

Sektor ketenagalistrikan memiliki peran strategis dalam mendukung pertumbuhan ekonomi, pelayanan publik, dan produktivitas nasional. Untuk memperkuat keandalan sistem tenaga listrik, PT PLN (Persero) terus mengembangkan infrastruktur ketenagalistrikan, salah satunya melalui pembangunan Gardu Induk. Pelaksanaan proyek tersebut memiliki kompleksitas koordinasi lintas disiplin yang meliputi pekerjaan sipil, elektrik, mekanikal, kontrol-proteksi, dan komisioning. Sebagai bagian dari RJPP 2024–2028, PT PLN (Persero) telah menginisiasi implementasi Building Information Modeling (BIM) melalui pilot project pada 11 Unit Induk Pembangunan. Meskipun capaian administratif menunjukkan perkembangan positif melalui penyusunan *BIM Execution Plan*, *penerapan Common Data Environment*, pengembangan *model 3D*, *clash detection*, simulasi 4D, dan estimasi biaya 5D, kondisi implementasi BIM di tingkat proyek belum dievaluasi secara komprehensif.

Penelitian ini bertujuan mengidentifikasi potensi, menganalisis tantangan, dan merumuskan strategi implementasi BIM pada proyek Gardu Induk PT PLN (Persero). Penelitian menggunakan survei kuantitatif yang didukung Focus Group Discussion. Tahap validitas isi melibatkan 25 responden, sedangkan survei utama melibatkan 147 responden, terdiri atas 76 owner, 39 konsultan, dan 32 kontraktor. Data dianalisis menggunakan *Cronbach's Alpha*, *Mean Score Ranking*, *Kruskal–Wallis*, dan *Post-Hoc Pairwise Comparison*. FGD dilakukan untuk memperdalam dan memvalidasi strategi terhadap tiga tantangan utama.

Hasil penelitian menunjukkan bahwa potensi utama BIM adalah transparansi data proyek, peningkatan kolaborasi antar pihak, dan keberlanjutan pengelolaan informasi proyek. Tantangan utama meliputi biaya awal implementasi yang tinggi, kurangnya keahlian teknis, dan kesiapan organisasi. Strategi yang direkomendasikan mencakup pengadaan perangkat lunak dan infrastruktur, insentif adopsi pemerintah, pelatihan dan pengembangan SDM, kolaborasi industri-akademik, penguatan manajemen perubahan, serta penyusunan regulasi dan standar BIM. Uji Kruskal–Wallis menunjukkan sebagian besar parameter tidak berbeda signifikan antar kelompok, kecuali tantangan adaptasi implementasi BIM yang melibatkan kelompok kontraktor. Penelitian ini menghasilkan strategi BIM terintegrasi untuk memperkuat teknologi, kompetensi SDM, organisasi, dan regulasi pada proyek Gardu Induk PLN. Strategi tersebut diharapkan mendukung penerapan BIM yang lebih terarah, efektif, berkelanjutan, dan sesuai kebutuhan proyek ketenagalistrikan PLN nasional.

Kata kunci: BIM; Gardu Induk; PLN; Potensi; Tantangan; Strategi Implementasi

The electricity sector plays a strategic role in supporting economic growth, public services, and national productivity. To strengthen the reliability of the power system, PT PLN (Persero) continues to develop electricity infrastructure, including substation projects. The implementation of these projects involves complex interdisciplinary coordination, encompassing civil, electrical, mechanical, control-protection, and commissioning works. As part of the 2024–2028 Corporate Long-Term Plan (RJPP), PT PLN (Persero) has initiated the implementation of Building Information Modeling (BIM) through pilot projects across 11 Project Development Units. Although administrative achievements have shown positive progress through the preparation of the BIM Execution Plan, the implementation of the Common Data Environment, the development of 3D models, clash detection, 4D simulation, and 5D cost estimation, the actual condition of BIM implementation at the project level has not yet been comprehensively evaluated.

This study aims to identify the potential, analyze the challenges, and formulate strategies for BIM implementation in substation projects at PT PLN (Persero). The research employed a quantitative survey supported by Focus Group Discussion. The content validity stage involved 25 respondents, while the main survey involved 147 respondents, consisting of 76 owners, 39 consultants, and 32 contractors. The data were analyzed using Cronbach's Alpha, Mean Score Ranking, Kruskal–Wallis, and Post-Hoc Pairwise Comparison. The Focus Group Discussion was conducted to deepen and validate the strategies in response to the three main challenges.

The results indicate that the main potentials of BIM are project data transparency, improved collaboration among stakeholders, and sustainable project information management. The main challenges include high initial implementation costs, lack of technical expertise, and organizational readiness. The recommended strategies include the procurement of software and infrastructure, government adoption incentives, human resource training and development, industry–academic collaboration, strengthening change management, and the development of BIM regulations and standards. The Kruskal–Wallis test shows that most parameters do not differ significantly among respondent groups, except for the challenge of BIM implementation adaptation, which involves the contractor group. This study produces an integrated BIM strategy to strengthen technology, human resource competence, organizational capacity, and regulatory readiness in PLN substation projects. The proposed strategy is expected to support BIM implementation that is more structured, effective, sustainable, and aligned with the needs of PLN's national electricity infrastructure projects.

Keywords: BIM; Substation Project; PLN; Potential; Challenges; Implementation Strategy