



APPLICATION OF VALUE METHODOLOGY IN ENGINEERING MANAGEMENT USING WIND TURBINES CERTIFICATION FOR ELECTRICITY GENERATION

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Abstract: Nowadays highlight the fact that electricity projects often face unexpected problems or obstacles increases the overall or total cost and may hinder the progress of the project if there is a budget deficit such as the part of the high price of materials that can be obtained at a lower price and more honest quality. Or the use of alternatives available to perform the same work required materials at a total cost close to or below the original cost. Hence it was necessary to assume a specific method and methodology that revises the projects and exploit to better the work method and the selection of tools work optimally and the least cost while maintaining the form or role service provided by this project in the residuum. The method that has ultimately proved successful in addressing this is value engineering and the application of its glide path to finding solutions to the problems of power generation. It showed the importance of applying this methodology in determining alternatives to the old ways and means of generating electricity. The survey aimed to suggest alternative methods of generation of electricity from the old techniques also used the hypothesis of the exercise of modern methods in the genesis and conveyance. The creature of change and growth, which is the value engineering in many respects, including the theoretical frameworks of value technology, carried on this label, its concept, and its successful objectives in improving execution and cutting costs in addition to elements of basic value engineering and its supposed benefits. Likewise, the survey concentrated on the price of the project and the reasons for some unnecessary costs. Besides this how to reduce these prices in society, not to affect the character and performance required using modern methods of conception. The researcher also asked the research strategy for the application of value engineering during the project and evaluation of the operation of the proposed project after the implementation and can provide a modulation. In amending the provision of services in the area of electric force, this work aims to solve the problem of genesis by bringing about the successful alternative, by using wind turbines to generated electricity.

Keywords: Wind Turbines, Cost, Electricity Generation, Transmission, Value engineering

1. Introduction

Much talk about value engineering, applications, and successes on the international stage. Value engineering is not a specialized geometry, as in computer engineering or mechanical, electrical, or civil engineering, but the method is to devise a problem-solving methodology. Whether these problems are administrative, engineering, or Manufacturing. Where the approach of value engineering has become one of the most important modern programs currently used in many developed countries scientifically. The story of the discovery of the value engineering of World War II by the General Electric Company in the United States of America due to lack of strategic resources for its wares, which led the company to look for choices that contributed to reducing the cost and Ontogeny of the product, and between 1947 and 1952, discovered Lawrence Miles Which is turning at the company to get a system of techniques called value analysis, that the analysis of functions and not an analysis of parts is the best path to improve the value and dilute the price. This methodology includes system design and planning that starts with examining possible cost capture ideas at the research and development and engineering design phases. It also requires the same steps in production engineering and all other industrial technology disciplines.

Agreeing to this modern methodology, alternatives to substances and ingredients can be found when there is a chronic shortage. These alternatives are frequently found to bring down costs and provide equal or more respectable functioning. (1)

Miles select the product value as a percentage of two elements: Function / Cost. The function of any aspect is the specific work designed for its performance, and the cost refers to the cost of the element throughout its life cycle. (2)

2. Research Methodology

2.1 Problem Searching.

A large amount of waste electrical power in the distribution systems of electricity and production because of the disruption of electricity transmission networks by Linking villages and rural areas and desert and agricultural. Also, with the same network of electricity feed to cities. This causes the high monetary value of transport and distribution of several factors we will analyze and detail the clearest. The remote areas of the Iraqi desert, which are furnished with Electricity by generators while all areas on its way are supplied with electricity through the national grid.

2.2 The Importance of Research.

The need to work on the study of the potential of technology and techniques available and indicated by modern methods of value engineering. How to encounter solutions to crop down the electric loads of the home networks through several proposals to solve problems in this state. And to address the methods of production, distribution, and maintenance of networks linking the remote areas and the substitution of previous systems, feeder of these fields using (the generation of electricity by wind turbines).

2.3 The Objective of the Research.

The research aims at the following:

- Implementing value engineering principles designed to reduce costs.
- The possibility of applying value engineering to the electricity processing project for this distant area.

