

# ELECTRAK

(A Mobile ERP System for Electric Companies)



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## ELECTRAK Sustainable Development Goals

(Please tick the relevant SDG(s) linked with FYDP)

SDG No	Description of SDG	SDG No	Description of SDG
SDG 1	No Poverty	SDG 9	Industry, Innovation, and Infrastructure ✓
SDG 2	Zero Hunger	SDG 10	Reduced Inequalities
SDG 3	Good Health and Well Being	SDG 11	Sustainable Cities and Communities ✓
SDG 4	Quality Education	SDG 12	Responsible Consumption and Production
SDG 5	Gender Equality	SDG 13	Climate Change
SDG 6	Clean Water and Sanitation	SDG 14	Life Below Water
SDG 7	Affordable and Clean Energy	SDG 15	Life on Land
SDG 8	Decent Work and Economic Growth ✓	SDG 16	Peace, Justice and Strong Institutions
		SDG 17	Partnerships for the Goals



## ELECTRAK (A Mobile ERP System for Electric Companies)

Range of Complex Problem Solving			
	Attribute	Complex Problem	
1	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues.	
2	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.	
3	Depth of knowledge required	Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach.	✓
4	Familiarity of issues	Involve infrequently encountered issues	
5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering.	
6	Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs.	✓
7	Consequences	Have significant consequences in a range of contexts.	✓
8	Interdependence	Are high level problems including many component parts or sub-problems	
Range of Complex Problem Activities			
	Attribute	Complex Activities	
1	Range of resources	Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies).	
2	Level of interaction	Require resolution of significant problems arising from interactions between wide ranging and conflicting technical, engineering or other issues.	✓
3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways.	
4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation.	✓
5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches.	

## **Certification**

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This is to certify that Omama Israr, 2020-CE-158, Syed Huzaifa Ali Shah, 2020-CE-133, Syed Osama Ali, 2020-CE-126 and Shayan Faiz, 2020-CE-031 have successfully completed their final project ELECTRAK (A mobile ERP System from Electric Companies), at the Sir Syed University of Engineering and Technology, to fulfill the partial requirement of the degree Bachelors of Science in Computer Engineering.



**Project Supervisor**  
Engr. Rabia Siddiqui  
Senior Lecturer, CED

  
15/12/2023

**Chairman**

Department of Computer Engineering,  
Sir Syed University of Engineering & Technology

## Abstract

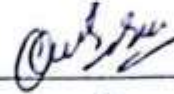
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In response to the complex challenges faced by K-Electric in managing its expansive 1354 km transmission system, comprising 220 kV, 132 kV, and 66 kV lines, along with 71 grid stations, 20 auto transformers, and 181 power transformers, this abstract proposes a comprehensive and automated solution. The current manual efforts for continuous monitoring and maintenance of transmission lines necessitate an expedited approach to streamline management activities. Additionally, communication inefficiencies persist between administrative and management authorities and lineman staff, impacting procurement, maintenance, and shutdown scheduling processes. To address these issues, we propose the implementation of an application-based system designed to enhance operational efficiency. The cross-platform mobile application features live location tracing and tracking of linemen, route mapping of the entire transmission line, real-time discrepancy updates, and prompt generation of maintenance or shutdown alerts. The system aims to eliminate communication delays and align processes, offering a seamless solution for daily shutdown maintenance, procurements, and other routine tasks. This innovative approach is poised to significantly reduce the burden on line workers and management, eliminating the need for time-consuming approvals from higher authorities.

**Keywords:** shutdown alert; automated; tracking; lineman; discrepancy; updates; alerts; mapping; route;

## Undertaking

I certify that the project ELECTRAK is our own work. The work has not, in whole or in part, been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged/referred.



Omama Israr

2020-CE-158



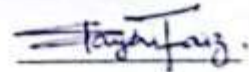
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## Acknowledgement

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Gratitude is extended to K-Electric, specifically to our external collaborator, Mr. Daniyal Fatmi, the manager of K-Electric's underground transmission line, and our project internal advisor, Engineer Rabia Siddiqui, a lecturer at Sir Syed University.

Their valuable insights and support were instrumental in addressing the intricate challenges associated with K-Electric's extensive 1354 km transmission system. The proposed automated solution aims to alleviate the manual burden of monitoring and maintenance, streamline management activities, and rectify communication inefficiencies among administrative authorities, management, and lineman staff. This acknowledgment is also extended to my dedicated team members for their contributions to this innovative project.

## Table of Contents

<b>Certification</b>	<b>i</b>
<b>Abstract</b>	<b>iv</b>
<b>Undertaking</b>	<b>v</b>
<b>Acknowledgement</b>	<b>vi</b>
<b>Table of Contents</b>	<b>vii</b>
<b>1. Introduction</b>	
<b>1.1 Error! Bookmark not defined.</b>	
1.2 Motivation	9
<b>2. Introduction</b>	
2.1 K.E Transmission line system	9
2.2 Limitations of existing system	10
<b>3. Improving the system</b>	10
<b>4. Application</b>	10
<b>5. Methodology</b>	10
<b>6. National need</b>	11
<b>7. Conclusion</b>	11
<b>8. References</b>	11
<b>Annexure</b>	<b>12</b>



## **1. Introduction:**

ELECTRAK, a Mobile ERP System designed for Electric Companies, comprises two core components. The mobile application harnesses SCADA IoT data from K.E's existing setup, enabling 24/7 monitoring of transmission lines. It not only tracks lines but also locates underground ones, alerts discrepancies, and facilitates predictive analytics for shutdown procurements. This groundbreaking project is poised to revolutionize power companies' operations, aiding in power theft detection, personnel monitoring, maintenance scheduling, and intelligent discrepancy identification. ELECTRAK promises to redefine industry standards with its comprehensive functionalities and forward-looking capabilities.

