List of figures report example

Business, Customers

Implications of Transmission Lines and Grid Network of New Zealand

Abstract

This report aims to evaluate implications of transmission line and existing mechanism of transmission distribution network in New Zealand. There are various theoretical and real life implications posed by transmission lines including environmental and health issues, security system, problems associated with voltage and so forth. Quality material and mechanized system can minimize these implications. Un-organized transmission lines effects ecosystems that are essential for sustainable atmosphere and environment. Moreover , transmission lines arrangement within the ground leads to other issues related to plants, trees, water, animals and biodiversity. Transmission lines are set by using three different installation procedures as cable bridges, on-river-bed installation and below-river-bed installation, but it is better to use below-river-bed installations in the context of health and safety. New Zealand has well structured distribution mechanism that is sub-divided into eastern and western regions to facilitate the people living in these regions. Transpower being the backbone for the national grid is responsible to operate these distribution systems. It has a huge capacity to perform and has importance relating to the matter of transmission lines and the supply of electricity. The sufficient investment can further enhance the proper functioning of the flow of electricity as well as maintenance of the grid. Moreover, it is regulated with well defined rules and regulations for

smooth and effective functioning of the system as well as cost and pricing framework.

Implications of Transmission Lines and Grid Network of New Zealand

Introduction

Transmission lines are used for the transportation of loads of electric power from one place to another place. The common example of transmission lines can be seen in grid stations. Transmission lines are also used for combining different electric supply sections and components such as generators of power plant. But, for the transportation of this electric power to main city or the houses, transmission lines should be safe and capable of effective transportation of electric load or power from grid station to the main city or houses. As these transmission lines have the capability of transporting high voltage among them, therefore, Transformers are used at different areas just to step down this high voltage into sustained and low voltage that could be used for the functioning of daily use without effecting household objects. Transmission lines are mostly made up of aluminum cable steel reinforced (ACSR) having sufficient strength similar to steel. Aluminum wires have a capability of supporting high voltage transmission system (Elliott& Wadley, 2002).

Transmission lines also play an important role in communication and electronic engineering. These cables also carry alternating current of radio frequency and other electricity. Transmission lines are used for the connection purposes like radio transmitters and receivers along with their antennas, cable networking for TV distribution, computer network

distribution and much more. Different types of transmission line include ladder line, coaxial cable, dielectric slabs, strip line, waveguides and optical fiber. Hence, this report aims to evaluate implications of transmission lines as well as current status of power distribution mechanism present in New Zealand.

Implication of Transmission Lines –An Overview

With the advancement of technology, transmission lines are playing a drastic role in the development of daily life environment. It is also playing significant role for the creation of new discoveries and ideas or planning. There are different impacts of transmission lines including environmental issues, the theoretical ideas on a large scale and working of daily life objects (Furby et al., 1988).

Despite from the theoretical implications that have been monitored by the researcher's, there are real world implications that have been monitored by individuals and are a concern of the government. The working of transmission lines that are affecting our lives in a positive manner apart from its different negative aspects are discussed below:

Thermal Implications

Throughout the world, huge numbers of professionals/or engineers always recommend using cheap products for transmission lines. The major ideas behind the using of such scale of transmission lines are to set such transmission lines that are accommodative within the budget of the family. The second thinking or idea for the using such transmission lines is to transmit huge quantity of transmission of either electricity or any other

source. Due to the flowing of a large quantity of electric current or heat within these transmission lines, the resistance or thermal limit of these transmission lines could increase above their limit. This could cause difficulty within the transmission lines or totally destroys the transmission lines. In most of the cases, with an increase in the thermal limit of transmission lines, these lines could be converted into firing products that could affect other home appliances. In addition, firing default that is caused due to increase in the transmission of heat within these transmission lines , other fatal damages could occur as overloading and other similar damages (Bond & Hopkins, 2000).

Voltage Implications

The use of cheap products during installation of transmission lines could cause a decrease in the voltage. Transmission of voltage from the grid stations would be good but due to low cost transmission lines and with the increase in heat, the quantity of voltage could go on a decrease value. Voltage at the beginning of any station would be in contrast against the ending result of that voltage (Han &Elliott, 1983).

