamics, further qualitative research would be valuable to track these developments and deepen the analysis .

Ultimately, for a truly international « Made in Algeria » solar industry to emerge, a clear political vision, structured SME support, and recognition of their strategic role in the green transition are essential. Without such foundations, even the most determined efforts risk remaining isolated in the face of global competition. Broader, comparative research involving other companies would help refine these findings and inform more effective public policy recommendations.

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Appendecies

ANNEXE-Guide d'entretien directif n°01 avec ZERGOUN GREEN ENERGY

Déroulement de l'entretien :

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En-tête académique :

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Étudiante : HADDADJ Thanina
Université : Université Mouloud Mammeri Tizi-ouzou
Encadrante : DJELLOUT Fatima
Répondant : M. ZERGOUN Rahmoun , PDG de ZERGOUN Green Energy
Date de l'entretien : 01 MAI 2025
Lieu : au niveau de leur siège social a kouba , alger
Durée estimée : 57 minutes
Langue : français
Confidentialité : Accord donné pour inclusion dans le mémoire.
Type d'entretien : Semi-directif

Introduction

Bonjour et merci d'avoir accepté cet entretien. Il s'inscrit dans le cadre de mon mémoire de Master 2 en finance et commerce international à Université Mouloud Mammeri Tizi-Ouzou.

L'objectif est de comprendre le processus d'internationalisation de Zergoun Green Energy, en tant que PME innovante du secteur des énergies renouvelables.

Cet échange durera environ 45 à 60 minute , vos réponses sont confidentielles, et vous pouvez choisir de ne pas répondre à certaines questions. Je vous propose de démarrer par quelques questions générales sur l'entreprise, puis nous aborderons les aspects liés à l'internationalisation.

Appendecies

Rubriques	Questions
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2. Ressources, expertise et financement	**Question 2.1 : en plus de vos ressources naturelles abondantes , quelles ressources humaines mobilisez-vous pour de les exploiter efficacement ?** **Question 2.2 : Quelles sont vos principales sources de financement ?** **Question 2.3 : Quelle est la position actuelle de ZGE dans la chaîne de valeur mondiale de production de panneaux photovoltaïques ?** **Question 2.4 : Bénéficiez-vous de soutiens gouvernementaux ?**
3. Marchés , cibles et partenariats	**Questions 3.1 : Qui sont vos clients?** **Question 3.2 : Quels types de partenaires recherchez-vous ?** **Question 3.3 : Avez-vous des partenariats ? Qui sont vos partenaires principaux ?** **Question 3.4 : Qui a initié ces partenariats ?** **Questions 3.5 : Avez-vous des accords avec l'Union Européenne ?** **Question 3.6 : Quels avantages tirez-vous de ces partenariats ?**

4. Stratégie d'internationali -sation	**Question 4.1 : Quels sont vos objectifs en matière d'internationalisation ?** **Question 4.2 : Quel mode de pénétration souhaitez-vous utiliser ?** **Question 4.3 : quels moyens avez-vous mobilisé pour atteindre votre objectif d'internationalisation ?**
5. Stratégie face à la concurrence	**Question 5.1 : Quels sont vos principaux concurrents au niveau national et international ?** **Question 5.2 : comment apercevez-vous la menace chinoise ?** **Question 5.3 : Quels sont vos atouts face à cette concurrence ?** **Question 5.4 : Quelles sont vos faiblesses face à cette concurrence ?** **Question 5.5: Comment comptez-vous améliorer votre compétitivité ?**
6. Contraintes	**Question 6.1 : Quelles sont les contraintes rencontrées au niveau du marché local ?** **Question 6.2 : D'après votre expérience avec les partenaires étrangers quel type de contraintes rencontrez-vous à l'international ?**

ANNEXE-Guide d'entretien directif n°02 avec ZERGOUN GREEN ENERGY

Déroulement de l'entretien :

