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An Empirical Study on English-to-Chinese Translation Quality: A Comparative Analysis of DeepSeek V3 and Doubao in Energy Technology Texts

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Abstract

The rapid advancement of Large Language Models (LLMs) has increasingly highlighted the value of Artificial Intelligence (AI) translation in specialized domains. Sustainability reports in the energy sector, as typical informative professional texts, exhibit characteristics of terminology density, logical rigor, policy orientation, and interdisciplinary integration. Their translation quality directly impacts the effectiveness of technical exchanges, carbon reduction cooperation, and global energy governance among multinational energy enterprises, thereby necessitating stringent standards for translation professionalism, accuracy, and terminology consistency. However, existing research predominantly focuses on AI translation quality assessment in literary, financial, and other fields, while empirical studies on niche texts such as energy sustainability reports remain scarce, leaving industry demands for specialized translation solutions largely unmet. In response, this study selects core corpora from Enel's 2023 Sustainability Report, employs DeepSeek V3 and Doubao as research subjects, constructs a comprehensive evaluation framework of "parallel text comparison and human review", and systematically compares their English-to-Chinese translation performance across four dimensions,which are terminology processing accuracy, syntactic transformation rationality, logical coherence integrity, and professional context adaptability.

Keywords

DeepSeek V3; Doubao; English-Chinese Translation; Translation Quality Assessment.

1. Introduction

With breakthroughs in large language model technology, the application value of AI translation in specialized text domains has become increasingly prominent. DeepSeek V3, leveraging its chain-of-thought explicitation and web connectivity capabilities, demonstrates strong terminology matching proficiency, while Doubao excels in Chinese expression fluency and policy context adaptation. However, existing research predominantly focuses on single-model evaluation for general or specialized texts, with studies on composite texts in the energy sector that integrate "technology, governance, and case studies" remaining scarce. Such texts involve energy technology terminology and ESG policy concepts, imposing stringent requirements on translation professionalism. Existing scholarship offers limited horizontal comparisons of different AI model translations and has yet to develop targeted evaluation systems and optimization pathways, failing to meet industry demands for AI translation model selection and application guidance.

Sustainability reports published by energy enterprises, as typical informative professional texts, exhibit characteristics of terminology density, logical rigor, policy orientation, and interdisciplinary integration, systematically presenting corporate practical achievements and

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strategic planning across the three dimensions of environment, society, and governance, and serving as a core medium for disseminating industry benchmark experiences. Enel S.p.A., as a global leader in renewable energy deployment, low-carbon technology innovation, and socially responsible operations, its 2023 Sustainability Report comprehensively covers core content such as smart grid construction, distributed energy integration, green transportation coordination, and carbon reduction target implementation, constructing a complete logical closed loop of "technology innovation, infrastructure, and user services," providing an international reference with both practical applicability and forward-looking insights for China's energy industry.

2. Research Significance

2.1. Practical and Theoretical Significance

This study optimizes the dual-model human-AI collaborative translation workflow for energy sustainability reports. Energy sustainability reports face multiple challenges, including "dense cross-domain terminology, complex logical structures in long sentences, standardized data formats, and policy context adaptation." Based on translation practice of Enel's 2023 Sustainability Report, this study compares the differential performance of DeepSeek V3 and Doubao in terminology processing, syntactic transformation, logical coherence, and contextual adaptation, refining model-specific prompt design schemes and targeted post-editing strategies. Ultimately, it develops a reusable dual-model collaborative translation framework to enhance translation efficiency and quality for similar texts.

Simultaneously, the process also enhances translators' capability to harness different AI translation models. By systematically examining challenges and solutions in translating this report with dual models, the study clarifies optimal application scenarios and optimization directions for different models, accumulates translation experience in dual-model collaboration within the energy and ESG domains, and strengthens translators' differentiated application and quality control capabilities for AI tools.