2.4 Research Hypothesis.

The research is founded on the hypothesis that transmission, distribution, and production of electricity through the separation of networks that extend to large spaces and far in the deserts and the countryside to offer several homes with electricity, which can produce electricity locally and scientific methods proved successful in many areas of the globe. As considerably as the possibility of carving up the feeding networks of some of these countries and connecting them to a special network called the rural network and desert electricity. Altogether the above assumes that the research will improve the legal transfer of electricity to all countries and trim back the hours of thinning, the cost of production, dispersion, and upkeep.

The research hypotheses that will be utilized effectively to find solutions are:

A-The adoption of value engineering in the research sample and application of its methodology to empower in the possibility of the country in the field of electricity and the possibilities of technical development in the world in the production of electricity. Research and analysis following what will be explained by mechanisms and methods of value technology to determine the weaknesses and error in the distribution, production of electricity.

B- The sound study of the methods of delivering electricity to remote areas will increase the efficiency of the service and reduce prices.

C- The application of re-engineering of electrical networks and generation in the research sample achieves the price decrease of the propagation, operation, and dispersion of electrical energy. (3).

3. Study of The Theoretical Framework

3.1 Engineering Management and Value Engineering

Engineering management is the technical leadership for engineering teams and projects in general by applying technical skills with basic work and managing skills. Engineering management also improves performance levels and develops it continuously in line with rapid developments in the engineering administrative field. The engineering department also ensures the possibility of logical thinking to deal with work problems and make engineering decisions Adoption of the administrative organization of projects and engineering works and their development, taking into account quality and good performance.

One of the most important modern methodologies adopted by engineering departments is the value engineering methodology as one of the effective and successful tools in the optimal performance of projects and works in all their stages by searching for engineering alternatives. for the prevailing patterns while preserving the desired basic goals of these works and projects. (4)

3.2 The Origin and Concept of Value Engineering

Warren Mills was the artificer of the value-engineering analysis methodology. He was interested in the concept of value analysis in the late 1940s of the Second World War, at general electric, which faced a dearth of strategic materials needed to make its products during the war.

The second project was to search for, negotiate, and get the materials and components that the company needed, these difficult circumstances forced Myles to think about seeing the alternative answer. The question he asked was, "If I cannot take the product, how do I obtain the same function as the product using just about machines or work or fabric that can be obtained?"

That was the concept of operational analysis, which later evolved to be experienced as value analysis, was implemented by the US Navy Fleet Office in 1954 with the Help of Myles and its staff. The result was that the analysis of value began to gain great popularity, and eventually a group of practitioners succeeded in creating a learning community that shared the conceptualization and development of innovative capabilities in this field, which is known as the American Society for Value Engineering. During the 1980s, the concept of value analysis came to an end. (5). (6)

Another concept of value engineering, was announced and quickly followed by the concept of value management and can be considered excessive attention to reducing the cost is responsible largely for the emergence of the concepts of value analysis and value engineering (6).

3.3 Objective of Value Engineering.

The engineering value aims to transfer the scientific discipline of planning and engineering to high-precision and character domains. For instance, there are buildings with big spaces and contents in the building such as the number of rooms or windows without making the most of them. Likewise, in the area of electrical engineering, where they practice the former systems of electricity generation and distribution while the lack of services to the consumer. Dillon points out that the overall objective of value engineering has been easily described Provide total cost control methods anywhere within the orbit of life cycle elements of the product. By pressing to reduce prices while keeping the character and reliability demanded the materials being examined, and examine the value of the following aims; (7). (8).

A. Remove or reduce the cost of the process, material, or product.
 B. Improve client satisfaction with materials, products, or processes that are being considered.

C. The value analysis of the natural process is going on developed, which will be applied to all companies, projects, cost, or functionality problems. Provide total cost control methods anywhere within the orbit of life cycle elements of the product. (9)



Figure 1: A simple scheme to illustrate the relationship between cost, quality, and efficiency. (10)

3.4 Elements of Value Engineering.

By identifying concepts or the term value engineering, it is potential to place the elements that value engineering has in common. -The change is essential: This method raises fundamental questions that include not only the methods and methods employed but also the business itself and the presumptions underlying the business, for instance, why do we do the work we execute? why do we

stick with this approach at work? Such fundamental questions put the speculations on which the business is based and ask workers to reconsider these assumptions.

