Study of the process of pricing on the power transmission in basis of POC

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Abstract: The electric power industry provides the production and delivery of electricity energy, often known as power, or electricity, in sufficient quantities to areas that need electricity through a grid connection.The system "point of connection" is one of the most important grids. In a competitive energy market, if a reasonable framework about the power transmission does not be presented, power manufacturers would not have any motivation to generate power or absorbing the radioactive power; Hence Independent. Electricity System would have problem in the stability of voltage and accessibility of voltage profile. It's over two decades passing from the reconstruction of electricity industry in various countries, in which the transmission network is the main topic involved in the electricity industry. However, the cost of transmission involves low percentage of system price; anyway it is highly important in electricity market. Hence, transmission pricing has to be an acceptable economic index applying through market, in which making decisions about determining the resources, developing and enhancing the systems would be possible. In recent years, various approaches of transmission pricing have been presented and applied. In this article, we have attempted to present the transmission pricing through the method "point of connection." In this paper, we have observed the method "The Point of Connection (PoC) ", in which transmission pricing mechanism through PoC lends itself to the requirements of the Tariff Policy ; PoC mechanism has already been used in the power exchange based transactions. The charges through the method "PoC" need to be applied across all types of transactions long term, medium term and short term including the power exchange. Transmission charges are based on the location of various generators and demand customers in the grid capture utilization of the underlying resources.

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Introduction

Initially transmission lines were supported by porcelain pin-and-sleeve insulator similar to those used for telegraphs and lines. However, these had a practical limit of 40 kV. In 1907, the invention of the disc insulator by Harold W. Buck of the Niagara Falls power corporation and Edward M. Hewlett of General Electric allowed practical insulators of any length to be constructed for higher voltages.[32][26] By 1914 fifty-five transmission systems operating at more than 70kV were in service, and the highest voltage then used was 150 kV. The first three-phase alternating current power transmission took place in Lauch hammer and Riesa, Germany in 1912. On April 17, 1929 the first 220 kV line in Germany was completed, running from four cities. The masts of this line were designed for eventual upgrade to 380 kV. The world's first 380 kV power line was built in 1957. Ten years later, 1967, the first extra-high-voltage transmission at 735 kV took place on a transmission line. In 1982 the first transmission at 1200 kV was in the Soviet Union.The rapid industrialization in the 20th century made electrical transmission lines and grids a critical part of the economic infrastructure in most industrialized nations.[19][30]

In the early years of electricity emergence, using electricity energy and power transmission within consumer voltage was possible, through this some regions were supplied with DC power, and this was due to the point that increasing DC voltage was impossible at those days; As different types of consumers such as lamps or engines needed various voltages, so a distinct generator was better to be used, which this could annihilate using the grid to generate electricity for consumers. In 1888, Nikola Tesla presented his paper **"**the modern system of alternating current systems and transformators" in AIEE community, and he defined the advantages of using this system.Later, Westinghouse Company. recommended the first system of frequency current, in which A transformer is a power converter that transfers electrical energy from one circuit to another through inductively coupled conductors—the transformer's coils. A varying current in the first winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic field through the secondary winding. This varying magnetic field induces a varying voltage in the secondary winding. It could be said that while new technologies have eliminated the need for transformers in some electronic circuits, transformers are still found in nearly all electronic devices designed for household voltage; in which Transformers are essential for high-voltage electric power transmission, which makes long-distance transmission economically practical. The possibility of economic usage through mass manufacturing was provided through centralized powerhouse. Today,

energy is a fundamental and infrastructure issue, and countries‘s political and economic structure relies on the way of accessibility to energy, consumption and price of energy. Also, in developing and developed countries, energy and all the related issues to energy are effective in all development policies. Currently, economy alteration, energy security and easy access to energy are stimulus issues in all around the world, in which Access to cheap energy has become essential to the functioning of modern economies, and here it could be mentioned that energy consumption is considered for the availability of natural resources for energy consumption. Electricity pricing varies widely from country to country, and may vary significantly from locality to locality within a particular country. There are many reasons that account for these differences in price. The price of power generation depends largely on the type and market price of the fuel used, government subsidies, government and industry regulation, and even local weather patterns. Electricity prices vary between countries and can even vary within a single region or distribution network of the same country. In standard regulated monopoly markets, electricity rates typically vary for residential, commercial, and industrial customers. Prices for any single class of electricity customer can also vary by time of day or by the capacity or nature of the supply circuit. In economic terms, electricity (both power and energy) is a commodity capable of being bought, sold and traded. An electricity market is a system for effecting purchases, through bids to buy; sales, through offers to sell; and short-term trades, generally in the form of financial or obligation swaps. Bids and offers use supply and demand principles to set the price. Long-term trades are contracts similar to power purchase agreements and generally considered private bilateral transactions between counterparties; Studies show that generally demand for electricity is driven largely by temperature.heating demand in the winter and cooling demand (air conditioners) in the summer is what primarily drives the seasonal peaks around the year in most regions, in which it could be concluded that Electricity pricing in household was considered within climatic changes.