Furthermore, this study enriches the empirical research system of AI translation in specialized sub-domain texts. Existing AI translation research predominantly concentrates on literary, financial, and other fields, with limited studies on interdisciplinary composite texts such as energy sustainability reports. This study, using ESG reports as specific corpora, systematically analyzes English-to-Chinese translation differences between DeepSeek V3 and Doubao, providing reference for AI model selection and quality assessment of similar texts. Guided by Skopos Theory and integrating technical characteristics of AI translation, the study explores the specific application of the "purpose rule, coherence rule, and fidelity rule" in terminology unification, syntactic transformation, and contextual adaptation, enriching research dimensions of translation theory and multi-model integration.

2.2. Objectives and Content

The research objectives are to evaluate the performance of DeepSeek V3 and Doubao in English-to-Chinese translation of energy sustainability reports, identify their differential advantages and deficiencies across terminology processing, syntactic transformation, logical coherence, and contextual adaptation.And then propose scientifically feasible dual-model differentiated optimization pathways and collaborative application schemes.

The research content involves, taking a multi-dimensional authoritative reference system as the benchmark, respectively comparing the professional fitness of DeepSeek V3 and Doubao translations, while simultaneously conducting horizontal comparison of the two models' translation performance differences.

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Specifically, the authoritative reference system comprises three components: (1) an energy industry authoritative terminology database,integrating the China Power Carbon Emission Accounting Guidelines (2024), IEA official terminology translations, and GHG Protocol core concept standards; (2) domestic benchmark energy enterprise ESG parallel texts,e.g., sustainability reports of State Grid and China Huaneng for 2023-2024; and (3) dual-carbon policy documents, policy expression norms issued by the NDRC and NEA. The study focuses on comparing the alignment between the two models' translations and the reference system in key scenarios such as niche professional terminology, complex long sentences, and policy context expressions, thereby clarifying the specific differences between the two models in terminology accuracy, syntactic rationality, and contextual adaptability.

3. Literature Review

3.1. Progress in AI Translation Quality Assessment

Foreign research on AI translation quality assessment commenced relatively early, initially relying predominantly on machine metrics such as BLEU and BERT-Score to quantify lexical matching and semantic similarity. In recent years, a gradual shift toward a comprehensive framework of "machine metrics plus human multidimensional review" has occurred, focusing on the evaluation of traditional specialized texts such as legal and medical documents (Zhang et al., 2020). Some studies have confirmed that prompt engineering and human-AI collaboration strategies can effectively enhance translation quality (Chen et al., 2023; Sahoo et al., 2024). However, an evaluation system for interdisciplinary composite texts of "technology and governance" in the energy sector has yet to be established. Domestic research predominantly employs parallel text comparison combined with manual review, focusing on the evaluation of general or single-domain specialized texts (Li, 2022). A limited number of studies involve translation comparisons of domestic AI models (Qian et al., 2025). Nevertheless, exclusive evaluation metrics for niche texts such as energy ESG reports have not been constructed, and assessments of differential performance between dual models in this domain remain relatively scarce, making it difficult to meet industry demands for specialized translation solutions.

3.2. Current Status of Energy Text Translation

Domestic energy sector translation research predominantly concentrates on purely technical documents, with limited attention to translation strategies and quality assessment for "technology and governance" ESG reports (Liu et al., 2025). Existing research primarily focuses on single translation modes, lacking specialized investigation into the translation effectiveness of AI models in energy ESG reports, thus creating a gap with industry practice demands for efficient translation tools.

3.3. Current Status of DeepSeek-Assisted Translation

As an open-source large language model, DeepSeek's chain-of-thought explicitation and web connectivity capabilities have been preliminarily validated in foreign literary and financial text translation, demonstrating strong syntactic parsing and contextual adaptation capabilities (Yu, 2025). Domestic research has found that it possesses formatting standardization advantages in reference editing and general text translation, but exhibits shortcomings in professional terminology adaptation and interdisciplinary knowledge integration (Liu et al., 2025). Doubao, as a domestic closed-source model, has existing research predominantly focusing on its translation performance in literary texts and general policy documents, revealing its advantages in Chinese expression fluency and basic policy context adaptation (Qian et al., 2025). However, specialized studies on its application in the energy domain are extremely scarce both domestically and internationally. Scattered preliminary studies indicate deficiencies in niche

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technical terminology translation and complex logic reproduction, and there is a lack of comparative studies with open-source models such as DeepSeek in energy ESG reports, unable to provide reference for industry model selection.