-The change must be radical: Should be taken by a radical value engineering change it has import and value is to improve yield or performance in facilities, meaning, and value rather than the physical body. And the evolution of what is any restoration of the current position must be altered radically by uprooting the existing Its roots and rebuild products or processes in line with current demands and objectives of economic unity Friendly.

-The effects are real and huge: This method calls for achieving substantial results and huge, not limited to the melioration in the products or performance, which Galpatradia.

-Change in operations: This approach focuses on analyzing and reconstructing processes, not organizational and functional ones on structures and responsibilities. The processes themselves are the focal point of research and focus rather than people and departments.

-Change depends on information technology: This approach is based on investing in information technology so that it is used effectively to employ it creatively for radical change, which creates a method and methods of implementation of work, not mechanization, which aims to save time.

-That change based on thinking where the change is indicative and not deductive: This attack is based on extrapolating the search for opportunities for evolution and change before then Emergence of problems that scream for alteration. The rejection of this method of thinking and development, while the conclusion of waiting until the issue of the problem

And then work on studying and looking for appropriate answers. (11)

Likewise, we can limit the principal phases of value engineering as follow:

-Information catering.

- Alternative creation.

-Evaluation.

-Application.

3-5 Benefits of Value Engineering.

The benefits of applying value engineering can be tallied up as follows:
A- Completion of integrated rather than small operations. In addition to the speed of completion of the work.

B- Narrowing the time lag between action steps

C- The purpose of accurate and more objective criteria to evaluate performance and better the character of work and find new ways of carrying out.

D- The speed of coordination between different actions

E- The gumption of the importance of employees due to the variety of skills and ability of people to do diversified work.

F- The desire to give novel ideas to form.

G- Improve the collective performance of the spread of cooperation.

H-Train and motivate creative and outstanding workers and pass around the spirit of challenge and the desire to surpass.

K- Improve control controls.

J- Improving information systems and developing customer decision-making. (6). (12).

There is little doubt that engineers, designers, and draughtsman arc well aware of the need to minimize cost, and in most instances, they are anxious to receive and use better cost information. Still, there are other reasons why unnecessary cost occurs in the products they

are limiting. For instance, the needs of the user are not always well defined. Where there is a lack of data, and so it is inevitable that the exact necessities of the client or user will be passed. New lower-cost products and materials become available at a confusing rate, and quickly render existing design concepts obsolete. Processes Many designs evolve over the years, and the lack of which persists Time in most engineering organizations encourages these design approaches to be perpetuated even if in a modified shape. Whilst it is not practicable to question every design, if those areas of significantly high cost likely to be doubled in the hereafter are not regularly reviewed, the quantity of unnecessary cost contained in them will increase as the design approach, materials, and methods used, become out of engagement. The leak of time also can lead to a lack of ideas and the espousal of the first solution Ideas which will meet technical requirements, irrespective of its ultimate cost. Proposed resolutions to problems and novel thoughts are frequently turned away because of erroneous but sincerely held opinions. For object lesson, a material can be discounted as unsuitable or a tool cost assumed to be too high to justify a proposed modification. Good thoughts are often thrown away without proper consideration and examination of today's facts. (The purpose of a toothed belt to force back the valve gear of an internal burning engine has been seen and ruled out many times as impracticable. Although today it is normally practiced. (2). (13)

4. The Application of the V.E Method to Electrical Project

4.1 Factors That Arise Costs and Poor Quality

Internal failure raises costs and inadequate character

Internal failure costs occur before the product or project is made out,

Examples of internal failures include:

- Re-inspection and re-testing
- Review Articles
- Safety and environmental incidents
- The operation failed, data entry errors, is missing
- Practical steps lost

External failure raises costs and poor-quality External examples include:

- Lost sales or missed points.
- Warranty claims.
- Most of the time.
- Non-regulation and coordination with suppliers of raw materials and construction.