An electrical grid is an interconnected network for delivering electricity from suppliers to consumers. It consists of three main components: 1) power stations that produce electricity from combustible fuels or non-combustible fuels; 2) transmission lines that carry electricity from power plants to demand centers; and 3) transformers that reduce voltage so distribution lines carry power for final delivery. A town is only said to have achieved grid connection when it is connected to several redundant sources, generally involving long-distance transmission.

Existing national or regional grids simply provide the interconnection of facilities to utilize whatever redundancy is available. The exact stage of development at which the supply structure becomes a grid is arbitrary. Similarly, the term national grid is something of an anachronism in many parts of the world, as transmission cables now frequently cross national boundaries. The terms distribution grid for local connections and transmission grid for long-distance transmissions are therefore preferred, but national grid is often still used for the overall structure. The electric utility industry seeks to take advantage of novel approaches to meet growing energy demand. Utilities are under pressure to evolve their classic topologies to accommodate distributed as generation becomes more common from rooftop solar and wind generators, the differences between distribution and transmission grids will continue to blur. Also, demand response is a grid management technique where retail or wholesale customers are requested either electronically or manually to reduce their load.since the emergence of electricity in industrial age, the electrical grid has evolved from an insular system that serviced a particular geographic area to a wider, expansive network that incorporated multiple areas. At one point, all energy was produced near the device or service requiring that energy. In the early 19th century, electricity was a novel invention that competed with steam, hydraulics, direct heating and cooling, light, and most notably gas. Interconnected network is a group of distribution networks in areas which all operating with alternating current (AC) frequencies synchronized,so that, peaks points would be occurred at the same time. This allows transmission of AC power throughout the area, connecting a large number of electricity generators and consumers and potentially enabling more efficient electricity markets and redundant generation. Transmission lines, when interconnected with each other, become transmission networks, these are typically referred to as “power grids” or just "the grid", and also this network is known as the "National Grid." A power station, also referred to as a generating station, power plant, and powerhouse or generating plant, is an industrial facility for the generation of electric power. At the center of nearly all power stations is a generator, a rotating machine that converts mechanical power into electrical power by creating relative motion between a magnetic field and a conductor. The energy source harnessed to turn the generator varies widely. it is essential to mention that power station is a site, in which the electric equipments including transformers, electronic keys, measurement devices, capacitors, input and output

lines of reactors could be utilized in electricity distribution and transmission. [12] Nicola Tesla is best known for many revolutionary contributions in the field of electricity and magnetism in the late 19th and early 20th centuries. Tesla's patents and theoretical work formed the basis of modern alternating current electric power (AC) systems, including the polyphase power distribution systems and the AC motor.In recent 100 years, electricity industry had come into a fundamental principle for modern societies‘s advancement, in which Many households and businesses need access to electricity, especially in developed nations, the demand being scarcer in developing nations. Currently, two factors “economic and ecology “influenced on the governments to make policies in order to use energy resources, which this would help the distribution companies to implement the management programs of power and electricity. The results of implementing these policies and application of modern technologies would be manifested in future; these policies would put influence on all the aspects of power system such as protection, control, and tariff structure and enterprise procedure of power system. Through this, planning the distribution network would come into a modern issue. An electric distribution network is a system of cables which deliver electric power from its point of generation to the end users. It comprises high voltage cables, cable splices, network transformers, network protectors, manholes and service boxes. The entire network consists of the following parts; generation plant, long-distance power transmission lines, substations and local power lines. In the early days of electricity distribution, direct current (DC) generators were connected to loads at the same voltage. The generation, transmission and loads had to be of the same voltage because there was no way of changing DC voltage levels, other than inefficient motor-generator sets. Low DC voltages were used since that was a practical voltage for incandescent lamps, which were the primary electrical load. Low voltage also required less insulation for safe distribution within buildings. In transmission system, there are a variety of energy resources, which extensively have been utilized in the transmission system, and current in transmission lines could generate new currents. [31]