4. Research Design

4.1. Theoretical Basis

Guided by Skopos Theory, this study focuses on its three core principles and adopts them as the logical yardstick for translation quality assessment and strategy optimization of the two models. This design ensures that the target texts meet the requirements of accurately conveying energy ESG information, adapting to the cognitive habits of Chinese industry readers, and retaining the core semantic meaning of the source texts; meanwhile, it provides a theoretical basis for setting assessment dimensions and formulating optimization strategies for the two models.

4.2. Evaluation Methods

A comprehensive evaluation method integrating a multi-dimensional authoritative reference system and manual review is adopted, focusing on the comparative analysis of the English-to-Chinese translation performance of DeepSeek V3 and Doubao, so as to ensure the professionalism, rigor and industry adaptability of the evaluation results. A triple reference benchmark is constructed to guarantee the objectivity of the comparison. For terminology reference, a dedicated terminology reference set for energy ESG is formed on the basis of China Electric Power Carbon Emission Accounting Guidelines (2024), the official terminology database of the International Energy Agency (IEA) and the core concept standards of the GHG Protocol. For text reference, a parallel corpus of energy ESG is constructed by selecting the 2023-2024 annual sustainability reports of State Grid Corporation of China and China Huaneng Group. About policy reference, the normative expressions in the policy context are defined in accordance with the dual-carbon policy documents issued by the National Development and Reform Commission and the National Energy Administration.

Furthermore, with reference to the TAUS Translation Error Type Evaluation Template and Li Fengxi's (2022) error scoring method, scoring rules characterized by "error type + quantitative score + objective judgment criteria" are formulated. Reviewers only need to determine the error type by matching the criteria, without conducting subjective scoring:

Table 1. Scoring Criteria

Error Level	Judgment Criteria (Objectively Verifiable)	Score Assigned	Covered Dimensions
Major Error	1. Terminology inconsistent with the terminology reference set 2. Syntactic logic conflicting with parallel text examples 3. Omission or misrepresentation of core information 4. Style conflicting with the formal register of ESG reports	5 points per item	Lexis, Syntax, Discourse
Minor Error	1. Consistent terminology but inexpressive wording 2. Correct syntax but suboptimal use of cohesive devices 3. Non-standard punctuation and formatting	1 point per item	Lexis, Syntax, Discourse

Finally, two independent reviewers are invited to conduct blind evaluation, including a practitioner specialized in energy translation and a researcher in translation studies, without being informed of the AI translation models involved. Specifically, the translations generated by DeepSeek V3 and Doubao are anonymized by removing the AI model labels and numbered in random order. Reviewers independently mark the error types and corresponding scores of

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each translation solely based on the multi-dimensional authoritative reference system and quantitative error scoring rules, without providing subjective comments.

4.3. Research Procedures

Two typical textual samples are selected from the 2023 Sustainability Report of Enel , covering sentences dense with core technical terms, complex long and difficult sentences, and sentences in policy contexts. The core terminology and translation difficulties of each sample are clarified.

Meanwhile, to ensure the fairness of the comparison, identical translation instructions are set for both DeepSeek V3 and Doubao: "As an expert in the energy field, translate the text into Chinese compliant with the norms of China's energy industry without changing the original meaning, ensuring accurate terminology and clear logic."

Subsequently, an objective evaluation is conducted on the translations generated by DeepSeek V3 and Doubao. In accordance with the evaluation dimensions and indicators, the two versions of translations are compared item by item, and objective errors such as terminological inconsistency, grammatical conflicts and stylistic deviations are marked. Then, a third-party blind evaluation is carried out, in which reviewers score the two translations blindly in accordance with the scoring rules, and record the error types and total scores. Finally, data integration is performed to calculate the average error score and the proportion of major and minor errors of the two translations. Reliability tests are conducted to ensure the reliability of the results, and the objective performance differences between the two models in each dimension are clarified.