Lack of visibility of the beneficiary of the project (2). (14)

4.2 Reduce the Cost of the Project Using Modern Engineering Methods, Design

The design for assembly and assembly (DFMA) consists of two main components: DFA and Design for Manufacturing (DFM). DFMA is an important methodology for reviewing product evaluation design. It is rattling important to cut down the number of components that are amassed on the merchandise. This can cut the cost of fabrication, assembly time, and materials. Thus, to bring down the price of the merchandise, the DFMA-Lucas Hull methodology is used by selecting a consumer product or a building or industrial project. The Tamest-Lucas Hull platform is utilized to value the product or evaluate project outputs. The original pattern or project designs are critiqued. A redesigned effort is formed to assess the product or parts of the task. (15). (16)

4.3 Strategy of Driving the Cost of Project.

The strategy is the ability of an organization to provide businesses and activities designed for production, projects, or services at a lower cost than competitors by improving productivity and efficiency and eliminating lost costs.

Esme Depot (Electronics) and Emerson Electric (Texas) are among the economic units that adopt this strategy. These companies provide products for customers at least as well as character. The aim of this strategy is the monetary value of the merchandise. Customers are taken to get the economic unit offer products or, in the sector where the service is less expensive. (16)

4.4 apply value engineering throughout the project to cut down prices.

Throughout a project's planning, intent, and building phases, Cost Management is employed as a means of balancing a project's scope and expectations of quality a Budget. The approach can be summarized as involving the following three steps:
 A- Determine the scope, the degree of quality desired, and the budget
 B- Ensure that the scope, calibers, and budget are aligned
 C- Monitor and manage the balance of these three components throughout the lifetime of the task.

The calculation of project contingencies should be established on an appraisal of the risk surrounding the project (site issues, availability of bidders, the method of procurement, and critically the market conditions in the emplacement of the project. As risks are mitigated (sit investigation is done, a market survey completed, program finalized, the design started, and thus contingencies can be shortened and the orbit of the estimated final cost narrowed. The firm turned on with overseeing the monetary values of the project should ideally be employed directly by the owner, early in the process, and should be independent of both the architect/engineer and the building contractor. (17)

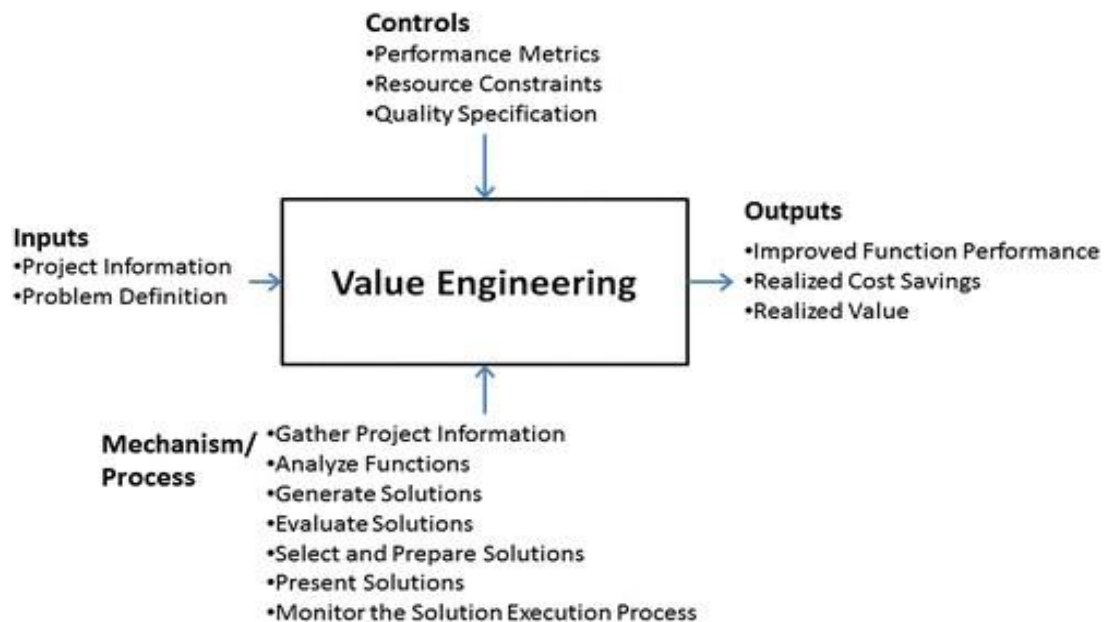


Figure 2: An outline of the application of value engineering throughout project phases. (17)