Bad Transmission Implication on Security Systems

The operation systems of industries or even daily household equipment are quite important. Reliable transmission of electricity or heat or voltage is very important for a better functioning of these products or proper functioning of operating systems. For the better functionality of these operating systems, a large number of rules and regulations are being made by different organizations. Recommendations suggested by the North American Electric

Reliability Council (NARC) convey the framework of rules and regulations and consequently there is no difficulty during the performance of these operating systems. Certain steps must be adopted in order to remain safe and let your products in a well-mannered way (Furby et al., 1988). Due to high and low appearance in the voltage and load of electricity, large number of products might get disturbed. Stability of voltage or electricity must be controlled in a good manner.

Implications on the Radio Frequencies

The transmission lines also play an important role for the functioning of radio waves or radio frequencies. Due to some minor faults within the transmission lines, conductors, transistors, resistors and corona discharge products that are required for better transmission of radio waves could be affected drastically. Prominent effects could be observed easily due to the defects in the transmission lines and their functionality.

Environmental Effects due to Transmission Lines

Land Use Implications

Geological and Social Problems

For the fitting of transmission lines within the ground, cutting of rocks, trenching of soils, tunneling and even at some areas, blasts are required in order to install these transmission lines. This simply effects the geological or social environment. On the other hand, huge cost is required for the functionality or setting of these requirements for transmission lines. Once, blasts are done at different positions; a huge quantity of soil is required in

order to fill that position after erecting transmission line. About 50% of soil would be needed in order to fill the required position.

Water and Biodiversity

Transmission lines also affect water, animals and biodiversity living inside the water. Sometimes, transmission lines are set by using three different installation procedures. Cable bridges, on-river-bed installation and below-river-bed installation. For a better working of transmission lines and also, for a safe crossing of these transmission lines, In-river-bed installation must be rejected. Despite in-river-bed installations, it is better to use below-river-bed installations. The use of a better way for the transmission of these lines, less damage could be applied for all those animals living within the water (Dotzour, M., 1997).

Ecosystem could be affected drastically if these transmission lines are not well organized or well set. Using a proper and appropriate procedure for fitting could decrease the damage that is caused to all eco-systems or to all animals.

Agricultural and Cultural Issues

Agriculture requires such spots that are free from every damaging material or every disease that could cause damage or effect to the crops or other products that are full of nutrients and full of mineral or vitamins needed for a human being. Transmission lines set underneath these planes or underneath these agricultural areas could cause a lot to all those crops and fruits or vegetables and their roots that are being plowed underneath or even above the ground. Due to the extraction of harmful heat or rays that are

consistently come out of these transmission lines are very dangerous to all those roots of crops and fruits or vegetables.

Air Pollution

Transmission lines also play an important role while polluting or harming air resources or airy environment. Constructing or fitting of buried transmission lines is more dangerous for the environment or the atmospheric condition than those of overhead transmission lines. Due to the using of heavy machinery for the organizing, controlling and fitting of these lines, extraction of highly diseased heat and the availability of huge quantity of soil piles are the major reasons for the environmental air pollution.

Socioeconomic and cultural Affects

Overhead transmission lines play its role while decreasing the beauty of any place. Most of the tourists and recreation resources or facilities are closely related to the beauty of any place or city. Overhead transmission lines simply minimize the feeling of simple and clean environment. Due to a huge number of transmission lines hanging over buildings and many other places decreases the aesthetic effect. Also, the economy of any state or city is largely affected due to these overhead transmission lines by organizing or fitting or repairing of these lines.

Cultural impacts can also be caused due to damaging and disaster performance of transmission lines. Buried archeological resources or information that has been buried since a long time could be affected or damaged in a huge quantity while digging out soil or land by erecting these transmission lines. Transmission or extraction of such harmful rays or heat

could cause all those buried information or buried archeological resources (Gregory &Winterfeldt, 1990).

Health Affects

Arrangement and Mechanism of Transmission Lines in New Zealand

Transmission lines and its network could be observed in every part of the world. From Asia to Australia, from United States of America to Europe, from Africa to Middle East, Russia and many more. New Zealand also got a well-organized and well set transmission line system and a network of grid stations. The national grid system of electric power transmission in New Zealand is organized or fitted all over the country. This system of transmission lines or national grid is owned, operated and maintained by the state-owned enterprise Transpower, New Zealand. There are total 178 substations and 11, 303 kilometers of transmission lines that are being set or fitted with the different cities of the country (Gregory &Winterfeldt, 1990).