L'entretien directif a été conduit à l'usine situé à Ouargla , en présence du chef de production. La collecte des données s'est effectuée par prise de notes minutieuse tout au long de l'échange, permettant ainsi de saisir les informations clés pour l'analyse

En-tête académique :

Titre du mémoire : **«** Internationalization strategy of Algerian Smes specialized in the photovoltaic industry **,** case study of ZGE **»**
Étudiante : HADDADJ Thanina
Université : Université Mouloud Mammerie Tizi-ouzou
Encadrante : DJELLOUT Fatima
Répondant : M. ZERGOUN Hakim , Chef de production à l'usine ZGE Ouargla
Date de l'entretien : 25 MAI 2025
Lieu : au niveau de leur siège social a kouba , alger
Durée estimée : environ 35 minutes
Langue : français
Confidentialité : Accord donné pour inclusion dans le mémoire.
Type d'entretien : Semi-directif

Introduction :

Bonjour et merci de m'accueillir aujourd'hui au sein de votre usine de production de panneaux photovoltaïques à Ouargla. Cet entretien fait suite à un échange réalisé avec le PDG de Zergoun Green Energy à Kouba sur Alger, dans le cadre de mon mémoire de fin d'études.

Il a pour objectif d'explorer plus spécifiquement la dimension industrielle de l'entreprise, en s'intéressant à l'organisation de la production, aux technologies utilisées, à la gestion de l'approvisionnement , aux contraintes rencontrées liés à l'environnement et aux marchés internationaux.

L'entretien est directif, et dure environ 30 à 50 minutes , vos réponses seront utilisées uniquement à des fins académiques et resteront confidentielles , je vous remercie d'avance pour votre collaboration.

Rubriques	Questions
1.Organisation de la production	Question 1.1 : Pouvez-vous me décrire l'organisation générale de la chaîne de production dans cette usine ?
2. Stratégie de production et optimisation	Question 2.1 :Quelle stratégie de production et d'optimisation des processus avez-vous mise en place pour maximiser l'efficacité, réduire les coûts et garantir une qualité constante ?
3.Gestion de la chaîne d'approvisionnement	Question 3.1 : Quelle est votre approche pour gérer la chaîne d'approvisionnement et minimiser les risques liés aux fluctuations internationales et aux contraintes d'approvisionnement ?
4. Adaptation aux marchés internationaux	Question 4.1 : Comment l'usine s'adapte-t-elle aux exigences des marchés internationaux en matière de satisfaction des produits ?
5.Positionnement Concurrentiel	Question 5.1 : Selon vous, quels sont les principaux atouts de cette usine qui vous permettent de vous différencier des autres sites de production ?
6. Innovation et formation	Question 6.1 : Disposez-vous d'un centre de recherche et développement ? Question6.2 : Comment assurez-vous la formation continue de vos employés (ingénieurs) ?
7. Obstacles de production	Question 7.1 : Quels sont les principaux obstacles rencontrés dans la production ? Question 7.2 : . Quelles sont vos contraintes sur le terrain (en milieu désertique) ?

APPENDIX 01 – Structured Interview Guide No. 01 with ZERGOUN GREEN ENERGY

Interview procedure

The structured interview was conducted at the company's headquarters located in Kouba, in the presence of the CEO. Data collection was carried out through careful note-taking throughout the exchange, allowing the capture of key information for analysis.

Dissertation title: « Internationalization strategy of Algerian SMEs specialized in the photovoltaic industry ; Case study of ZGE »
Student: HADDADJ Thanina
University: Mouloud Mammeri University of Tizi-Ouzou
Supervisor: DJELLOUT Fatima
Interviewee: Mr. ZERGOUN Rahmoun, CEO of ZERGOUN Green Energy
Interview date: May 1st, 2025
Location: Company headquarters, Kouba, Algiers
Estimated duration: 57 minutes
Language: French
Confidentiality: Consent granted for inclusion in the thesis.
Interview type: Semi-structured (Directive)

Introduction

Hello, and thank you for accepting this interview. It is conducted as part of my Master's thesis in Finance and International Trade at Mouloud Mammeri University of Tizi-Ouzou. The objective is to understand the internationalization process of Zergoun Green Energy, an innovative SME operating in the renewable energy sector.

