

Sub: POWER THEFT AND ENERGY MANAGEMENT

CODE; REE-086

SOLUTIONS OF QUESTIONS

Q.1.A. List the different source of energy.

ANS: The followings are the source of energy:

- i) Fossil sources like coal, gas, oil and nuclear energy.
- ii) Non conventional energy sources like Solar, Wind, Ocean thermal, Geothermal, Tidal energy, Magneto hydro Dynamic, Chemical Energy sources and thermo electric power.

Q.1.B. What is power theft or pilferage?

Ans: Altering, modifying or damaging in any style, interfering with or upsetting the function or composition of any authorized metering device for measuring or registering the utility service is called power theft or pilferage

Q.1.C. What are sealing and tampering in power system?

Ans: Seals on the meter are watchdogs and are not expected to act as lock to any forceful entry but are tamper Evident Seal (TES).Lead seals are used, the seals disclose the history only when the utility sleuths inspects it next time.

Tampering in power system is damaging the metering system in any style or form meant for recoding or measuring purposes of power.

Q.1.D. What is harmonics and how it affect the power losses?

Ans Harmonics are the integral multiple of fundamental frequency. When electric current pass through any circuit, there will be some losses depending upon the load circuit. Due to vibrant characteristics of load the current wave become complex in characteristics and are super position with the fundamental frequency causing +ve, -ve and zero sequence current and develop power losses.

Q.1.E. List the types of power meters.

Ans: Following are the power measuring meter. i) Electro-Mechanical meter, ii)Electronic meter, iii)pre-paid meter, iv) Smart meter v) Tri vector meter for measuring apparent, active and reactive power

Q.2.A . Explain energy demand, supply, crisis ad future scenario

Ans; SUPPLY: The quantity of energy supplied is the flow of energy brought onto the market.,

DEMAND: The quantity of energy demanded is the amount of energy purchased for a particular period of time.

CRISIS: It often refers to a decrease in the supply of electricity as compared to its demand.

Future scenario: In the next decade India needs to increase the generating capacity to 1100GW about 2.5 times more than that of today. We have to depend upon the coal, gas and nuclear power sources in future, lot of the solar plants are being put into the national Grid. The Indian power sector needs huge investment. Foreign investment and private participation can solve this problem to some extent.

Q.2.B. Explain Menace of power theft and reason of power pilferage.

MENACE OF POWER THEFT: There is power theft all over the world. Like any commodity electricity can also be stolen. Generally power sleuths find it hard to believe and still hard to prove it. The total energy loss including theft all over the world was 1148.58 billion units in 2004. The energy loss and theft rose to 85% during the last quarter of century. It was just 617.68 billion units in 1980. India is losing almost half of its production. Power theft is a crime in terms of cost and safety. All utilities know the pain of power theft. Study shows 80% of total power theft detected all over the world is from dwelling places and 20% from commercial and industry.

REASONS OF POWER THEFT:

i) For saving utility bill. ii) Where electric bill plays a major role in the cost of production of industry (e.g. Steel, ice factory, plastic injection moulding) iii) To overcome certain regulations (especially during power cut and during peak load) and restrictions. iv) To avoid consequential taxes. (In paper mills labor charges are paid based on units consumed in a day) v) For social and psychological reasons and purporting a false image in the public. vi) Some people do it as a sign of revolt and try to justify it as they feel they will not get caught.

Q.2.C. What methods power thieves use in electromagnetic metering?

Following are the methods applied for power theft in E-M meter: i) power is multiplication of voltage and current. so disturbing the voltage and current circuit. ii) By passing the meter outside style iii) bypassing the meter inside style. iv) Drilling hole in the meter v) insertion of film into meter. vi) Lopping of supply from incoming wires. vii) Direct Tapping from incoming wires and service wire. viii) Theft by connivance of utility staff. ix) Energy meter tampering a) partial earth fault b) missing neutral c) cross potential methods. x) Direct tapping from overhead.

Q.2.D. What methods power thieves use in electronic metering?

Following are the methods applied for power theft in Electronic meter: i) By changing the multiplication factor. ii) Altering the burden of C.T. iii) Providing shunt across C.T. iii) By removing the C.T. By suppress effect on C.T. iv) disturbing voltage circuits. v) By means of electro static Discharge vi) By tampering PCB. vii) By tampering the frequency circuit and display circuit. viii) By interfering counter circuit. ix)

tampering of real time clock x) By using magnets and disturbing magnetic field. Many other types of methods are being adopted in pilferages.