For a better and equal treatment related to transmission lines or related to the National Grid functionality of the New Zealand, National Policy Statement on Electricity Transmission (NPSET) was implemented on 10th of April 2008. The major aim or purpose of this policy or statement is to organize or establish rules that are required for a better and equal transmission of electricity among different cities of New Zealand. Moreover, Contaminated Land Management Plan (CLMP) has also been developed to monitor proper and equal or fair treatment related to the transmission lines or grid station system throughout the country (Gregory &Winterfeldt, 1990).

The major focus of these plans or councils is to select best options for the transmission of electricity and also to provide a better place for the making

of grid stations. The availability of better requirements for transmission of electricity including grid station’s products, better transmission lines, good quality cables, and effective transformers at different areas. In addition efficient and professional team that is capable of handling, maintaining, organizing problem or any work that is related to the transmission lines. Finally the availability of the flow of electricity within these lines, as well as protective monitoring over the costs of electricity and the costs for the buying of these cables or transmission lines or grid stations and much more. These councils or statements also make sure that the different harmful activities that are mostly caused due to the transmission to protect the environment, society, ecosystem, and so forth (Dotzour , 1997).

Figure 1 New Zealand Electricity Prices

Source: http://en. wikipedia. org/wiki/Electricity_sector_in_New_Zealand

Methods for the Pricing of Electricity

Pricing methodologies involve several definitions or steps that must be kept in consideration.

- Any time maximum demand or use: This means providing full requirements or facility of electricity at every place or area in the country. The statement or the notice over this facility is mostly being taken after every 12 months. Means, how many kW of electricity or voltage is provided for the daily use of consumers or local people of the city? This survey is conducted to see whether how a company or a grid station is mostly related to its functioning by providing its facilities to the people.

- Avoiding the cost of Transmission: This provides a facility to the consumers or to the local populace or giving them a free hand not to pay bills on the

transmission lines or the transmission systems that play a vital role in the flowing of electricity. There are some companies or institutions that mostly cut costs or bills related to the functioning of transmission lines, as well.

- Point of Connectivity: This shows that point where connectivity occurs between different transmission lines. Like, most of the time, electricity comes through various grid stations. The electricity coming out of grid station composed of a huge amount of heat and quantity. In order to reduce this head and quantity or pressure up to normal condition or up to the normal state, different varieties of transformers are set at different places. These steps are mostly organized with great concern (Elliott & Wadley, 2002). The table 1 presenting cost estimated summary of Wairau scheme.

There are different methods that define separate rules for every sector or area conveying or provide the information about transmission lines or the consumers using these transmission lines or even the pricing methods.

Eastern Methods of Noticing Price Related to Use of Electricity

In the context related to the eastern parts of the nation, the consumers are divided into a separate group. There is a variety of consumer groups through which the pricing facility or requirement could be easily specified.

- Un-metered consumers,
- Those consumers are having a small or sole business or composing of a single house or property. The normal current or voltage required for these consumers is less than or either equal to three phase that is 60 amp,
- Those consumers having a strength or capacity greater than 60 amp but this capacity doesn’t cross the three phase comes in the category of 300

ampere,

- Consumers using more than 100 KVA with half hour metering system,

- Some consumers are individually priced.

Powerco facilities and provides ease to the local people or consumers by grouping them in to different sectors or groups. So that, there is no difficulty encountered while choosing the different rates or prices for different categories or groups of people. These groupings are mostly appreciated by United Networks Ltd (Elliott & Wadley, 2002).

Figure 2 Schematic representation of pricing procedure in New Zealand

Methods for Assigning or Allocation of Consumers

Consumers living in the eastern parts of the nation are assigned or allocated by whether Valley or Tauranga or both distribution networks depending on the grid station which is directly related to the consumer's ICP. Consumers are then distributed related to the usage of electricity among them. This clearly involves their personal properties, their business, the amount of electricity using in their business, different security systems and electricity using on it, transformer capacity and so forth (Furby et al., 1988; Powerco, 2013).

