



# Credit Underwriting Practices and Risk Assessment in Renewable Energy Financing: A Segment-Wise Study of an Indian NBFC

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## ABSTRACT

Renewable energy financing in India is expanding rapidly, and non-banking financial companies (NBFCs) have become important providers of credit for rooftop solar, commercial and industrial (C&I) installations and solar supply chains. Yet the underwriting practices that make this lending sustainable receive little academic attention. This paper examines how credit underwriting and risk assessment are applied across three financing segments — residential rooftop solar, C&I solar and supply chain financing — at Solfin Sustainable Finance Private Limited, an RBI-registered NBFC, drawing on a three-month on-the-job training (May–July 2026) in its credit underwriting function. A descriptive and exploratory case-based design is used. One anonymised, illustrative borrower per segment is analysed through repayment-capacity measures (FOIR, residual surplus, loan-to-value), financial statement and ratio analysis (current ratio, quick ratio, debt-to-equity, interest coverage, DSCR, margins) and working-capital metrics (DSO, DIO, DPO, cash conversion cycle), and simple stress tests are added. The results show that the primary repayment source, the decisive quantitative test and the monitoring requirement differ materially by segment; that cash flow, not accounting profit, should anchor the lending decision; and that no single ratio is adequate on its own. The paper proposes a segment-specific underwriting framework and recommends standardised assessment formats, ratio benchmarks, automated early-warning alerts and stronger post-disbursement monitoring.

## 1. Introduction

India's transition to clean energy depends as much on the availability of finance as on the availability of technology. Rooftop solar systems, factory-level installations and the dealer networks that supply them all require capital that purchasers and distributors often cannot provide up front. Government programmes such as the National Solar Mission, PM-KUSUM and PM Surya Ghar: Muft Bijli Yojana have raised demand for solar capacity, and this in turn has increased the need for lenders that can assess and price the associated credit risk.

Non-banking financial companies complement banks in this space by offering faster processing, more flexible structures and products designed for narrower segments. Specialised green-finance NBFCs face a distinct challenge, however. Their borrowers range from salaried households to manufacturing firms to equipment dealers, and the source of repayment, the information available and the failure modes differ sharply between them. A single underwriting template cannot serve all three well.

This paper studies how that challenge is handled in practice. It is based on the author's on-the-job training in the credit underwriting function of Solfin Sustainable Finance Private Limited (Solfin), a technology-driven NBFC focused on solar and renewable energy projects. Its contribution is a segment-by-segment comparison of underwriting logic, supported by worked, anonymised cases, and a set of practical recommendations for lenders operating in the same market.

The remainder of the paper is organised as follows. Section 2 reviews the conceptual background. Section 3 describes the sector and the case institution. Section 4 states the research objectives and questions. Section 5 sets out the methodology. Section 6 presents the analysis and results. Section 7 discusses the findings, Section 8 gives recommendations, Section 9 notes limitations and directions for future research, and Section 10 concludes.

## 2. Conceptual Background and Related Literature

### 2.1 Credit underwriting and credit risk assessment

Credit underwriting is the process by which a lender evaluates a borrower's financial condition, repayment capacity and creditworthiness before approving a loan. It draws on financial statements, banking behaviour, credit history, cash flows, collateral and the feasibility of the financed project (Pandey, 2021). Credit risk assessment is the related task of estimating the likelihood that the borrower will fail to repay on the agreed terms, and it considers both firm-specific factors and external conditions. The Basel Committee's principles for credit risk management emphasise a sound credit-granting process, well-defined approval criteria, and ongoing administration and monitoring of the credit portfolio (Basel Committee on Banking Supervision, 2000).

## ***2.2 Information asymmetry and the role of screening***

Lenders cannot observe borrowers' true risk or intentions directly. Stiglitz and Weiss (1981) showed that under imperfect information, lenders may ration credit rather than raise prices, because higher interest rates can attract riskier borrowers and discourage safer ones. Underwriting is the practical response to this problem: verification, document checks and financial analysis reduce information gaps before a commitment is made. Petersen and Rajan (1994) similarly highlight the value of information gained through the lending relationship, which is the logic behind the use of banking conduct and repayment history in credit decisions.