Main body

Demonstration of validity in power system is highly significant, means that all the reasonable occurrences such as defects in transmission lines have to be observed, and we have to be assured that taking a line or generator would not make any problem in electricity system, and silence would not be occurred.In the late 40 years ago, transmission system faced the modern technologies such as particular designs, which this caused the validity be increased. We have to observe the way of planning the distribution network within same complexities comparing to transmission systems. With the emergence of intelligent network‘s technologies, the load flow in low pressure levels of network would be two-directional, and energy resources such as generators would be installed in various networks.In addition, Automotive Electrical Technologies, automotive equipment distribution network and Demand Response Programs Implementation are the factors in alteration. Furthermore, electric indices of renewable technologies are highly increasing, and in future they would be altered as well.The increase in manufacturing resources would put the direct effect on network‘s optimal productivity and planning.The planners in the extent of power system, needed to be informed of the network data such as loading, validity, voltage control and power quality in all the networks. Also optimal capacitor placement could reduce the wastages and increase the validity of network.The advancement in energy technologies has lead to the optimization and network control within high validity, the equipments such as Liquid Metal Battery, sodium sulfite Battery, and vanadium battery are all involved in these technologies with high response time, and distinct charge and D-charge indices. Hence, through the points such as micro-networks, compensation of uncertainty in renewable resources and unification of network; energy technologies would be changed to the network‘s optimization power.Industrial loads could install various generators in their site and form a micro-network. While micro-networks are interconnected to network, in this case they could be utilized. We have to provide more studies about planning the renewable energy resources in micro-network within implementation of load response. While automotive distribution network could identify the maximum error in distribution network, in this case optimization would be realized. The network ‘s reconstruction schemes could avoid long emergence of errors in network.The hypotheses of this research are forward to finding the transmission pricing along with electricity prohibition. Also, The process “POC” would be realized along with creating the pattern of constant electricity current average, and improving the electricity transmission along with internal supply chains would be an important affair involving the research‘s hypotheses.

In base of electricity pricing, many studies have been accomplished in which they are divided into long and short term pricing. Surely, the studies have been accomplished in electricity industry. In long term pricing, due to little amount of productivity cost, the reactive power has been disregarded comparing to

real power.In 1997, the theory and application of real power pricing has been presented. The accomplished studies are based on the optimization procedure of traditional systems in electricity industry. In the other word, two articles have been presented about procedure of using the "the theory of connection point pricing" and "limited costs". In this research, using the " the theory of connection point pricing " through limited costs, a new method in electricity transmission pricing, has been presented in a way that the accessibility to the best profile and voltage constancy has been provided at least time.Hence,determining the marginal cost has been designated, and it would be specified in power system.The locational marginal prices of real and reactive power at any bus and at any time interval are the marginal costs of supplying the real and reactive powers respectively, at that bus and at that time and are the by-products of the solution of the market dispatch problem. Also, technological and economic conditions have been lead to the point that some countries buy the electric energy through country's transmission network. A great deal of studies has been accomplished about this issue. In the other side, observing the impact of electricity transmission through the third country's transmission network is highly important. Particularly, determining a reasonable rate based on the type of consumer's consumption type is considered in electricity Transit affair. In this article, to display the way of electricity consumer's role through consumer's static modeling of load, the real time of real and reactive power has been considered.

The concept of local transmission price

This price in the process of using the transmission lines and different elements show the process through generator, in which this process would be realized through the results of real electricity trace.The cost of line transmission in IM services, is related to the cost of investment in operation costs and maintenance.real electricity trace makes the distribution of this price possible. ϭ is the fraction in which the price of network is divided through loads, and we could assume that loads could create the costs, anyway this would develop a same definition for generators. P_{LM}^{2} is the real marginal cost (mw) through the element of IM network in S simulation condition

$$C_{Im}^{-L,(s)} = \frac{\beta TC_{tm}}{p_{tm}^{r,(s)}}$$

Also the cost of using transmission per MW form LM element of transmission, would be applied in S condition, and all the costs of using the system for load I would be obtained through the following formula:

$$TC_i^{-L,(s)} = P_{L_i} \sum_{vim} y_{tm}^{i,(s)} C_{tm}^{-L,(s)}$$

The local transmission price (ltp^i) for the load base in S condition would obtained within dividing above formula to p_{li}.if the simulation be accomplished for N_t condition, then the average of LTP^i would be presented as following:

$$LTP^i = \frac{1}{N_t} \sum_{s=1}^{N_i} LTP^{i,(S)} \; S/MW$$

Using the method "topology generation distribution factor "based on the participation principle is relevant for calculating $LTP^{i(s)}$, and these would be shown as LTP_p^i, so the following equation would be obtained:

$$LTP_p^i$$

In PoC transmission method, the more the voltage is, the less current would be in the transmission wires; as a result, the losses of I^2R line and also voltage reduction would be reduced; also decrease in wire section would decrease the weight of disposal wires. Producing generators with high voltage (more than 20kw) would be technically inaccessible. For the high-voltage transmission, increasing the voltage transformer would be applied in the beginning of the line. After the transmission process by airlines in the public places, voltage would be decreased, and this is due to the point that high-voltage lines would not be safe to apply in cities [15] [34].

The aim by transmission is a set of these high-voltage lines along with posts, transformers, rigs and related places, which transmit electric energy in large scales. Today, it is said that lines in Iran include 230 and 400kv. So the higher voltage increase, the fewer the loss rate would be. However the costs of the transformers in the beginning and end of these lines, and also other equipments would be increased. So, the space between wires and their height from the surface would be increased as well.

PoC method for power transmission almost is as old as power generation. In the early 20s Nicola Tesla suggested using big couplings for power transmission in household through atmosphere's troposphere layer. Even he started to build a tower called Warden Kleif in the Long Island New York, which was a big communicative tower, in which he was able to examine his theory of power transmission. However this process was cut when his sponsors found that there is no way to be ensured whether people would pay the charges of power or not; then the wire power transmission was developed.

PoC gained power again in 1960s, when a miniature helicopter was created, which was received microwave radiation from the earth. Some people were claiming that one day we would be able to

provide required energy of our spacecrafts through illumination of laser radiations. Hence, many theoretical works was done on the illumination of radiation to the earth which absorb the solar energy. Although, earth to earth transmission of wireless power in long distances need to high cost infrastructures; Also existing concerns about safety of power transmission through microwave radiations did not let the advancement come into this theory [18].

However in the near future a wireless transmission grid would not be applied, energy illumination theory would be developing rapidly. This mainly would be as a result of developing wireless communications including Wi-Fi, Bluetooth and electrical orbits, which are going to be smaller and smaller as time goes. Now the power cables are one and only hedges in this way, which this matter should become completely portable.

Methodology

Due to high costs and voltage reduction, Transmission pricing would be increased from the levels within high voltage to lower voltage, and supporting policies would make the farmers free from paying the costs, and in this case the lowest amount of energy costs would be belonged to farmers in comparison with other consumers, in a way that the average of all the country‘s electricity rate was 22 Rial in 2008, in which industrial and public parts would be provided with financial portion.[8]

Effective factors in the structure of electricity pricing could be divided into external and internal factors; internal factors are due to the way of electricity energy supply, and external factors rely on consumers. Through this, the role of external factors is highly important.From the external factors, consumers‘s consumption situation, the desirability in base of consumption and financial resources to respond demand of electricity’s consumers could be mentioned. Marginal cost of electricity energy would be influenced of external factors. Hence, due to the effect of external factors, particular attention has to be taken to the structure of electricity tariffs.[4][7] In recent years in Iran, due to relative economic reduction in industry, energy consumption was reduced ; in contrast due to population increase, so the energy consumption in households was increased at peak times, which this lead to the increase in consumption comparison at peak and normal times.this could increase the investment costs and marginal cost as well. In practice, if electricity identifies as an economic good, so the tariffs have to be relevant with current and fund costs of Electricity Corporation, surely not with the governmental office of electricity. We have to mention the point that, reviewing the social and economic considerations of determined tariffs are lower than the marginal cost of electricity, in which this would be lead to the financial limitation in electricity industry, and it could be highlighted that not only investment costs would not be involved in tariffs, but also the current costs would be influenced in this process as well, and the maintenance of electricity institution’s services would be in danger. This problem in base of investment would be manifested at the time that government determines product‘s price, which this would deny the role of supply and demand market in order to determine the price, in which the redundancy of private part would be manifested. Investors are concerned about all the available problems in supply and demand market in electricity and energy parts. [11][12]