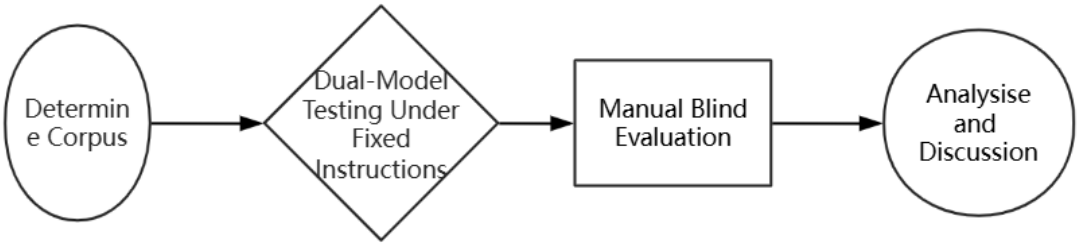

Figure 1. Research Procedures

5. Empirical Analysis of English-Chinese Translation by Dual Models – A Case Study of DeepSeek V3 and Doubao

5.1. Terminological Accuracy

This dimension selects two cases involving compound energy-finance terms to analyze the differences between the two models in terms of terminological standardization and connotative integrity.

Example 1

The Group continues to pursue the decarbonization Road map in line with limiting global warming to below 1.5 °C: in 2023, absolute direct and indirect greenhouse gas emissions were reduced by 26.3% compared to 2022, in line with the decarbonization targets as certified by the Science Based Targets initiative (SBTi).

DeepSeek 译文：本集团继续遵循将全球温升控制在 1.5℃以内的脱碳路线图：2023 年，经科学碳目标倡议（SBTi）认证，集团直接与间接温室气体排放总量较 2022 年下降 26.3%，符合既定脱碳目标。

豆包译文：该集团持续推进脱碳路线图，严格遵循“将全球升温控制在 1.5℃以内”的目标要求：2023 年，其绝对直接与间接温室气体排放总量较 2022 年下降 26.3%，该减排成果符合经科学碳目标倡议（SBTi）认证的脱碳目标。

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The core terms in this paragraph are "decarbonization Road map" and "Science Based Targets initiative (SBTi)". In terms of the accuracy of terminological modification, Doubao retains the restrictive meaning of "absolute" in the original text and translates it as "absolute direct and indirect", which clarifies the statistical attribute of total emissions. DeepSeek omits this restrictive modifier, thus attenuating the connotative boundary of the professional term. At the level of logical relation explication, Doubao strengthens the causal correlation between "emission reduction data" and "SBTi" by using the anaphor "this emission reduction achievement", whereas DeepSeek places the certification information in a preposed position, blurring the logical chain and exhibiting certain characteristics of semantic generalization typical of machine translation.

Example 2

Going beyond the disclosure requirements of the taxonomy, Enel has included the Capex alignment percentage as one of the key performance indicators... Enel confirmed its target on the proportion of Capex aligned to the EU taxonomy equal to or higher than 80% for the period 2024-2026.

DeepSeek 译文：在满足分类法披露要求的基础上，Enel 进一步将符合分类法标准的资本性支出占比纳入关键绩效指标体系……Enel 重申其目标，即在 2024 至 2026 年期间，符合欧盟分类法标准的资本性支出比例将保持在 80% 及以上。

豆包译文：意大利国家电力公司（Enel）超出《欧盟分类法》的披露要求，将资本支出符合率纳入关键绩效指标体系。该公司同时明确，2024-2026 年期间，符合《欧盟分类法》要求的资本支出占比目标不低于 80%。

The core terms of this sentence are "Capex alignment percentage" and "EU taxonomy". In terms of terminological conciseness, Doubao translates "Capex alignment percentage" as "资本支出符合率" , adopting the general abbreviated terms in the energy industry, which conforms to the principle of terminological standardization and adaptation. DeepSeek adopts a literal translation, which is redundant and inconsistent with the expression norms of professional texts. As for the labeling norms of policy texts, Doubao adds book title marks to "EU taxonomy" to clarify its attribute as a policy document, and DeepSeek does not make any format distinction, which weakens the policy connotation of the term. At the level of the expression norms of policy documents, Doubao clarifies the attribute of "EU taxonomy" as a policy document by adding book title marks, which conforms to the "fidelity principle" of Skopos Theory; whereas DeepSeek does not make any format distinction.