## ***2.3 Financial ratios in credit analysis***

Ratio analysis condenses financial statements into measurable indicators of liquidity, leverage, profitability and debt-servicing capacity. Altman (1968) demonstrated that a combination of financial ratios could discriminate between failing and non-failing firms more effectively than any single ratio, an insight that supports multi-indicator credit assessment. In practice, lenders combine liquidity ratios (current and quick ratios), leverage ratios (debt-to-equity), coverage ratios (interest coverage and DSCR) and margin measures, and interpret them alongside cash-flow analysis and qualitative checks.

## ***2.4 Gap addressed***

Textbook treatments generally present underwriting as a unified process. Less attention is given to how the process changes across borrower types within a single lender, particularly in the fast-growing market for renewable energy finance in India. This paper addresses that gap through a comparative, segment-wise treatment of residential, C&I and supply chain solar financing.

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## **3. Sector and Institutional Context**

### ***3.1 NBFCs and renewable energy financing in India***

NBFCs extend credit to individuals, micro, small and medium enterprises (MSMEs), industry and infrastructure, and are regulated by the Reserve Bank of India (RBI). Renewable energy financing is a growing sub-segment, supported by government initiatives, digital lending platforms, e-KYC and paperless documentation, and increasing interest in green finance and ESG investing. Challenges include credit risk and defaults, regulatory compliance, rising cost of funds, competition from banks and fintech companies, cybersecurity risk and interest-rate volatility. A Porter's Five Forces view of the segment suggests moderate threat from new entrants (given regulatory and capital requirements), moderate supplier power (dependence on banks and investors for funds), and high buyer power, substitution threat and competitive rivalry.

### 3.2 The case institution

Solfin Sustainable Finance Private Limited is a private, technology-driven green-finance company established in 2022 and headquartered in Gurugram, Haryana. It operates as an RBI-registered NBFC, is backed by Waaree Energies Limited, and offers financing for residential, C&I, supply chain and EPC (engineering, procurement and construction) solar projects. According to the company's published information, it has financed more than 1,697 solar projects across over 265 cities, disbursed more than ₹100 crore, financed over 40 MW of capacity and built a network of more than 1,078 EPC partners (Solfin, 2026). As a private company, detailed financial information is not publicly available.

The author worked in the credit underwriting function as a Finance (Business Analytics) trainee from May to July 2026. The structured process observed there runs from application and document collection (KYC, financial statements, bank statements, GST returns and income-tax returns) through document verification, financial and cash-flow analysis, preparation of a credit appraisal note, decision (approval, modification or rejection), documentation and disbursement, to post-disbursement monitoring.

## 4. Research Objectives and Questions

The study has four objectives:

- (i) To describe the credit underwriting process used by an NBFC to finance solar and renewable energy projects.
- (ii) To analyse borrower financial statements and ratios to assess repayment capacity and creditworthiness.
- (iii) To examine how credit risk assessment and risk management differ across financing segments.
- (iv) to relate finance theory to NBFC lending practice. These are addressed through three research questions.

### Questions

- **RQ1.** What is the primary repayment source, and which quantitative tests are decisive, in each of the three financing segments?
- **RQ2.** How resilient is the repayment capacity in each illustrative case to adverse changes in income, cash flow or collateral quality?
- **RQ3.** What changes to underwriting and monitoring practice would improve the quality and speed of credit decisions?

## 5. Methodology

### 5.1 Research design

The study follows a descriptive and exploratory design (Kothari & Garg, 2019) and uses a multiple-case approach, with one illustrative borrower analysed in each of the three segments. Cases are used because the aim is to understand how underwriting logic varies, not to estimate population-level default rates.

### 5.2 Data sources

Primary data came from practical work, direct observation and discussions with employees during the training period. Secondary data came from the company's published information, RBI and Ministry of New and Renewable Energy (MNRE) materials, and standard finance and research-methodology texts. Because borrower-level information is confidential, the borrower cases analysed in Section 6 are **illustrative and anonymised**; they follow the structure and logic of the underwriting analyses observed but do not reproduce any actual borrower's data. The numerical results therefore demonstrate the method and should not be read as portfolio statistics.

### 5.3 Analytical tools

Table 1 summarises the segments studied and Table 2 defines the principal measures. All ratio calculations were checked for arithmetic consistency against the underlying statements.