Surely, it has to be noticed that the economic marginal cost would be calculated in base of electricity costs and tariffs. In this method, costs would be divided into two parts of current and finance; in which current costs would be divided into constant and varied group, and due to cost reduction, the marginal cost would be calculated in generation, distribution and transmission parts.In following regarding the consumers‘s condition and other consumption properties such as load, consumption energy and the number of consumers, the marginal cost would be calculated for each of consumption parts. Post calculating the marginal cost at the current activity level, the investment marginal cost would be also calculated within real value.

Mathematical modeling

Modeling the limitations of optimal trace problem

To trace the electricity current, two versions has developed “generation trace and load trace”, and the equality limitations would be classified as followings:

1-the limitations of current properties ; these limitations would be developed for the alternating indices such as lines and transformers, and these limitations would not mean ever for the generation trace problem, and these limitations are as followings:

$$p_{im} = \sum_{k-1}^{nc} x_{lm}^{k} . p_{c_k} v \; set \; of \; lines$$

The similar limitations for load trace problem would be developed as following:

$$p_{im} = \sum_{l-1}^{ni} y_{lm}^{k} . p_{Li} v \; set \; of \; lines$$

2-limitations for resource properties ;these limitations are related to shunts like generators and loads, and for trace problem, generating these limitations announce the generators role in loads, and this limitations would be presented as following:

$$p_{L_i} = \sum_{k}^{n}$$

Similar limitation for load trace problem would be developed as following:

3-protecting the good's current limitations: protecting this current would lead to the point that in a multi-good network within nodes 's zero capacity, protecting the current limitation for all the good 's current factors would be protected, and unequal limitations would be related to current limitations,and due to the point that the problems such as generation trace and load trace show two distinctive problems, so there would be integration between results, and this would be achieved through presenting the unequal limitation, in which the good points would be shown [25].

Objective function

Total cost of network transmission through loads would be paid like TC^L, which this would be clear from the first and would be presented as following:

$PLMP^{i.(s)}$shows LMP simulation of I load in S condition which is as follows :

$$\sum_{i=1}^{n_L} pLMP^{L,(s)} p_{L_i} = Tc^L$$

$PLMP^{i.(s)}$ shows low scaling of $LMP^{i.(s)}$through Y, which is shown as following:

$$\sum_{i=1}^{n_L} yLMP^{L,(s)} p_{L_i} = Tc^L$$

Hence, the following would be resulted:

$LMP^{i.(s)}$ Coefficient in Y factor, shows that the space alteration pattern would be saved in $LMP^{i.(s),}$ and according to the presented principles, the result of optimal trace shows that $PLMP^{i(s)}$ has to be verified for all bus loads, Hence the objective function would be obtained through following:

$$\min \sum_{i=1}^{n_L} pLMP^{L,(s)} - LTp_O^{i.(s)}$$

where $e_1 LTp_O^{i.(s)}$ $is\ given\ as$:

$$LTp_O^{i.(s)} = \sum_{vim} y_{Lm,(O)}^{i,(s)} C_{Im}^{-l,(s)} \text{S/MW}$$

The solution would be measured with the solution in LMP simulation pattern through P forms of various forms, and because this would be lead to optimization matter in a minimum value (LAV), in which this would be lead to linear programming. [25][21]

Power transmission through "point of connection "

A connection point object contains data about one or more instances of a service available on the network. The object class connection Point is the abstract base class from which objects representing connectable resources in Active Directory Domain Services are derived. Point-of-connection (POC) scheme of transmission pricing in decentralized markets charges the participants a single rate per MW depending on their point-of-connection. The POC tariff based on distribution of network sunk costs by employing conventional tracing assures recovery of sunk costs based on extent of use of network by participants. However, the POC tariff by this method does not accommodate economically efficient price signals which correspond to marginal costs. On the other hand, the POC tariff, if made proportional to marginal costs alone, fails to account for sunk costs and extent of use of network. Since, real power tracing problem is amenable to multiple solutions, it is formulated as linearly constrained optimization problem. By employing this methodology " point of connection ", consideration of extent of network use and sunk cost recovery are guaranteed, while objective function is designed such that the spatial pattern of price signals closely follows the pattern of scaled locational marginal prices. The methodology is tested on IEEE 30 bus system, wherein average power flow pattern is established by running various simulation states on congested and un-congested network conditions.

