

Breakthroughs in Addressing Procedural Challenges in Environmental Impact Assessment for Onshore Wind Power Projects

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Abstract: This paper focuses on the procedural challenges and corresponding breakthrough strategies in the Environmental Impact Assessment (EIA) process for onshore wind power projects. It first outlines the policy and procedural framework of EIA as well as the specific characteristics of onshore wind projects. It then analyzes key difficulties, including site selection conflicts, inconsistent report quality, and resistance in public participation. Finally, it proposes targeted solutions such as optimizing site selection, standardizing technical procedures, and innovating public participation mechanisms. The study aims to provide practical references for the smooth implementation of EIA procedures in onshore wind power projects and to promote their green and sustainable development.

Keywords: Onshore Wind Power; Environmental Impact Assessment; Procedural Challenges; Classified and Hierarchical Management

Introduction

Against the backdrop of global energy transition, onshore wind power has experienced rapid development as an important component of clean energy. However, the implementation of Environmental Impact Assessment (EIA) procedures for onshore wind projects faces numerous challenges, involving site selection, report preparation, public participation, and approval processes. These issues not only affect the pace of project advancement but also bear significant implications for ecological and environmental

protection. A systematic analysis of these challenges and the exploration of effective breakthrough strategies are therefore of great significance for promoting the healthy and orderly development of the onshore wind power industry.

1. Policy and Procedural Framework for Environmental Impact Assessment of Onshore Wind Power Projects

1.1 Domestic Environmental Impact Assessment System

The Environmental Impact Assessment (EIA) system for onshore wind power projects in China is



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grounded in core environmental protection and EIA-related laws and regulations. Relying on specialized regulatory documents such as the *Catalog for the Classified Management of Environmental Impact Assessment of Construction Projects*, a four-tier regulatory framework—comprising laws, administrative regulations, departmental rules, and local implementation measures—has been established. Within this framework, wind power projects are subject to differentiated approval management in the form of either an Environmental Impact Statement (EIS) or an Environmental Impact Report Form, depending on factors such as installed capacity and the environmental sensitivity of the project site. Meanwhile, the system is aligned with the “Three Lines and One List” control requirements, namely the ecological protection red line, the environmental quality bottom line, the resource utilization upper limit, and the ecological environment access list. At the local level, authorities formulate targeted implementation measures based on regional ecological characteristics, refining approval standards for wind power project EIAs. This has resulted in a governance structure characterized by unified national regulation and precise local implementation. Such an institutional arrangement provides a clear legal basis and policy guidance for handling EIA procedures of onshore wind power projects, ensuring that the assessment process proceeds lawfully, compliantly, and in an orderly manner.

1.2 EIA Handling Procedures and Key Nodes

The EIA handling process for onshore wind power projects can be divided into three major stages: preliminary preparation, report preparation, and approval completion. Key control nodes run throughout the entire process. During the preliminary preparation stage, project registration and preliminary site investigation must be completed. The project scope and the surrounding ecological environment conditions should be clarified, while baseline data—such as regional environmental quality indicators and the distribution of environmentally sensitive receptors—should be collected simultaneously. The EIA classification level is then determined and reported to the competent environmental authority for record filing ^[1]. The report preparation stage constitutes the core of the process. Qualified institutions must be entrusted to conduct on-site monitoring and ecological

surveys. A comprehensive analysis of the project’s potential impacts on air, water, soil, and ecological systems is required. Feasible pollution prevention and ecological protection measures must be proposed, and the EIA report should be completed and publicly disclosed.

During the approval completion stage, complete application materials must be submitted to the competent authority. The authority conducts formal review, technical evaluation, and verification of public opinions. Upon meeting all requirements, an official EIA approval document is issued. Among these procedures, technical evaluation and public opinion review are critical nodes that significantly affect approval efficiency.

1.3 Particularities of Environmental Impact Assessment for Wind Power Projects

Compared with general industrial projects, the Environmental Impact Assessment (EIA) of onshore wind power projects demonstrates distinctive characteristics, primarily reflected in three aspects: prominent ecological impacts, significant regional differences, and the need to emphasize long-term effects.