**Table 1: Financing segments studied and primary credit focus**

| Segment                       | Primary repayment source                         | Principal credit focus                                                     |
|-------------------------------|--------------------------------------------------|----------------------------------------------------------------------------|
| Residential rooftop solar     | Salary / household income                        | Customer profile, FOIR, residual surplus, bureau score, documentation      |
| Commercial & industrial (C&I) | Business operating cash flow                     | Cash flow, leverage, liquidity, DSCR, margins, project feasibility         |
| Supply chain financing        | Collections from inventory sales and receivables | Working-capital cycle, drawing power, receivable ageing, counterparty risk |

**Table 2: Definitions of principal measures**

| Measure               | Definition                                                                                                                                     |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| FOIR                  | $(\text{Existing monthly EMIs} + \text{proposed EMI}) \div \text{net monthly income}$                                                          |
| Loan-to-value (LTV)   | $\text{Loan amount} \div \text{project cost}$                                                                                                  |
| Current ratio         | $\text{Current assets} \div \text{current liabilities}$                                                                                        |
| Quick ratio           | $(\text{Current assets} - \text{inventory}) \div \text{current liabilities}$                                                                   |
| Debt / equity         | $(\text{Short-term} + \text{long-term borrowings}) \div \text{net worth}$                                                                      |
| Interest coverage     | $\text{EBIT} \div \text{interest expense}$                                                                                                     |
| DSCR                  | $(\text{PAT} + \text{depreciation} + \text{interest}) \div (\text{principal} + \text{interest repayments})$                                    |
| DSO / DIO / DPO       | $\text{Receivables} \div \text{revenue} \times 365; \text{inventory} \div \text{COGS} \times 365; \text{payables} \div \text{COGS} \times 365$ |
| Cash conversion cycle | $\text{DSO} + \text{DIO} - \text{DPO}$                                                                                                         |

## 6. Analysis and Results

### 6.1 Case I: Residential rooftop solar financing

The borrower (R-01) is a salaried private-sector employee with six years in the current organisation, a credit bureau score of 782 and verified net monthly salary of ₹1,26,000. A loan of ₹7.50 lakh is requested against a solar project cost of ₹8.25 lakh over 60 months at an indicative 15.0% p.a. reducing rate. Table 3 presents the assessment.

**Table 3: Residential case – repayment capacity assessment**

| Measure                   | Calculation / data                           | Result     |
|---------------------------|----------------------------------------------|------------|
| Net monthly income        | Verified salary credit                       | ₹1,26,000  |
| Existing monthly EMI      | Existing obligations                         | ₹18,500    |
| Proposed EMI              | ₹7.50 lakh, 60 months, 15.0%                 | ₹17,842    |
| FOIR                      | $(18,500 + 17,842) \div 1,26,000$            | 28.8%      |
| Proposed EMI / income     | $17,842 \div 1,26,000$                       | 14.2%      |
| Household expenses (est.) | Illustrative verified estimate               | ₹52,000    |
| Residual monthly surplus  | $1,26,000 - 18,500 - 17,842 - 52,000$        | ₹37,658    |
| Loan-to-value             | $₹7.50 \text{ lakh} \div ₹8.25 \text{ lakh}$ | 90.9%      |
| Average bank balance      | Six-month average                            | ₹1.45 lakh |

The case shows a satisfactory profile: a strong bureau score, stable salary inflows, a FOIR of about 28.8% and a healthy post-obligation surplus. The principal risks are concentration of repayment on a single income source, project execution risk and the high LTV relative to project cost. These are mitigated respectively by employment and salary-credit verification, verification of the EPC quotation with controlled disbursement to the vendor, and the borrower's own contribution. The case is assessed as low-to-moderate risk, subject to standard sanction conditions.

### 6.2 Case II: Commercial and industrial solar financing

The borrower (C-01) is a mid-sized engineering components manufacturer with 12 years of operating history. It requests a ₹150 lakh term loan against a ₹180 lakh solar project (LTV 83.3%) over 60 months at an indicative 15.5% p.a., implying a monthly EMI of about ₹3.61 lakh (about ₹43.3 lakh annually). The estimated annual electricity saving is a conservative ₹24 lakh. Tables 4 and 5 summarise the three-year financial position and ratios.