5.2. Transformation of Complex and Lengthy Sentences

Example 1

Efficiency and effectiveness through the simplification of activities and processes, a leaner organization with clear accountability and a focus on core geographies... in order to maximize cash generation and compensate for inflationary dynamics and rising cost of capital.

DeepSeek 译文：通过简化业务流程、构建权责清晰的精益化组织并聚焦核心区域运营,以最大化现金流生成，对冲通胀压力与资本成本上升的影响。

豆包译文：通过简化业务活动与流程、构建权责清晰的精益化组织、聚焦核心区域市场，提升运营效率与效益，进而最大化现金流创造能力，以应对通胀变动及资本成本上升的挑战。

Doubao’s translation restores the implicit logical chain of the original text and adds "improving operational efficiency and benefits" as an intermediate link, which conforms to the reconstruction strategy of "logical explicitation" for complex and lengthy sentences. However, there exists semantic overlap in the expression "业务活动与流程", and the phrasing "应对挑战" is relatively colloquial, which is less consistent with the formal register of financial texts than "对冲影响".

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DeepSeek's translation is concise and compact, omitting redundant modifiers, with core actions and objectives directly connected. Moreover, the term "对冲" accurately conveys the antagonistic connotation of "compensate for", demonstrating strong adaptability to the financial context.

Example 2

Financial materiality analysis consists in identifying and assessing risks and opportunities related to ESG topics arising from the external environment, which affect or could affect, positively (opportunity)/negatively (risk), the Company's financial position, results of operations and cash flows, access to finance or cost of capital in the short, medium or long term.

DeepSeek 译文：财务实质性分析旨在识别和评估源于外部环境、与 ESG 议题相关的风险与机遇。这些风险与机遇在当前或未来可能对公司的财务状况、经营成果、现金流、融资渠道或资本成本产生正面（机遇）或负面（风险）影响。

豆包译文：财务实质性分析旨在识别并评估源自外部环境的 ESG 议题相关风险与机遇，这些风险与机遇会对企业的财务状况、经营成果、现金流、融资可得性及资本成本产生正向（机遇）或负向（风险）影响，影响周期涵盖短、中、长期。

Doubao's translation of this sentence retains the temporal qualifiers of "短、中、长期" with complete information; it translates "access to finance" as the more precise "融资可得性" , and integrates parenthetical elements naturally into the main clause, balancing fidelity and fluency. However, the long sentence is not split, and the superposition of multiple semantic layers leads to a cumbersome reading experience.

DeepSeek splits the long sentence into two short ones with a clear structure, reducing reading difficulty. Although "融资渠道" is not sufficiently precise, it conforms to the expression norms of general financial texts and poses no comprehension obstacles. Nevertheless, it omits the temporal qualifier of "短、中、长期", and the expression "当前或未来" deviates semantically from the original "in the short, medium or long term", which constitutes "semantic generalization".

5.3. Policy Context Adaptation

Example 1

The Group continues to pursue the decarbonization Road map in line with limiting global warming to below 1.5 °C: in 2023, absolute direct and indirect greenhouse gas emissions... were reduced by 26.3% compared to 2022, in line with the decarbonization targets... as certified by the Science Based Targets initiative (SBTi).