First, ecological impact is particularly prominent. Onshore wind power projects are often located in open areas such as mountainous regions, grasslands, and hilly terrains. These areas frequently involve ecologically sensitive sites. The installation of wind turbines and the laying of transmission lines may damage surface vegetation and affect wildlife habitats. Therefore, ecological impact assessment becomes the core component of the EIA process.

Second, regional differences are evident. Variations in climatic conditions, ecological sensitivity, and industrial policies across different regions result in differing approval standards and assessment priorities. Consequently, EIA implementation must be tailored to local conditions, ensuring precise and context-specific evaluation based on the actual circumstances of the project location.

Third, long-term environmental impacts require particular attention. Onshore wind power projects typically have long operational lifecycles. Impacts such as turbine noise and shadow flicker are continuous and long-term in nature. Therefore, the EIA must comprehensively consider both the construction and operation phases and propose sustainable and long-

term prevention and mitigation measures.

2. Core Procedural Challenges in Handling EIA for Onshore Wind Power Projects

2.1 Conflict Between Site Selection and Ecological Sensitivity

The conflict between site selection and ecological sensitivity constitutes the primary challenge in handling EIA procedures for onshore wind power projects. Wind power projects depend on sufficient wind energy resources and therefore tend to be located in open areas with stable wind speeds. However, such areas often overlap with ecologically sensitive zones, including ecological protection red lines, nature reserves, permanent basic farmland, and drinking water source protection areas, or are adjacent to wildlife migration corridors and areas with dense vegetation coverage. If a project site involves ecologically sensitive areas, the difficulty of EIA approval increases significantly and may even lead to rejection. Conversely, adjusting the site to avoid sensitive areas may result in insufficient wind energy resources or increased transmission costs. Moreover, in some regions, the boundaries of ecological sensitive areas are not clearly delineated. As a result, it is difficult to accurately identify all sensitive elements during the preliminary site selection stage, leading to repeated modifications of site selection plans and prolonged procedural timelines.

2.2 Uneven Quality of EIA Report Preparation

The uneven quality of EIA report preparation constitutes a significant constraint on the smooth handling of EIA procedures for onshore wind power projects. At present, although there are numerous institutions qualified to prepare EIA reports in the market, substantial differences exist in their technical capacity, professional competence, and practical experience. Some small-scale consulting institutions lack specialized professionals with expertise in wind power project assessment and do not possess a thorough understanding of the technological characteristics and ecological impact patterns of wind power development. During the preparation process, issues frequently arise, including incomplete collection of baseline data, non-standardized on-site monitoring, unreasonable impact prediction methodologies, and a lack of targeted pollution prevention and ecological protection measures. In extreme cases, violations such as data falsification and content plagiarism may occur. Such

substandard EIA reports are unlikely to pass the technical review conducted by the competent authorities and must undergo repeated revisions and improvements. This not only increases preparation costs but also significantly delays the approval process, thereby affecting the overall project implementation schedule^[2].

2.3 Resistance in Public Participation and Interest Coordination

Strong resistance in public participation and difficulties in coordinating stakeholder interests represent challenges that are often overlooked yet exert substantial influence on the EIA process for onshore wind power projects. During both construction and operation phases, issues such as turbine noise, shadow flicker, and electromagnetic radiation from transmission lines may affect the daily lives and production activities of nearby residents. As a result, local communities may develop opposition to project development and express dissenting opinions during the public participation stage. In some cases, residents may hold misconceptions regarding the environmental impacts of wind power projects, fearing adverse effects on their living environment and physical health. Even when the EIA report clearly specifies mitigation and control measures, such concerns may not be easily dispelled. Furthermore, project construction may involve land acquisition and vegetation occupation, affecting the interests of multiple stakeholders, including residents, village collectives, and enterprises. Divergent interest demands among these parties, coupled with the absence of effective coordination mechanisms, further complicate the EIA approval process.