**Table 4: C&I case – selected financials (₹ lakh)**

| Item             | FY 2023-24 | FY 2024-25 | FY 2025-26 |
|------------------|------------|------------|------------|
| Revenue          | 950.0      | 1,120.0    | 1,320.0    |
| EBITDA           | 115.0      | 153.2      | 196.4      |
| Profit after tax | 49.6       | 74.1       | 101.7      |

| Item                     | FY 2023-24 | FY 2024-25 | FY 2025-26 |
|--------------------------|------------|------------|------------|
| Net cash from operations | 88         | 118        | 150        |
| Total borrowings         | 250        | 240        | 220        |
| Net worth                | 380        | 460        | 565        |
| Closing cash and bank    | 38         | 49         | 62         |

Table 5: C&amp;I case – ratio analysis

| Ratio                | FY 2023-24 | FY 2024-25 | FY 2025-26 | Interpretation               |
|----------------------|------------|------------|------------|------------------------------|
| Current ratio        | 1.58x      | 1.71x      | 1.85x      | Improving liquidity          |
| Quick ratio          | 1.00x      | 1.10x      | 1.21x      | Improving liquid-asset cover |
| Debt / equity        | 0.66x      | 0.52x      | 0.39x      | Deleveraging                 |
| Interest coverage    | 3.79x      | 4.85x      | 5.91x      | Strong and rising            |
| DSCR (existing debt) | 1.65x      | 1.93x      | 2.30x      | Comfortable                  |
| EBITDA margin        | 12.1%      | 13.7%      | 14.9%      | Improving                    |
| Net profit margin    | 5.2%       | 6.6%       | 7.7%       | Healthy trend                |

Revenue, profit and operating cash flow all rise over the period while leverage falls. For FY 2025-26, cash accrual (PAT + depreciation + interest) is about ₹160.7 lakh against existing annual debt service of about ₹70 lakh, giving a DSCR of 2.30x. Adding the proposed loan's annual EMI of about ₹43.3 lakh, the pro-forma DSCR is about 1.42x before any energy savings and about 1.63x after including the ₹24 lakh annual saving. The proposal is therefore supportable, but the sanction should remain linked to sustained operating performance, satisfactory banking conduct, GST and income-tax consistency, promoter and bureau checks, and technical and economic feasibility of the solar project.

### 6.3 Case III: Supply chain financing

The borrower (S-01) is an eight-year-old solar equipment dealer and distributor (modules, inverters, balance-of-system components and batteries) requesting a ₹300 lakh revolving working-capital limit for inventory procurement and funding of eligible receivables. Tables 6 and 7 present its financial profile and ratios.

Table 6: Supply chain case – selected financials (₹ lakh)

| Item                          | FY 2023-24 | FY 2024-25 | FY 2025-26 |
|-------------------------------|------------|------------|------------|
| Revenue                       | 1,500.0    | 1,850.0    | 2,250.0    |
| EBITDA                        | 105.0      | 149.5      | 208.0      |
| Profit after tax              | 51.0       | 79.5       | 118.4      |
| Net cash from operations      | 68         | 92         | 128        |
| Total borrowings              | 220        | 235        | 250        |
| Net worth / partners' capital | 190        | 250        | 315        |
| Trade receivables             | 300        | 360        | 420        |
| Inventory                     | 340        | 390        | 450        |

Table 7: Supply chain case – ratio and working-capital analysis

| Measure           | FY 2023-24 | FY 2024-25 | FY 2025-26 | Interpretation                      |
|-------------------|------------|------------|------------|-------------------------------------|
| Current ratio     | 1.32x      | 1.35x      | 1.37x      | Adequate; working-capital intensive |
| Quick ratio       | 0.68x      | 0.71x      | 0.73x      | Below 1.0x; inventory dependent     |
| Debt / equity     | 1.16x      | 0.94x      | 0.79x      | Leverage improving                  |
| Interest coverage | 3.46x      | 4.36x      | 5.44x      | Improving                           |
| DSCR              | 1.64x      | 2.13x      | 2.52x      | Positive capacity                   |

| Measure                      | FY 2023-24 | FY 2024-25 | FY 2025-26 | Interpretation      |
|------------------------------|------------|------------|------------|---------------------|
| EBITDA margin                | 7.0%       | 8.1%       | 9.2%       | Improving           |
| DSO (days)                   | 73         | 71         | 68         | Faster collections  |
| DIO (days)                   | 98         | 93         | 89         | Lower stock holding |
| DPO (days)                   | 81         | 78         | 77         | Broadly stable      |
| Cash conversion cycle (days) | 90         | 85         | 80         | Improving           |