4.5 Facility performance evaluation (FPE).

Facility Performance Assessment (FPE) is an extension of the so-called post-occupancy assessment. FPE is an ongoing process to assess the operation and/or effectiveness of one or more aspects of constructions about matters such as accessibility, aesthetics, cost-effectiveness, functionality, productivity, safety and security, the Public, and many others. This program is applied in the united states -California. The aims of this program, as noted on the DGS website, are; -
- Fuller understanding of the shock of early delivery decisions Design on the long-term efficiency and effectiveness of buildings,
- To better realize the impact of delivery building processes and decisions on customer response initially and throughout the life cycle of the edifice. (18)

5. Using the V.E. method to find an alternative to generate electric power in a remote area in Iraq (Alsalman)

5.1 A brief description of the Village and the Surrounding Geography

Some studies have proven that the area confined between Dhi Qar and Muthanna in southern Iraq is the best area for installing fans to generate and produce electric power, as the wind speed in these areas reaches 21 km/hour throughout the year. It is enough to rotate the fans and produce electric power to overcome the deficit in providing electricity to southern Iraq. (19)

The village in question is located in the southern desert of Iraq. It is called Al Salman, and it is about 150 km from the heart of Al-Muthanna Governorate. It is geographically located in a great depression and surrounded by high plateaus from all locations.

The village site provides a very excellent environment for applying the method of using wind turbines to generate electricity in this village, as large swirls or fans can be placed around high plateaus where the wind is available in quantities and efficiency with high industrial feasibility. (20)

The old source of electricity supply still uses diesel generators. This system suffers from a major operation, generation, and maintenance problems, in addition to insufficient energy saved from this limited electrical power source.

The following picture shows the location of the village of Salman, which is about 150 km away from the heart of the city and is located in the middle of the desert in southern Iraq. The monetary value of transporting fuel to this small town is reflected in the cost of transporting electricity with wires or even electricity produced by gas oil.

Hence, based on the information reviewed on the benefits of applying the value engineering mechanism to find the best alternative to the electric power source that provides better quality and service quality at a lower cost, the most desirable way to supply electricity is to install wind turbines to generate electrical energy in this small city.



Figure 6. The image depicts the position of the village of Salman in the spirit of the desert. (20)

5.2 Overview

In this section, will be the practical side of this method.

We dealt with choosing the best way to produce electrical energy for a remote village in Iraq. The means that I believe are successful, economically feasible, and successful in providing the ideal service are to provide this village with electricity through the use of wind turbines. The following picture is a model of a famous type of these turbines. Which will be detailed about its components and method of work in the following points in this chapter, while maintaining the use of diesel generators connected to the network for emergencies and specific periods. (21)



Figure 3. It is a Famous type of wind electric generators. (21)

5.3 Use of wind turbines to generate electrical energy

5.3.1 The origin of the wind turbines, their importance and their mode of operation

Oil and natural gas are often used to power large turbines to generate electricity. These sources are harmful to the environment because they create toxic gases when burned. It is also not available in all regions of the world. As caused by wars and disasters on humanity. Oil wells in the universe, regardless of escalating costs and near depletion, historically,

nations and ancient civilizations used wind energy in various ways, including the role of ancient Egyptians in this ability to transport boats on the Nile. The Muslims also used this energy to grind various textures, while the Chinese used the energy to pump water. In particular, which indicates that this energy has been recognized since ancient times by the degree of different civilizations. (22)

At a time when the world desperately needs the energy to obtain electricity, electricity has entered all aspects of human life in communications, hospitals, lighting, roads, transportation, refrigeration, and others. Other areas where electricity is indispensable. A stream of air power is used to generate electricity from moving wind turbines and convert wind energy into mechanical energy, which in turn turns into electrical energy that can power appliances and reach homes. Often, this method is used to obtain electricity in rural areas far from power stations. The electrical energy generated by the kinetic energy of the wind is proportional to the total wind that spoils and goes. Wind turbines have two basic designs, namely the horizontal axis and the vertical axis, and they are symbolized by HAWTs, VAHTs, and the most used type is the horizontal type and the following figure shows the most important components of this type (23).