Discussion

Others are optimistic about practicality of power transmission through (Point of Connection) PoC method for portable tools, which are portable between rooms and door constantly. Mono Terfez, the head of Holland's wireless power consortium, says "An infrared radiation would not be suitable to charge a mobile phone, because it has no certain space". Power-beam solution is to put a small fluorescent lamp into the receptor, so that, the camera installed in the transmitter would be able to sepearte it and send the laser radiation toward the same side. Another problem is that, to charge each device, a separate radiation should be sent; this problem at the statement of Aristidis Caralis from MIT, would be troublesome for engineers. He already is working on an alternative system of wireless transmission of power. [10] [11]

The third possibility is magnetic induction, which is the most attractive choice for the main local applications. An alternative magnetic field, resulted from a coupling, would induct the electric current in another coupling. This is a method, by which many devices such as electric toothbrush and even mobile phones would be able to charge their batteries. however the efficiency of coupling devices is considered desirable, while within even several mm space, the efficiency in these devices would return to zero range. There is a common element; if two devices have resonance in a similar frequency, the transmitted mechanical energy would be increased. When an Opera singer makes a glass to vibrate by his/her sound, in fact this element has been applied.

Caralis et al tended to increase the efficiency of magnetic field in the larger spaces. The research group has used an inductive coupling connected to a capacitor. The energy in the orbit would vibrate quickly between an electronic field in the capacitor and a magnetic field in the coupling. The frequency of this vibration would be controlled by capacitor's ability to load save and coupling's capability to create a magnetic field. If the frequency of transmitter orbit be different from the receptor's frequency, the resonance would not be happened. As a result, the sent energy from transmitter would not be in the same phase of receptor, so they would neutralize each other. The research group has observed that if both receptor and transmitter be resonance, fields in both couplings would be synchronized with each other; it means that their intervention would be constituent and the rate of transmitted energy would be increased.

In 2007 they had examined their theory successfully and this result was obtained as the transmission of 60w in 2m space and efficiency of 50%. The group after developing the theory, put the effort to establish a company called WiTricity. Last year the company applied two square coupling within 30cm, one in the transmitter and other in the receptor to feed a 50w TV with efficiency of 70% in the half meter away from power source. Contrary to laser energy transmission, which required direct view, magnetic field would not be centralized on the receptor; also barriers could be passed between receptor and transmitter [22].

Large electronic companies also were interested in enterprise on the PoC method. For example, Sony has presented a wireless TV and Intel is going to enterprise on this technology to produce certain tools. "The efficiency of energy transmission is different from the power rate, so we are able to apply this approach for Laptops, electronic devices such as TV; also they could be applied for portable devices like mobile phones". In the other word, the efficiency of energy would be same to feed a big plasma TV and a small PDE using resonance.[30]

With regard to such efficient approaches, it could be mentioned that power transmission by PoC play an important role in our life. Now there is a technical standard called QI, for non-resonance magnetic induction, also adaptable webs would be available as soon as possible. Other approaches would not be presented here, but we would present similar standards for them [21].

Input power of grid

Electric power would be produced with low voltage about 30kv in the powerhouses, then it would be increased up to 115-756kv by post-power transformers regarding to path length and other factors of grid, so that it would be possible to transform it toward long paths [19].

The output of transmission grid

As the transmission lines approach to cities and public places, the voltage would be decreased in several stages to improve safety. These decrease stages include 400-230kv, 230-132kv, 132-63kv and 63020kv respectively. In the final stage or distribution stage, Transmitter transformers would decrease the voltage from 20kv to consuming power or 231-400v. In the other countries also consumer's voltage is 100-600v. [16][30]

Limitations

The rate of transmittable power in a line is limited and this limitation would be changed according to the length of transmission line. In a short transmission line, the heat which has been created resulted of current power, would create a limitation; because the more the heat the more wires would be bended, so they would approach to the ground. This could be hazardous; also conductors may be melted because of high power current.