Because a trading business funds itself largely through inventory and receivables, a simple current ratio is not a sufficient test. The limit is instead derived from eligible working assets (Table 8). After excluding aged or ineligible receivables (₹350 lakh of ₹420 lakh assumed eligible), eligible inventory and receivables total ₹800 lakh. Deducting trade payables of ₹390 lakh gives a net working-capital requirement of ₹410 lakh; applying a 25% borrower margin yields an indicative financeable amount of ₹307.5 lakh, which supports the requested ₹300 lakh limit.

**Table 8: Supply chain case – working-capital limit assessment (₹ lakh)**

| Component                        | Amount | Treatment                                             |
|----------------------------------|--------|-------------------------------------------------------|
| Inventory                        | 450    | Subject to ageing, saleability and stock verification |
| Eligible receivables             | 350    | Aged / ineligible receivables excluded from ₹420      |
| Eligible inventory + receivables | 800    | Base operating assets                                 |
| Less: trade payables             | 390    | Supplier credit reduces net requirement               |
| Net working-capital requirement  | 410    | 800 – 390                                             |
| Borrower margin (25%)            | 102.5  | Retained by borrower                                  |
| Indicative financeable amount    | 307.5  | 75% of net requirement                                |
| Recommended limit                | 300    | Subject to monthly drawing power and monitoring       |

#### 6.4 Stress tests

To address RQ2, simple downside scenarios were applied to each case (Table 9). These tests are the author's additions to the illustrative cases, and use only the inputs already stated.

**Table 9: Stress tests on the illustrative cases**

| Case         | Scenario                       | Measure                                 | Result                            |
|--------------|--------------------------------|-----------------------------------------|-----------------------------------|
| Residential  | Baseline                       | FOIR / monthly surplus                  | 28.8% / ₹37,658                   |
| Residential  | Income falls 20%               | FOIR / monthly surplus                  | 36.1% / ₹12,458                   |
| Residential  | Income falls 30%               | FOIR / monthly surplus                  | 41.2% / about nil (–₹142)         |
| C&I          | Baseline cash accrual          | Pro-forma DSCR (without / with savings) | 1.42x / 1.63x                     |
| C&I          | Cash accrual falls 10%         | Pro-forma DSCR (without / with savings) | 1.28x / 1.49x                     |
| C&I          | Cash accrual falls 20%         | Pro-forma DSCR (without / with savings) | 1.13x / 1.35x                     |
| Supply chain | Eligible receivables ₹350 lakh | Financeable amount                      | ₹307.5 lakh                       |
| Supply chain | Eligible receivables ₹300 lakh | Financeable amount                      | ₹270 lakh (below ₹300 lakh limit) |

The residential borrower's surplus is thin only under a severe income shock of about 30%. The C&I borrower's coverage remains above 1.0x even with a 20% fall in cash accrual, though the margin of comfort narrows substantially and depends on realisation of the energy savings. The supply chain case is the most sensitive to collateral quality: a ₹50 lakh deterioration in eligible receivables reduces the financeable amount below the proposed limit, which shows why drawing power must be recomputed regularly.

## 6.5 Comparative analysis

**Table 10: Comparative credit analysis across segments**

| Area                       | Residential                                                        | C&I                                                                          | Supply chain                                                      |
|----------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Primary repayment source   | Salary / household income                                          | Business operating cash flow                                                 | Receivable collections and inventory turnover                     |
| Decisive quantitative test | FOIR and residual surplus                                          | DSCR, leverage, liquidity, margins                                           | Working-capital cycle, drawing power                              |
| Main cash-flow risk        | Loss or reduction of salary                                        | Business downturn; project underperformance                                  | Slow collections; excess inventory; counterparty delay            |
| Documentation emphasis     | KYC, income proof, bank statements, bureau, installation documents | Audited financials, GST/ITR, bank statements, liabilities, project documents | Financials, GST, bank statements, stock and receivable statements |
| Monitoring need            | EMI servicing and account conduct                                  | Financial and project performance                                            | Frequent ageing, utilisation and collection monitoring            |
| Illustrative risk view     | Low-to-moderate                                                    | Moderate, acceptable coverage                                                | Moderate; structurally working-capital intensive                  |

## 7. Discussion

The cases support four main findings.