This interview will last approximately 45 to 60 minutes. Your answers will remain confidential, and you may choose not to answer certain questions. I suggest we begin with a few general questions about the company, then move on to those related to internationalization.

Interview Questions

Sections	Questions
1. Company profile	**Question 1.1: When was Zergoun Green Energy founded, and in what context?** **Question 1.2: What is ZGE's mission?**

	Question 1.3: What are your key objectives? **Question 1.4: What are your future prospects for the company?**
2. Resources, expertise and financing	**Question 2.1: In addition to your abundant natural resources, what human resources do you mobilize to utilize them effectively?** **Question 2.2: What are your main sources of funding?** **Question 2.3: What is ZGE's current position in the global photovoltaic value chain?** **Question 2.4: Do you benefit from any governmental support?**
3. Markets, targets and partnerships	**Question 3.1: Who are your clients?** **Question 3.2: What types of partners are you looking for?** **Question 3.3: Do you have any existing partnerships? Who are your main partners?** **Question 3.4: Who initiated these partnerships?** **Question 3.5: Do you have any agreements with the European Union?** **Question 3.6: What advantages do you gain from these partnerships?**
4.Internationali-zation strategy	**Question 4.1: What are your goals in terms of internationalization?** **Question 4.2: What market entry mode do you intend to use?** **Question 4.3: What means have you mobilized to achieve your internationalization goal?**

5. Competitive strategy	**Question 5.1: Who are your main competitors at national and international levels?** **Question 5.2: How do you perceive the Chinese threat?** **Question 5.3: What are your strengths in facing this competition?** **Question 5.4: What are your weaknesses compared to this competition?** **Question 5.5: How do you plan to improve your competitiveness?**
6. Constraints	**Question 6.1: What are the constraints you face in the local market?** **Question 6.2: Based on your experience with foreign partners, what types of constraints do you encounter internationally?**

APPENDIX 02 – Structured Interview Guide No. 02 with ZERGOUN GREEN ENERGY

Interview Procedure

The structured interview was conducted at the factory located in Ouargla, in the presence of the production manager. Data collection was carried out through careful note-taking throughout the exchange, allowing the capture of key information for analysis.

Academic Header
Dissertation title: « Internationalization strategy of Algerian SMEs specialized in the photovoltaic industry, case study of ZGE »
Student: HADDADJ Thanina
University: Mouloud Mammeri University of Tizi-Ouzou
Supervisor: DJELLOUT Fatima
Interviewee: Mr. ZERGOUN Hakim, Head of Production at the ZGE Ouargla plant
Interview tate: May 25th, 2025
Location: Company headquarters, Kouba, Algiers
Estimated turation: Approximately 35 minutes
Language: French
Confidentiality: Consent granted for inclusion in the thesis.
Interview type: Semi-structured

Introduction

Hello, and thank you for welcoming me today to your photovoltaic panel production plant in Ouargla. This interview follows a previous discussion held with the CEO of Zergoun Green Energy in Kouba, Algiers, and forms part of my final year Master's thesis. The aim is to explore in greater depth the industrial dimension of the company, focusing on production organization, technologies used, supply chain management, environmental constraints, and adaptation to international markets.