Source adopted: Powerco, 2013

Western Methods of Noticing Price Related to the Usage of Electricity

Similar to the eastern division or grouping for those consumers living in the eastern parts of the nation, western category also have some groups or categories among which certain rules are applied that are specifically made for the consumers living in the western parts. The categories or groups are:

- Consumers using connections less than 100kVA,

- Those consumers using 100 to 299kVA of connections,

- Those consumers using connections or electricity greater or equal to 300kVA.

The basic aim or purpose of this western distribution is to check the functioning or using of electricity at different places. Like urban/rural areas, geography of connections and also determining or the noticing of different load connectivity such as supply voltage or individual demand for electricity. These groups simply reduce the difficulty level of setting different prices on consumers. Thus it also play an important role for noticing of different prices or costs related to different groups, areas and consumers (Powerco, 2013: & Wadley, 2002).

Costs and Funding Methodologies

Finding out the cost of transmission lines is almost similar to that of finding out usage of transmission lines. How electricity is used? On what objects or products the electricity is mainly used? The distance of a particular home or business spot from the grid station is noticed, as well. In this survey, the process becomes simpler when there is complete information related to every single aspect or related to the every single use of electricity is mentioned with full knowledge. The different aspects on which cost or price is generally distributed are:

- Property and Residential Costs: The major aim of the Transpower institution is to find out the different range of either property or other business. Depending on the range of these elements, costs or prices are mentioned with great interest.

- Operating and Maintenance Costs: Related to the different operating systems and operations of different appliances and other products also play an important role and could be used as a noticing element for different institutions while setting up costs or prices.
- Construction or Project Management Costs: During the construction or fulfilling any management projects, costs or prices of electricity usually increases. Therefore, these situations or conditions are being noticed for setting up cost or price limits (Furby et al., 1988).

Investment in the National Grid

The backbone for the national grid was developed in the year 1950's and 1960's. Transpower due to the backbone of the national grid has a huge capacity to perform and also has a great importance relating to the matter of transmission lines and the supply of electricity. As proper functioning of the flow of electricity is very important, therefore good quantity of investment is mostly required in order to provide a better environment for Transpower. For the better functioning and maintenance of the grid, good facilities must be provided. The major investment program for Transpower is as follows:

- In the recent time use or demand of electricity has drastically increased. It is also forecasted to be increased much more in the coming 40 years. Therefore, providing every facility to this institute would provide much better facilities to the consumers.
- Ageing of grid might need some concentration to take care of the system.
- There is a big need to connect or to discover such resources that are applicable or that are very important for the better working of grid station or Transpower.

The following proper statures have been adopted for the better functioning of these grid stations:

- Statures for transmission agreements,
- Statures for interconnection assets,
- Statures for outage protocol,
- Statures for transmission pricing methodologies.

Conclusion

The world is growing up consistently related to the matters of technology, discoveries and research. New discoveries, products, facilities, and comfort are in progress to facilitate human beings.. Transmission lines, highly advanced methods, fiber optics and much more are in use by the human beings to eliminate every discomfort. But with the increase in the facilities and technologies, huge number of defects or fatal disease are coming up in both human being and animal world including plants, birds, insects and much more. Digging out soils, blasting mountains, use of advanced weapons for the fitting of these transmission lines could cause human environment a lot. With the increase in the facilities and technologies that are consistently being used by the human beings, there is also an increase in the costs or prices of all those products that facilitate population. By the passage of time after using such facilities, the importance or the life facilities are becoming dim. The decreasing facilities and with the increase in the defects in the human environment is an alarming point for all the human beings living on this earth (Gregory &Winterfeldt, 1990).

Recommendations

For transmission lines, there should be separate places or areas must be selected. Those areas covered by populace, plants or trees or even by water animals must be kept safe and well clear. Certain rules and regulations or laws must be developed so that these areas are kept under observation. The rules and regulations must be adopted during the electing, fitting, organizing and maintenance of these transmission lines. Prohibited areas for the fitting of transmission lines must be kept safe. Groups related to the consumers or those people who mostly use these transmission lines or electricity must be well informed related to the costs and prices and the fluctuations in the market values of electricity and also the oil or soil values must be kept in to the consideration.

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