Q.3.A. Explain electricity loss and theft-National and Global Scenario.

Ans: The demand for electricity will continue to grow at least until 2050 and may double according to various studies. It is challenging for utilities how they meet the future needs. Of course SMART GRID has the potential to challenges but reducing loss level is an equal challenge to face. Smart grids could bring major benefits over conventional technologies..

Most consumer pay for the amount of electricity they used for fixed period of time. There is no information 'how' and 'when' they have used it. There is no chance to arrive at 'how demand can be shifted by verifying the utility bills.

The demand for electricity in India may shoot by 509% and in China 231% by 2050. For middle east it will be 310% and US expects 35% and so is the OECD Europe. More electricity is produced in the system than what is in fact consumed. The difference is losses. In India 33% electricity generated is wasted where as in US 10% and 18% in middle east.

Q.3.B. How to control the power theft?

Ans: The ways to eradicate the power theft are social awareness, stringent laws and effective anti power theft operation. Electricity worth millions is siphoned off by various methods, ranging from hooking the overhead lines to sophisticated techniques. Followings are methods to control theft :

i) Tapping of supply or looping line from the service wire and cable are the major nuisance for Utilities. By means of TDR(Time domain reflectometer) and FDR (frequency domain reflectometer) theft point can be located.

ii) RFID methods: It consist of three component (a)A tag ,(b) reader?intrrogator and,(c) the supporting infrastructure.

iii) Energy audit and GIS: The mismatch between the sending end energy and total recorded consumption at various level can be understood by energy audit.

iv) Automated meter reading (AMR) and Smart Metering are heading for scrapping the manually read energy.

Q.4.A. Explain the Power theft in voltage circuit and by-passing meters with diagram.

Ans: Power Theft in Voltage Circuit: The voltage coil is connected across the supply and has thin wires when compared to current coil. Links are provided in voltage circuit for facilitating calibration and tests. It was common practice to open the link in the voltage circuit and was positioned outside the meter. After feedback of theft Link were installed inside the meter and the meters are sealed so that it cannot be removed. Tampering can be monitored by close monitoring of the seals if seals are tampered.

By passing meter is the oldest type of theft and exist right from the beginning. It is an illegal act . In this a sorting link is done across the current coil so that major portion of the current is not allowed to pass through the meter and meter read less.

Diagram draw SOLUTIONS OF QUESTIONS

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Diagram as drawn and shown in class room.

Q.4.B. Explain Power theft by means of Electrostatic Discharge in electronic meters

Ans; In this a high voltage ant frequency are applied on the meter, creating an electromagnetic field. Due to this, electronic circuits get affected and even discontinue the recording process. This condition occurs if high voltage is fed through neutral of the meters. If meters are subjected to high electric field the EEPROM gets initialized and reading of meter is set to zero. The meter again begins reading normally and accuracy remain the same.

Q5. A. Explain power theft by drilling holes and insertion of film on E-M meters.

Ans: Drilling holes is a visible attack on meter. This is insensible methods of forceful entry cannot be erased or altered latter. The consumer can insert the foreign material inside the meter to obstruct the free movement of the rotating disc. There is a fine gap between the disc and magnet, even a small dust on disc can decelerate the movement of disc. To slow down the movement of disc materials used are pin, needle etc. This type of theft can be prevented by using suitable type of material while manufacturing the meter.

In E-M meter an aluminium disc rotates between the fine gap of magnets and movement is directly proportional to voltage and current, strips of celluloid film, plastic wire, dry leaves, tongue cleaner, pieces of sticks are commonly used to arrest the movement of disc and theft can be performed.

Q. 5B. Explain Power theft by tampering the frequency circuit.

Ans: Crystal oscillator is widely used in Electronic Metering due to its many desirable characteristics. It has high degree of accuracy and frequency stability. The measuring IC requires a particular frequency for accurate performance and the same will be indicated in their specification. For any frequency other than the design value, the accuracy of meter gets affected. If tampering is done on oscillator by way of disturbing thermal stability etc. or replacing the oscillator itself by another oscillator, the accuracy of measurement get changed.

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