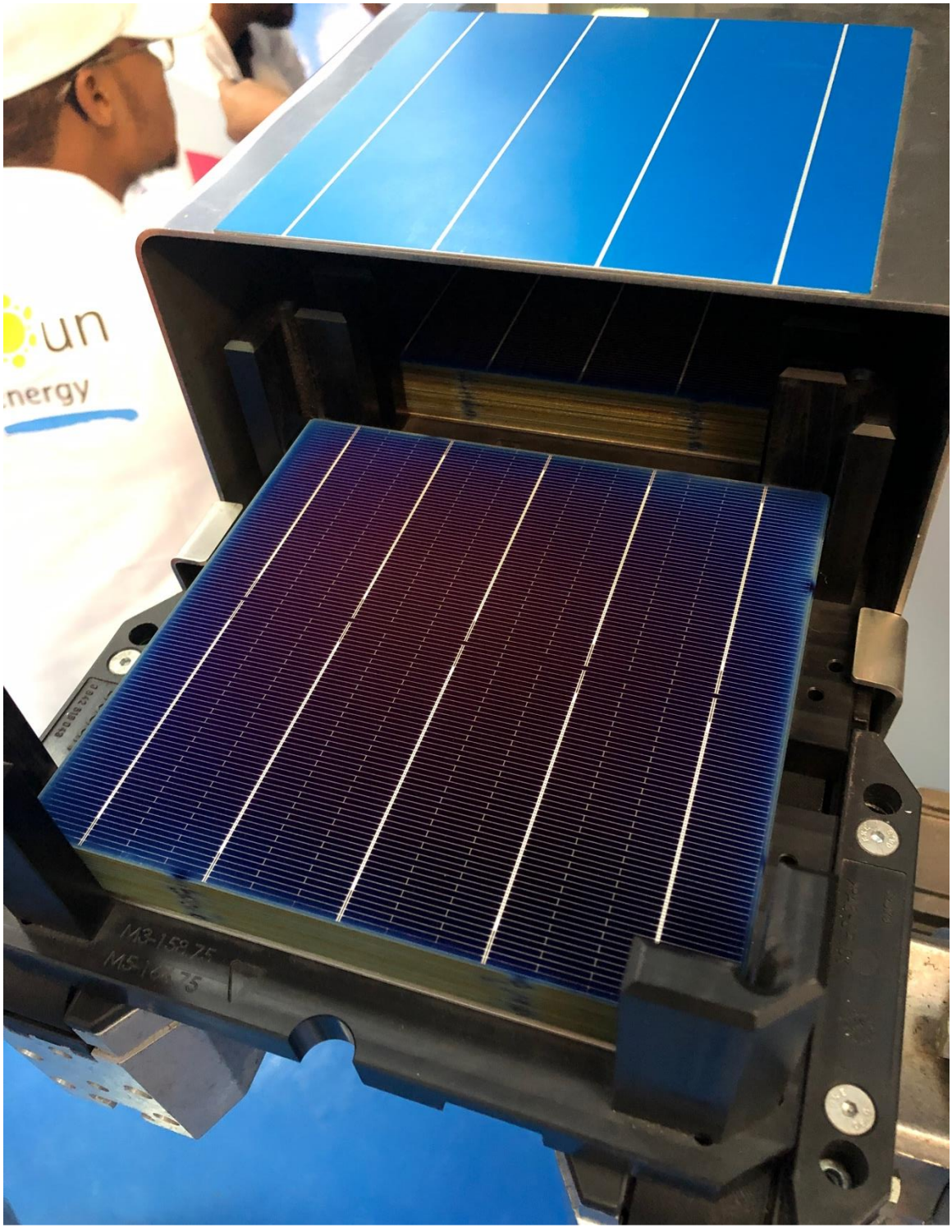
This is a structured interview, and it will last approximately 30 to 50 minutes. Your answers will be used exclusively for academic purposes and will remain confidential. Thank you in advance for your collaboration.