In the transmission lines with mid length about 100km, limitation would be related to voltage's decrease rate; in the long transmission lines stability would be the most significant issue in the grid. The angle between phases is relatively fixed in a 3phase system and its extra changes would lead to develop instability in all grid. In the long transmission lines, phase would be changed according to grid's power; this would develop limitation in a long transmission line. To improve power coefficient during a transmission, we should apply equipments such as capacitors for coefficient modification. In the HVDC, there is no limitation for line's power coefficient, the one and only limitation would be related to voltage drop and joule losses. [21] [17]

HVDC

HVDC transmission would be applied to transmit electric energy in large scales and long paths,or to connect two uncoordinated AC grids. When energy transmission should be applied in long path, DC transmission method is more economical because of fewer losses. In this case, the costs of loss reduction would be a compensation for costs of energy conversion from AC to DC. [25]

Another advantage of making grid stable would be connecting two different AC grids. For example, if two AC grids from two country be connected to each other, grid would be under instability, but this problem would be resolved by HVDC; in this regard, electric energy of seller country would applied in the DC form, then after transmission it would be returned to AC form.

PoC technology also includes some hedges. In one reason you may ignore the concern about

transmission of relatively powerful radiations of energy from atmosphere, for example considering laser transmission Caralis says "high energy, aggregated in the laser radiations, could hurt individual's health seriously". However this issue would not be dangerous in the power-beam products. If the small camera on the transmitter could not be able to observe the small lamp on the receptor, instead, it would turn the laser off in the thousand times per second. To increase safety, if receptor receives laser radiations untended, a massage would be sent to transmitter.[21]

Being under the radioactive radiations and magnetic fields, would be also dangerous potentially. If they send heat to our cells, they could damage our tissues over long times. Considering this issue that the rate of radiation, created by companies like Vitericity, is less than standard rates, in this case we would not be in danger. However this fear exists that electromagnetic fields may hurt our tissues through another non-thermal mechanism like concerning about mobile phones. Since there is no wide research to examine long-term hurts, the researchers had to rely on lab researches, in which no clear and continuous effect have been found. So it remained unexplored to understand that whether microwave radiations are harmful or not. However more concerns may be related to environmental issues. As the earth is going to be warmer day to day, many people would look for an approach for energy efficiency and saving, so that, they could reduce the distribution of greenhouse gases from powerhouses. For some individuals, wireless transmission of power would be a turn to back, considering its losses. [19][31]

Conclusion

Pricing the power transmission through PoC method in the decentralized markets, would determine a unit rate for costumers, which this rate would be per MV, which this would be based on PoC.

Using high costs to post stamps in the form of PoC loads, would not be an appropriate pricing method. Thus, in this article we found that PoC pricing based on grid distribution, would be applied by a normal trace ; this method should be based on the rate of costumer's applications. On the other hand, if the PoC creates marginal costs for costumers, the grid would not be available for costumers.

Here we could apply real energy trace. This method is in a linear optimizing approach. Also, along with pricing the power transmission through PoC method, it could be recommended to use grid, in which high costs would be reduced. Additionally, we could use grid simulation for this purpose as well. The costs of power transmission would be provided through various sources, which is evaluation of production costs in PoC or in grid's power. These costs include initial costs of transmission, discount rate and also fuel, maintenance and using power transmission.

Energy costs include the costs, in which power would be produced from certain sources and these costs include following costs;

Initial cost, cost of power transmission, fuel cost and maintenance cost, which are calculated in LEC, L_T, M_T, F_T, E_T, R and N respectively as following:

Average costs of power production, initial costs in year T, maintenance and using costs in year T, fuel costs in year T, power transmission in year T, discount rate, system's life time. PoC of an orbit should be equal to a set of uniform and zonal charges, as determined by Central Board, and this fact has been shown in following formula :

PoC rate (PoC) = m*Uniform charge+ n*Zonal charge

Where m and n are the fixed specified in the regulation which is 0.50 for initial two years of application of the PoC methodology.

The combination of uniform charges should be calculated in the PoC charges. PoC should include 50% uniform charge and 50% charge which have been obtained by HIBRID method.

Finally, pricing the power transmission by PoC is an essential factor to determine market's tariffs. PoC mechanism would be applied for energy transmission in transactions; This mechanism should be applied in all power transactions. It means that it should be applied in long-term, short-term and also mid-term transactions. Charge transmission by PoC depends on the location of producers and also costumer's application for the grid. Applying PoC mechanism for power transmission would improve the range of grid,and would be useful for costumers as well. It should be mentioned that PoC tariffs would be applied based on charge analysis and costumer's applications for the grid.

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