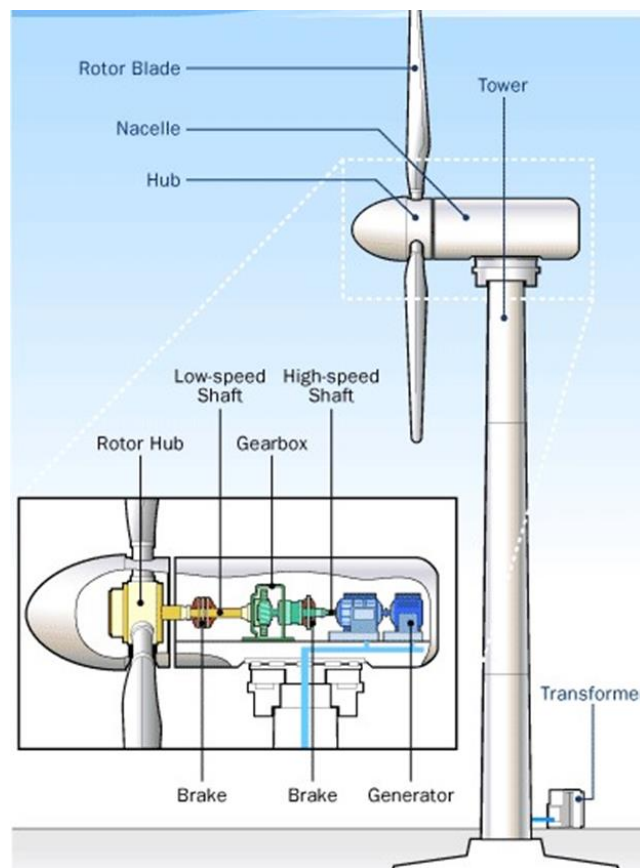


Figure 4. Presents a simple diagram of the most important components of this type (23).

The capacity of the turbines starts from small with a capacity of 10 kilowatts and can generate 1600 kilowatts annually, and large turbines with a capacity of 1 and 8 megawatts of electricity are sufficient to supply six hundred families with electricity. The prices of the turbines range from \$ 5,000 to \$ 1.5 million for the turbine suitable for the city in our study, which has a capacity of 1.8 MW. Below is a model of the horizontal type wind turbine that is proposed to be used in generating electricity for the Salman area in question and how these turbines work.

5.3.2 Calculations of the kinetic energy of the wind

The kinetic energy of winds is calculated by the following mathematical equation: -

$$\text{Kinetic energy} = 0.5 \times \text{wind mass} \times \text{wind velocity square}$$

Kinetic energy and its unit are joules.

Wind mass and unit kg

Wind speed and unit meters per second

The energy of the turbine is calculated by the following equation: -

$$\text{Turbine energy} = 0.5 \times \text{air density} \times \text{area of the circle drawn by the turbine} \times \text{turbine yield} \times \text{wind speed cube}$$

Turbine energy: energy that is converted from kinetic wind energy into rotational kinetic energy in a turbine.

Air density: it is the mass of air per unit volume and is less by height above sea level and its unit is kg per cubic meter (kg / m³)

Area of a circle: π the square of the length of the blade, which is the distance that the blade draws by its rotation, and its unit is square meters.

The turbine yield is the ability of the turbine to convert the kinetic energy of the wind into kinetic energy through which the turbine rotates.

The German scientist Betz said that the turbine cannot convert more than 59% of the kinetic energy in wind energy into rotational energy, which is called the Betz limit

Hence, the kinetic energy of the low turbine is transferred to the gearbox to raise the speed in proportion to the required speed of the generator, noting that the speed of the turbine blades ranges between 5-20 revolutions per minute, while the required generator speed is 750-3600 revolutions per minute and thus the winch and reducer transformers are connected with Turbine to achieve the conditions of connection and frequency control with the electrical grid.

The diagram below shows the generation system and its connection to the electrical grid that feeds consumers (24).