Appendecies

Interview Questions

Sections	Questions
1. Production organization	**Question 1.1: Could you describe the general organization of the production chain in this plant?**
2. Production strategy and process optimization	**Question 2.1: What production and process optimization strategies have you implemented to maximize efficiency, reduce costs, and ensure consistent quality?**
3. Supply Chain management	**Question 3.1: What is your approach to managing the supply chain and minimizing risks related to international fluctuations and supply constraints?**
4. Adaptation to international Markets	**Question 4.1: How does the plant adapt to international market requirements in terms of product compliance and satisfaction?**
5. Competitive positioning	**Question 5.1: In your opinion, what are the main strengths of this plant that differentiate it from other production sites?**
6. Innovation and training	**Question 6.1: Do you have a research and development center?** **Question 6.2: How do you ensure ongoing training for your employees (engineers)?**
7. Production constraints	**Question 7.1: What are the main obstacles you encounter in the production process?** **Question 7.2: What are your on-site constraints, especially in a desert environment?**

Appendix 03 : Photovoltaic cells imported from China



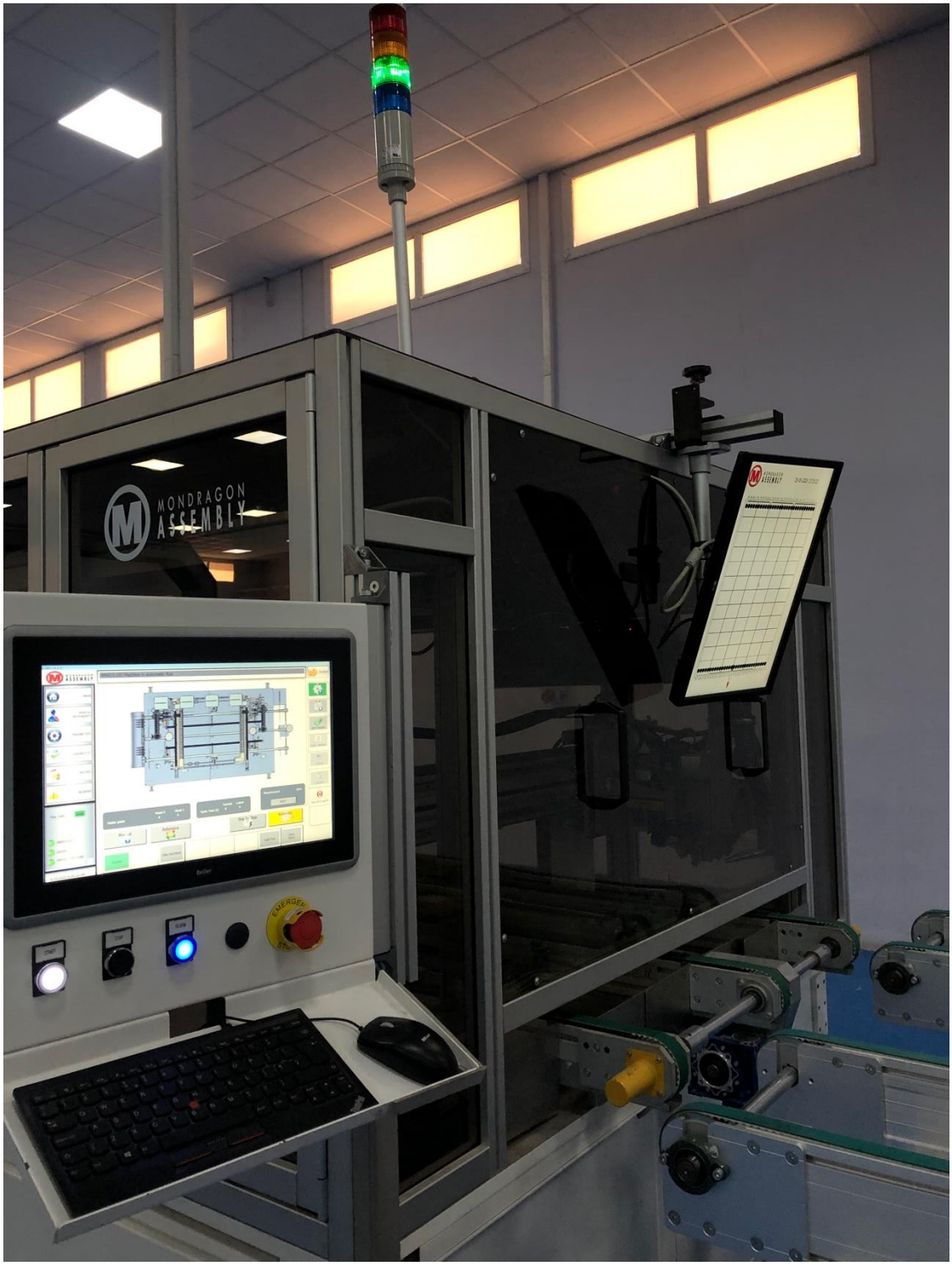
Source: Photo taken by the author

Appendix 04: EVA layer imported from India

Source: Photo taken by the author

Appendices 05, 06 and 07: Advanced technology available at the ZGE Ouargla factory