DeepSeek 译文：本集团持续推进将全球温升控制在 1.5℃以内的脱碳路线图：2023 年，集团直接与间接温室气体排放总量较 2022 年下降 26.3%，符合既定的脱碳目标，该成果已获得科学碳目标倡议（SBTi）的认证。

豆包译文：意大利国家电力公司（Enel）持续推进脱碳路线图，严格遵循“将全球升温控制在 1.5℃以内”的目标要求：2023 年，其绝对直接与间接温室气体排放总量较 2022 年下降 26.3%，该成果符合科学碳目标倡议（SBTi）认证的脱碳目标。

Doubao's translation uses "严格遵循" to strengthen policy compliance, supplements the full name of the enterprise to meet the requirement of "主题明确" in policy texts, features strong policy orientation, and conforms to the "Skopos Principle" of Skopos Theory. DeepSeek's translation adopts the expression of "已获得" to clarify the accomplished nature of the certification result and is semantically clear; The translation maintains the objective and prudent style of policy texts without over-interpretation, and this version is applicable to international general scenarios.

Example 2

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Stakeholder engagement is a key lever to create shared value in the long term and to pursue a just transition. In order to capture stakeholder needs and expectations, Enel promotes a continuous, active and open dialog with its stakeholders.

DeepSeek 译文：本集团将利益相关方参与作为创造长期共享价值、推动公正转型的关键路径。为准确把握利益相关方的诉求与期待，Enel 持续推动与各利益相关方开展积极、开放的常态化对话。

豆包译文：利益相关方参与是创造长期共享价值、推进公正转型的关键抓手。为精准把握利益相关方的需求与期望，意大利国家电力公司（Enel）与利益相关方开展持续、积极、开放的对话。

Doubao's translation renders "key lever" as "关键抓手", which conforms to the expression norms of domestic policy texts; it also supplements the full name of the enterprise to enhance identifiability, and the term "推进" is more action-oriented, complying with the "Coherence Principle" of Skopos Theory. However, "精准把握" is semantically heavier than "准确把握", appearing slightly exaggerated in policy texts. DeepSeek adopts the expression "关键路径", which is neutral and objective and applicable to international general scenarios; "常态化对话" accurately conveys the connotation of continuity in "continuous dialogue", and "各利益相关方" clarifies the coverage scope, with no omission of core policy information.

Table 2. Blind Evaluation Deduction Results by Professor A

Model	Lexical Terminology	Complex and Lengthy sentences	Policy Context	Total Deductions
DeepSeek V3	1 point	6 points	0 point	7 points
Doubao	0 point	2 points	0 point	2 points

Table 3. Blind Evaluation Deduction Results by Professor B

Model	Lexical Terminology	Complex and Lengthy sentences	Policy Context	Total Deductions
DeepSeek V3	6 points	0 point	0 point	6 points
Doubao	0 point	2 points	0 point	0 point

6. Conclusion and Prospects

Based on the objective comparison of six typical cases and the research findings of relevant literature, the core characteristics and applicable scenarios of the two models are summarized as follows. There is no absolute superiority or inferiority between them, and only the differences in "scenario-based adaptation" are reflected.

The translations generated by Doubao are characterized by overall precise and concise terminology, strong localization adaptation to policy contexts, complete logical chains and high information integrity. However, there are also problems such as occasional redundant expressions, insufficient adaptation of colloquial expressions to formal texts, and reduced readability caused by excessive emphasis on precision. Accordingly, the translations of Doubao are applicable to scenarios with high requirements for precision and localization adaptation, such as compliance disclosure reports of energy enterprises, domestic policy interpretation texts and professional technical documents.

The core advantages of DeepSeek's translations are mainly reflected in their conciseness and fluency, reasonable splitting of long sentences, strong stability of basic terms and prominent objectivity and neutrality. Nevertheless, there exist problems including insufficient in-depth adaptation of professional terms, weak transmission of policy connotations, easy omission of detailed information and limited context adaptability. Such translations are mainly applicable

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to scenarios with low localization requirements and emphasis on efficient transmission, such as basic texts for international communication, preliminary translation drafts and general energy information transmission.

For energy text translation, appropriate translation models should be selected according to usage scenarios. Doubao is preferred for local compliance scenarios, while DeepSeek can be adopted for international general scenarios. For complex texts, the "dual-model complementation" mode is recommended to balance precision and conciseness.

Nevertheless, the translations generated by both models can meet the basic requirement of "faithfully transmitting core information" for energy science and technology texts, and their terminological consistency and syntactic rationality reach the basic standards of professional translation.

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