2.4 Prolonged Approval Cycles and Policy Change Risks

Lengthy approval cycles and exposure to policy change risks represent prominent challenges in handling EIA procedures for onshore wind power projects. The approval process typically involves multiple competent authorities, including departments of ecology and environment, natural resources, forestry and grassland, and water resources. Each department requires separate review and record-filing procedures. However, inconsistencies in approval processes and review standards, as well as insufficient interdepartmental coordination, often result in prolonged overall approval timelines. In some cases, the EIA approval cycle

for onshore wind projects may extend beyond six months, significantly affecting construction progress. In addition, China's EIA regulatory framework is subject to continuous optimization and adjustment, with increasingly stringent environmental control requirements. Policy changes—such as the refinement of the “Three Lines and One List” control system and the optimization of ecological protection red lines—may necessitate the revision of EIA reports or adjustments to site selection plans, thereby increasing procedural uncertainty. Shifts in industrial policy orientation at different stages may also affect approval efficiency and evaluation standards, creating additional risks for the completion of EIA procedures.

2.5 Cross-Regional Coordination and Data Acquisition Challenges

Difficulties in cross-regional coordination and obstacles in obtaining baseline data constitute core challenges in the EIA process for certain large-scale onshore wind power projects. In some cases, wind turbine clusters and transmission lines span multiple administrative regions. Project construction may therefore generate cross-regional impacts on ecological environments, water resources, and other environmental elements. This requires coordination among environmental and natural resource authorities across different jurisdictions to clarify regulatory responsibilities and assessment requirements. However, disparities in approval standards and management requirements across regions, coupled with the absence of a unified coordination mechanism, often result in low coordination efficiency and difficulties in reaching consensus. Meanwhile, the acquisition of necessary environmental quality monitoring data and ecological survey data can be problematic. In certain instances, such data are managed exclusively by relevant authorities, and access procedures may be complex and time-consuming. Problems such as incomplete datasets and non-standardized data formats further undermine the accuracy and efficiency of EIA report preparation.

3. Breakthrough Pathways for Addressing Procedural Challenges in EIA for Onshore Wind Power Projects

3.1 Site Optimization and Avoidance of Ecological Conflicts

To address conflicts between site selection and

ecological sensitivity, the principle of “ecology first and scientific site selection” should be upheld, and ecological conflicts should be mitigated through systematic site optimization. At the preliminary stage, wind resource survey data should be integrated with spatial distribution maps of ecological protection red lines, nature reserves, and other environmentally sensitive areas. By applying Geographic Information System (GIS) technologies, a comprehensive site selection evaluation system can be established to identify candidate areas with adequate wind resources and relatively low ecological impact, thereby avoiding blind or arbitrary site selection. Subsequently, detailed ecological surveys should be conducted within the candidate areas to accurately identify sensitive elements such as wildlife habitats and vegetation-rich zones. Based on these findings, the project construction boundary should be reasonably delineated, and the layout of wind turbines and transmission lines should be optimized to avoid sensitive sites as much as possible^[3]. Furthermore, a dynamic site adjustment mechanism should be established. If new ecological sensitive elements are discovered during project implementation, timely adjustments to the site selection plan should be made. Simultaneously, ecological impact assessments should be conducted, and targeted ecological protection and compensation measures should be proposed. Through such coordinated planning, a balance between project construction and ecological protection can be achieved, thereby reducing resistance during the EIA approval process.

3.2 Standardization of EIA Technical Procedures and Capacity Enhancement

To overcome the issue of uneven quality in EIA report preparation, it is essential to accelerate the standardization of EIA technical procedures while simultaneously enhancing the professional capacity of consulting institutions. Relevant authorities should formulate unified technical guidelines tailored to the characteristics of onshore wind power projects. These guidelines should clearly define standards and requirements for key stages, including baseline data collection, on-site monitoring, impact prediction, and the formulation of mitigation measures, thereby standardizing the report preparation process. Supervision over EIA consulting institutions should be strengthened through rigorous qualification review

and the establishment of a credit evaluation system. Institutions that produce substandard reports or engage in regulatory violations should be subject to penalties, thereby creating incentives for quality improvement. In addition, professional talent development should be reinforced through targeted technical training programs on wind power EIA. Such programs should enhance practitioners' expertise in wind power technologies, ecological impact assessment methodologies, and pollution prevention measures. Encouraging cooperation between consulting institutions and scientific research organizations can facilitate the dissemination of advanced assessment technologies and methodologies, thereby improving the scientific rigor and relevance of EIA reports.