Appendix 05: EL-scanner

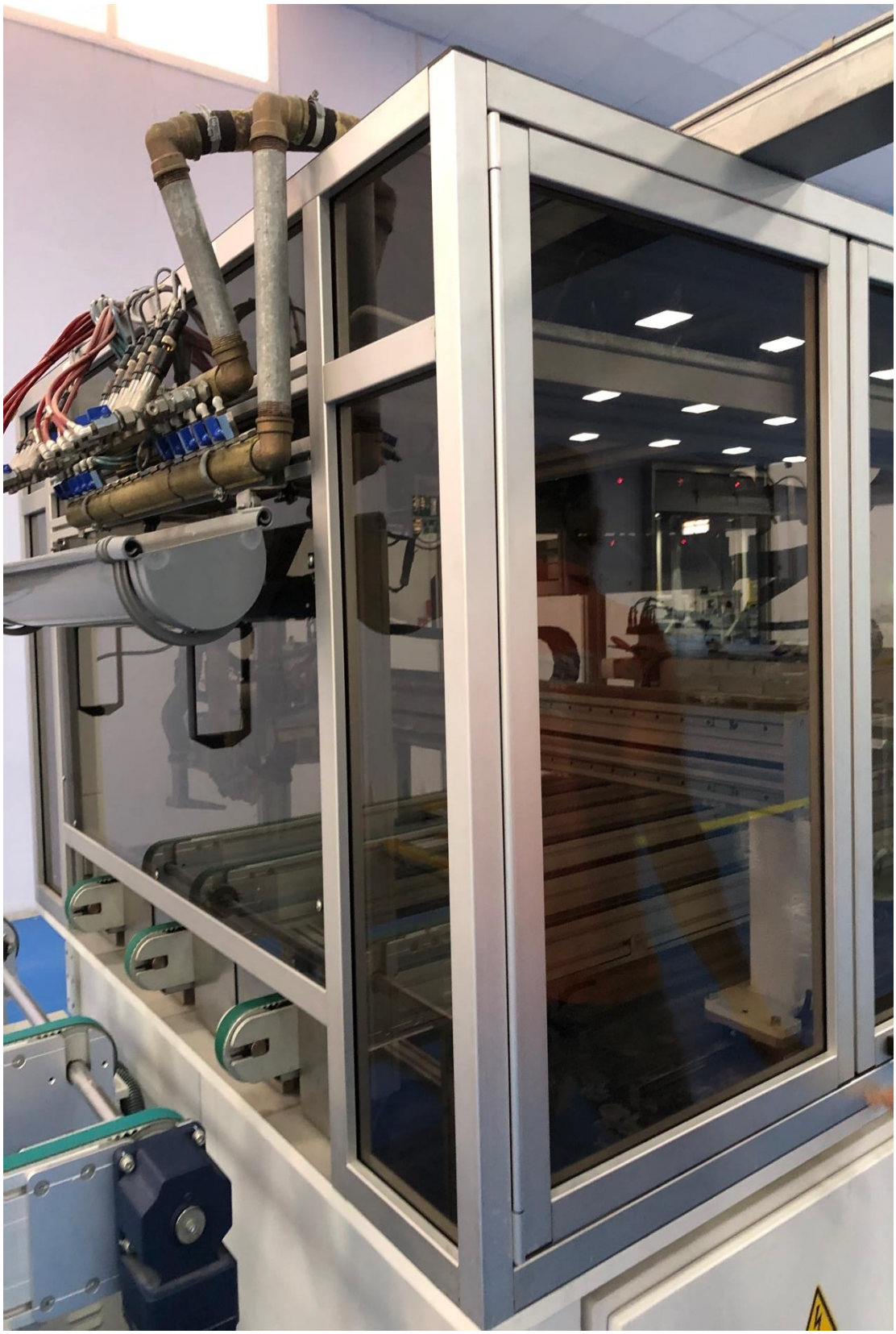


Source: Photo taken by the author

Appendix 06 : robot g-box to solder the cells

Source: Photo taken by the author

Appendix 07 : Inter-connexion machine



Source: Photo taken by the author

Abstract

This dissertation explores how algerian companies in the photovoltaic sector can develop an effective internationalization strategy and face global competition. The core research problem centers on their ability to leverage internal strengths while overcoming national constraints. A qualitative methodology was used, combining a theoretical review and a case study of Zergoun Green Energy. Findings show that despite challenges such as weak public support and technological dependence, ZGE is advancing internationally through strong vertical integration (70%), key technological partnerships, and skilled local engineering. ZGE's experience highlights the need for a hybrid strategy that integrates local adaptation with global best practices for successful internationalization

Keywords : ZGE**,** Competitive advantage**,** Internationalization, photovoltaic, vertical integration.

Résumé

Ce mémoire vise à analyser comment les entreprises algériennes spécialisées dans le photovoltaïque peuvent concevoir une stratégie d'internationalisation efficace face à la concurrence mondiale. La problématique centrale s'articule autour de leur capacité à tirer parti de leurs avantages compétitifs tout en surmontant les contraintes structurelles nationales. Une méthodologie