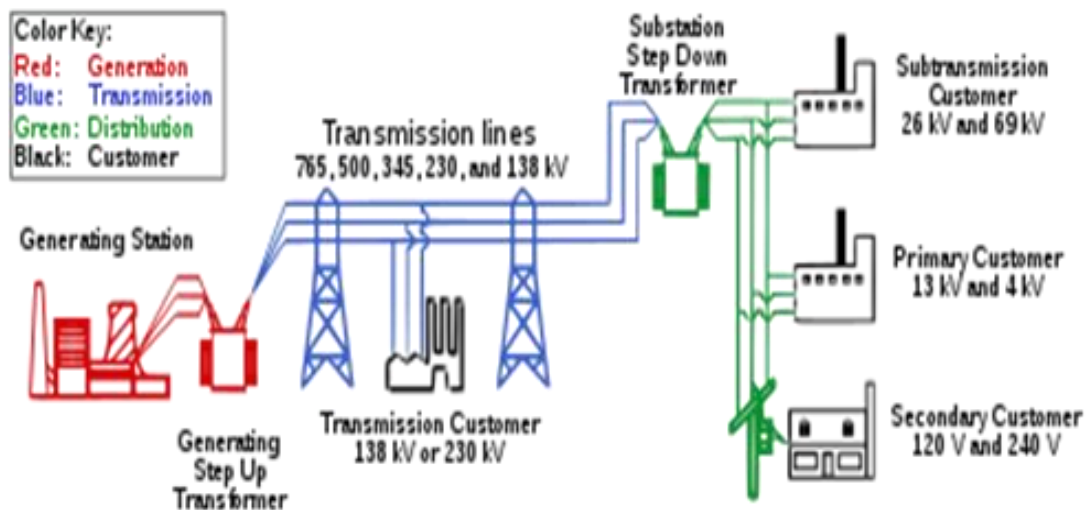


Figure 5. The diagram depicts the wind power generation scheme is more sophisticated and extensive. (24)

5.3.3 Choose the right turbine

Turbines are classified according to wind speed, as the International Electrotechnical Commission (IEC61400) defined the types according to three main factors: the average site wind speed (V_{ave}) and the maximum storm velocity over 50 years (V_{50}). The speeds are

measured at the level of the axis of rotation of the turbines (hub height), and the turbines are classified according to the speeds into five categories denoted by Latin symbols, while the turbulence level is classified into two classes A and B. The following table shows these classifications. (25)

Table 2. Wind Turbine Classifications.

WTG Class	I	II	III	IV
V_{ave} average wind speed at hub-height(m/s)	10.0	8.5	7.5	6.0
V_{50} extreme 50-year gust (m/s)	70	59.5	52.5	42.0
I_{15} characteristic turbulence Class A	18%			
I_{15} characteristic turbulence Class B	16%			

5.4 Proposed work stages for installing an electric power source by wind turbines in Al Salman village.

5.4.1 Calculation of all electrical loads in the village.

The actual electrical loads for all consumption units in the village were calculated and the total capacity was estimated for each housing unit, department or government service, industrial and technical establishments, markets, and shops, which have been installed in the following table.

Table 1. A table showing the types of consumers of electrical energy and the actual loads in the village. (26)

Type of electrical load	Number Of this type	The Amount of electrical loads per unit	Total loads per type
Residential unit	400	15 KW	6000 KW
Government section	23	50 KW	1150 KW
Public service and facilities	63	40 KW	2520 KW
Grocery stores	15	25KW	375 KW
Industrial and technical shop	15	50 KW	750 KW
Other	10	20KW	500 KW
Total			11295KW

The total volume of electrical loads in the village: 11295 kWh.

From what was mentioned in the previous table, the amount of electrical energy with the reserve is approximately 12,000 kilowatts.

And based on the classifications in the table mentioned in paragraph (5.1). And based on the study mentioned in paragraph (5.3.3), which proved that the wind speed in the search area is approximately 6 m / s. According to a study published by the United Nations Development Program, the average capacity in Iraq is 20%. The highest storm over the past 50 years is 42 m / s. And that the turbulence is the highest, reaching 18%, so the specifications of the turbines suitable for the Salman area are the turbines of the fifth class ((VI) specified by the International Electrotechnical Commission (IEC61400) as in the following table: -

Table 3. Wind Turbines Classifications suitable for the Salman desert region in Iraq.