- **Underwriting must be segment specific.** A residential loan is underwritten on personal income, obligations and banking behaviour; a C&I loan on the income statement, balance sheet, cash flows and project feasibility; and a supply chain facility on working-capital efficiency and collateral quality. Applying corporate ratios to a household, or FOIR to a distributor, would produce misleading conclusions. This answers RQ1.
- **Cash flow outranks accounting profit.** In all three cases, repayment depends on cash generated, not on reported profit. A profitable borrower with weak cash generation can still be a poor credit, consistent with the emphasis on coverage ratios such as DSCR.
- **Ratios must be read together, not in isolation.** The supply chain borrower's quick ratio is below 1.0x yet its cash conversion cycle is improving; the C&I borrower's historical DSCR is 2.30x but falls to 1.42x once the new loan is added. This echoes Altman's (1968) point that multiple indicators discriminate better than any single one.
- **Resilience varies by structure.** The stress tests show that headline approval metrics can hide sensitivity: thin surplus in the residential case under a large income shock, narrowing coverage in the C&I case, and a limit that could exceed eligible collateral in the supply chain case. This answers RQ2.

Taken together, these findings imply that screening, in the sense of Stiglitz and Weiss (1981), is most effective when it uses the information that is most informative for the specific repayment source, and that monitoring after disbursement is a continuation of underwriting rather than a separate activity.

## 8. Recommendations

In response to RQ3, the following measures are suggested for lenders in this segment:

- **Strengthen data-driven underwriting** by combining financial statements, banking behaviour, bureau history and repayment capacity in a consistent scorecard for each segment.
- **Standardise credit assessment formats** by segment, with defined ratio benchmarks (for example, minimum coverage thresholds and maximum FOIR) calibrated to the lender's own portfolio experience.
- **Add stress testing to the standard appraisal note**, including income, cash-accrual and eligible-collateral downside scenarios, so that approval does not rest on baseline metrics alone.
- **Improve post-disbursement monitoring** through automated alerts for missed repayments, adverse banking behaviour, receivable ageing and drawing-power breaches.
- **Increase automation** in document verification and financial analysis to reduce manual errors and turnaround time, and invest in regular training for credit analysts.

These measures are expected to improve the accuracy and speed of credit decisions, surface risks earlier and raise overall lending efficiency.

## 9. Limitations and Future Research

The study has several limitations. First, it rests on a short training period and the author's role as an intern, so some strategic and final credit decisions were outside direct observation. Second, borrower information is confidential; the three cases are illustrative and anonymised, and the sample is therefore not representative of Solfin's portfolio. Third, access to internal policies, underwriting models and risk parameters was restricted. Fourth, comparable internal data from other NBFCs is not public, so benchmarking against competitors was not possible. Fifth, the stress tests are simple single-factor scenarios and do not model correlated shocks.

Future research could test the segment-specific framework on anonymised portfolio data, study default prediction and AI-based underwriting models, examine portfolio-level risk, and compare renewable energy financing models across NBFCs and banks.

## 10. Conclusion

This paper has examined how credit underwriting and risk assessment operate across residential, C&I and supply chain solar financing at an Indian NBFC. The analysis shows that effective underwriting in renewable energy finance is segment-specific: the repayment source, the decisive tests and the monitoring requirements differ, and ratios should be read together with cash flow, banking behaviour, documentation and project or business feasibility. Stress testing reveals sensitivities that baseline metrics conceal. For practitioners, the implication is to standardise assessment by segment, build downside scenarios into appraisal and treat monitoring as part of underwriting. For researchers, the study offers a structured comparison that can be tested against larger datasets.

### Declarations

**Data and confidentiality.** Borrower cases are illustrative and anonymised; no confidential borrower data or internal company documents are reproduced.

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