qualitative a été adoptée, combinant revue théorique et étude de cas sur Zergoun Green Energy. Les résultats montrent que malgré un environnement national difficile (faible soutien public, obstacles administratifs, dépendance technologique), ZGE parvient à se positionner à l'international grâce à une intégration verticale forte (70 %), des partenariats technologiques stratégiques et une ingénierie locale qualifiée. L'expérience de ZGE illustre qu'une approche hybride, alliant adaptation locale et bonnes pratiques internationales, est essentielle pour une internationalisation réussie.

Mots-clés : ZGE , internationalisation , avantage concurrentiel, photovoltaïque, intégration vérticale

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ملخص

يهدف هذا البحث إلى تحليل كيفية تمكن الشركات الجزائرية المتخصصة في الطاقة الشمسية الكهروضوئية من تصميم استراتيجية دولية فعالة في مواجهة المنافسة العالمية. ترتكز الإشكالية الأساسية على قدرتها في الاستفادة من مزاياها التنافسية مع تجاوز القيود الهيكلية الوطنية. تم اعتماد منهجية نوعية تجمع بين المراجعة النظرية ودراسة حالة لشركة زرقون جرين إنرجي. تظهر النتائج أنه بالرغم من بيئة وطنية صعبة (قلة الدعم الحكومي، العقبات الإدارية، الاعتماد التكنولوجي)، فإن شركة ز.ج.إ تتمكن من التمركز دولياً بفضل تكامل رأسي قوي (70%)، شراكات تكنولوجية استراتيجية، وهندسة محلية مؤهلة. تجربة ز.ج.إ توضح أن تبني نهج هجين يجمع بين التكيف المحلي والممارسات الدولية الجيدة هو أمر أساسي لتحقيق النجاح في الدولية.

الكلمات المفتاحية: ز.ج.إ، الدولية، الميزة التنافسية، الطاقة الشمسية الكهروضوئية, شراكات تكنولوجية استراتيجية،