V_{ave} average wind speed at hub-height(m/s)	6.0
V₅₀ extreme 50-year gust (m/s)	42.0
I₁₅ characteristic turbulence Class A	18%

5.4.2 The most important cost-effectiveness measure is through engineering the value of the proposed unit of electricity from the wind turbine

For the role of implementing the cost measures to build a generating unit for electricity from wind turbines, it runs through a set of steps as follows-

The first step-

The hunt for a solid international company proposed Germany, Japan, and Denmark to prepare the on-site study and the processing of wind power generating units and by direct invitations to these societies.

Second step-

Choose the target price, this step includes determining the marketing cost of the unit of the selected commodity, bearing in mind that the target price is worthy of the category of generating unit determined globally, which provides in the cost in the old style to prepare electricity for the village plus the lost costs of electricity.

Third step-

Conclusion of the electrical power of the generating unit with a spare generation ratio of 10% of the full power of the generating unit.

Fourth step-

The culmination of the drilling contract, granting to the demands of consumers and international specifications and follow-up manufacturing, installation, and performance, including the inclusion of the contract period of maintenance and processing of adequate backup materials for at least five years.

Fifth step-

Training of engineering and technical personnel Commission of operating such generation units in the Manufacturer and supervising their operation is similar in power production units and testing them efficiency successful.

6. Conclusions and Recommendations.

6.1 Conclusions: -

A- Due to the distinguished geographical location of the research area (Salman), which is located in a depression and is surrounded by plateaus on the four sides, these desert fields are very suitable for starting the operation of wind turbines to provide economic and very fruitful winds. Energy, due to the difference in air pressures, resulting in excellent wind movement to feed the wind turbines that power the large generators.

B - The production capacity of the generators currently in the region, the research sample is very small, compared to the amount of electrical energy required and the large costs of generating electricity, as these generators operate on gas oil fuel. Note that generators are usually allocated for limited operating times, which calls for finding alternatives for continuous savings. And stable electric power.

C- It is not possible to transmit electrical energy through wire networks for a distance of 150 km, as it is very expensive in addition to the amounts of energy that will be lost in the wires that extend over large distances in a very hot desert area.

D- The value engineering method reduces costs without compromising the basic specifications and characteristics of the village electricity treatment system, and replaces the new energy that has become the goal of the developed world.

D- The value engineering approach requires redesigning power generation units and making drastic improvements to key success factors such as price, quality and time

E- The value engineering method must take place at the beginning of the value spectrum as it requires fundamental changes in the planning and design stages.

6.2 Recommendations:

A- We recommend forming an integrated work team to complete the stages and levels of (Value Engineering Method), which should consist of different jobs for engineers, production supervisors, architects, cost accounting, and others.

B- Value engineering requires, as mentioned in the chapters of our research that were mentioned above, that the success of the value engineering methodology is achieved through working with this methodology from the stage of initial studies of the project and the stage of designs, implementation, operation and maintenance carried out by the team recommended in paragraph (a) above, where it must be formed An integrated team used to fill in its steps and levels.

C- The improvement process must be done through testing the method of change that takes into account the improvement of the service provided and raising the efficiency of the electrical energy source supplied to consumers in the area under study. The goal of progress is to improve natural processes and processes. The method of improvement is how improvements can be achieved.

D- It is preferable when starting the contracting stages and in accordance with the Iraqi contracting conditions to adopt the method of direct invitation to companies specialized in this field and mentioned in the study and other companies specialized in manufacturing, installing and operating wind-powered electricity generators that have previous experiences of working in desert areas similar to the research area .

E- The type of turbine shall be the vertical type (VAWTs) with specifications commensurate with the hot desert areas (Hot Climate Version), as these specifications include isolating the turbines from sand and are designed to protect their internal components from sand and dust that the winds are expected to carry in the (Salman) area.

F - Choosing the appropriate heights on the hills surrounding the (Salman) area, in a way that guarantees reducing collision with migratory birds, especially those that come during the migration and spring seasons.

G- Setting up generation units as much as possible near the electrical network that is currently in the research area, preparing local cadres, training them, and involving them from the beginning in the installation, operation and maintenance operations, and by the specialized company that will carry out the work.

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