### **1.1 Importance:**

The importance of this project is that it improves work efficiency and processes, the application should track the transmission line personnel, which will automate the attendance system for the pupil-assigned duties in this particular area and at the same time the transmission system will be secured. Reduce the number of complaints from department management also identify and resolve discrepancies readily, and establish communication between all the linemen and employees. The application includes transmission lines fault management (notified using continuous data from transmission line), which provide a simple and automated ability to identify which area of transmission is affected.

### **1.2 Motivation:**

The motivation of carrying out the project is to enable an automated and effective system for a company that can increase the work efficiency and management of the tasks in a cost-effective manner. The project tends to transform the power industry, but is not limited to it. The usage of application will be quite easy and affordable since nowadays everyone has the mobile phone in their pockets and the tracking using GPS and communication are much easier. By analyzing data in real-time, this application will be able to monitor transmission lines 24 hours a day, 365 days a year, ensuring optimal efficiency and safety. The ability to locate underground transmission lines and their workers is a significant benefit that helps power companies streamline their operations and reduce costs. The application comprises modules that fit the needs of the company and are further scalable.

## **2) Background:**

### **2.1 K-Electric Transmission Line system:**

From the information provided by the representative of K-Electric, it was concluded that there is a dedicated department of K-Electric that maintains the underground transmission lines, as shown in Figure 1. These transmission line extends over the long area and are underground. On this transmission lines, there are numerous linemen designated to look after or maintain the lines, alongside of this transmission line there also exist some key installations of other facilities such as Karachi Water and Sewerage Board (KWSB) and Sui southern gas company (SSGC). The maintenance operation on these lines add discrepancies occur regularly, most often resulting in tense circumstances such as power outage, power theft or damage to installation of K-electric or other public facility, besides this there is also exist the trend for transmission line related maintenance or repair shutdowns.

## 2.2 Limitations of the Existing System:

The following issues have been identified as limitations of system that require an efficient solution.

- a) Lack of bonding/communication gap among the underground transmission line personnel (supervisors, linemen, and patrolmen).
- b) Delayed discrepancy alert/warning system as it moves through a lengthened and delayed channel.
- c) Live tracking of underground transmission line personnel (supervisors, linemen, and patrolmen) is being done in a scattered way that is WhatsApp Live location resulting a hassle scenario in which access of live location of transmission line personnel is limited.
- d) Underground transmission line data is being mapped dispersedly using Google earth and hence cannot be integrated.

## 3 Improving the System:

The proposed solution hinges upon the creation of a mobile application integrated with an analytics dashboard. This meticulously designed mobile application will encompass six distinct modules, each tailored to address and overcome the prevailing challenges within the system. By incorporating essential features, this application aims to resolve the existing flaws and hurdles effectively. Termed as Electrak, this innovative tool is poised to revolutionize the monitoring and reporting mechanisms for Karachi Electric (K.E) Transmission Lines. Its multifaceted modules will provide a comprehensive framework to enhance communication, track personnel in real-time, enable swift discrepancy alerts, unify data mapping through an integrated platform, and facilitate streamlined analysis of daily updates and procurements. Electrak stands as a pivotal solution, set to elevate operational efficiency and efficacy within the transmission line infrastructure.

## 4 Application:

The application is able to handle the aforesaid tasks efficiently and finds its use in many commercial applications. Each module brings added value to the project and can be used and expanded separately according to the user need.

## 5 Methodology

The mobile application comprises six modules designed for compatibility with Android and IOS platforms, facilitating its utilization across various devices. Deployment of the application mandates installation on the devices utilized by linemen, supervisors, and other employees of Karachi Electric (KE). This application necessitates no additional specialized configurations for installation or operation, ensuring ease of implementation across the targeted user base.

Furthermore, the Power BI dashboard serves as an integral component, offering simplified and visually intuitive data representation for maintenance and procurement updates. This dashboard streamlines the process of data visualization, providing a user-friendly interface for efficient monitoring and analysis of pertinent information related to maintenance activities and procurement processes within the system.



### 6 National Need:

The importance of the project can be highlighted by aligning it with the national needs and mapping the importance to the United Nations Sustainable Development Goals (SDGs). The project is related to the power industry because the application scope to be built will play a vital role in other industries such as manufacturing industry and many others. Therefore, it is aimed to suffice SDG goal 9 to bring innovation in infrastructures of industries. The project offers a sustainable solution for smart cities and communities that is SDG11. Furthermore, the project overshadows its scope in every field or sector of our society and will therefore exaggerate responsible consumption and production in that particular section.

### 7. Conclusion:

In conclusion, the introduction of ELECTRAK, the ERP system tailored for electric companies, marks a pivotal advancement within the power industry. This comprehensive system revolutionizes operational processes by offering continuous monitoring of transmission lines around the clock. By efficiently tracking underground transmission lines and personnel, ELECTRAK facilitates seamless updates on daily shutdowns and procurement details. This transformative solution empowers power companies to optimize their operations, curtail expenses, and elevate safety standards, thereby redefining industry standards and enhancing overall efficiency. The application comprises four modules that fit the needs of the company and are further scalable. The application will automate the attendance system and reduce the number of complaints from department management, identify and resolve discrepancies readily, and establish communication between all the linemen and employees. The project timeline shows the progress made over the past few months and the tentative timeline for upcoming modules. Overall, the project aims to transform the power industry by providing an automated and effective system that can increase work efficiency and management of tasks in a cost-effective manner.

### 7. References:[1] <https://www.ke.com.pk/our-business/transmission/>

<b>K.E</b>	Karachi Electric
<b>ERP</b>	Enterprise resource planning
<b>SDG</b>	Sustainable development goals

## **List of Acronyms**

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