3.3 Innovation in Public Participation Mechanisms

To address resistance in public participation and difficulties in interest coordination, it is necessary to innovate public participation mechanisms and establish efficient communication and coordination platforms to mitigate conflicts among stakeholders.

First, participation channels should be diversified. In addition to traditional methods such as public disclosure and hearings, new media platforms can be utilized to disseminate project-related information and conduct online consultations and opinion surveys, thereby enhancing accessibility and encouraging broader public engagement.

Second, science-based outreach and environmental education should be strengthened. Through on-site briefings, informational brochures, and online educational materials, surrounding residents can be informed about environmental protection principles, potential impacts of wind power projects, and corresponding mitigation measures. This approach helps correct public misconceptions, alleviates concerns, and fosters greater understanding and support for project development. Third, a multi-stakeholder coordination mechanism should be established. Representatives of residents, village collectives, enterprises, and other stakeholders should be invited to participate throughout the entire EIA process. Timely consultation and consideration of reasonable demands are essential. With respect to issues such as land acquisition and environmental impacts, fair and equitable compensation schemes should be formulated to resolve disputes and ensure the smooth progression

of the public participation stage.

3.4 Reengineering Approval Processes and Digital Empowerment

In response to prolonged approval cycles and policy change risks, approval process reengineering and digital empowerment are essential to improve efficiency and reduce uncertainty arising from regulatory adjustments.

First, reforms aimed at streamlining administration and improving services should be advanced. Approval functions across multiple departments—such as ecology and environment, natural resources, and forestry and grassland—should be integrated through a joint review mechanism. By simplifying procedures, compressing approval timelines, clarifying departmental responsibilities, and defining coordination nodes, a system of “single submission with multi-department joint review” can be achieved.

Second, a digital EIA approval platform should be established to enable full-process online handling, including report submission, review, public disclosure, and issuance of approval documents. This reduces reliance on paper-based documentation and significantly enhances administrative efficiency.

Finally, a dynamic policy tracking and early-warning mechanism should be implemented. By promptly collecting and interpreting changes in EIA-related policies, project developers can anticipate potential regulatory impacts and adjust assessment plans accordingly. Such proactive adaptation reduces risks associated with policy changes and ensures the smooth advancement of EIA procedures.

3.5 Strengthening Dynamic Supervision and Post-Evaluation

To address cross-regional coordination difficulties and data acquisition challenges while consolidating the effectiveness of EIA implementation, it is essential to strengthen dynamic supervision and post-evaluation mechanisms. A cross-regional EIA coordination mechanism should be established, led by higher-level competent authorities to coordinate relevant departments across different jurisdictions. Through the unification of approval standards and management requirements, clarification of responsibility allocation for cross-regional projects, and enhancement of inter-regional information sharing and collaborative supervision, coordination efficiency can be significantly

improved^[4]. In addition, the management of baseline environmental data should be standardized. A shared platform for regional environmental quality data and ecological survey information should be established to streamline data acquisition procedures, clarify responsibilities for data provision, and ensure that the data required for EIA preparation are timely, accurate, and standardized. Furthermore, a post-evaluation mechanism for wind power projects should be implemented. Regular assessments of environmental impacts and the implementation of mitigation measures during both construction and operational phases should be conducted. Identified issues should be promptly addressed to reinforce whole-process dynamic supervision. Such measures ensure that project development remains consistent with EIA requirements and promotes green and sustainable development.

Conclusion

Although numerous challenges exist in handling Environmental Impact Assessment procedures for onshore wind power projects, these difficulties can be effectively addressed through measures such as optimizing site selection, enhancing EIA technical standards and professional capacity, innovating public participation mechanisms, reengineering approval processes, and strengthening dynamic supervision and post-evaluation. In the future, with continuous

policy refinement and technological advancement, EIA procedures are expected to become more efficient and scientifically grounded. This will facilitate the achievement of both economic and ecological benefits in onshore wind power development, contributing to the optimization of China's energy structure and the realization of sustainable development goals.

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