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An Open-Source Tool-Box for Asset Management based on the asset condition for the Power System

C. Mateo Domingo; G.L Rajora; L. Bertling Tjemberg; M.A. Sanz Bobi

Abstract-

This Study introduces an open-source toolbox for asset management in power systems developed under the European ATTEST project. This paper focuses on presenting an open-source toolbox for Transmission and Distribution System Operators (TSOs and DSOs) to improve the reliability and efficiency of power networks, including a solution to the difficulties faced by the power industry, such as the aging infrastructure and the growing need for renewable energy integration The toolbox uses predictive analytics and machine learning to evaluate the health of assets, enhance maintenance plans, and guarantee efficient resource distribution. It evaluates the condition of power grid assets through clustering (K-means, SOM) and reinforcement learning (Q-learning), providing actionable insights for improving asset management. This approach allows TSOs and DSOs to adopt proactive maintenance strategies, reducing the risk of failures, minimizing downtime, and extending the lifespan of critical infrastructure. The toolbox provides actionable insights for planning maintenance strategies and optimizing resource allocation. Scalability tests were conducted using a synthetic power grid of 600 transformers alongside real-world data from five European electrical companies. Due to space constraints, only the results from 92 transformers. This research contributes to achieving sustainable power systems and supporting the energy transition by focusing on intelligent asset management.

Index Terms- ATTEST, Asset Health Assessment, Condition Monitoring, Power System Asset Management, Predictive Maintenance, Reinforcement Learning, Machine Learning, Data-Driven Insights.

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