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Power Outages

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Abstract:- Disconnected electric power from customers considered as one of the problems that happened and it is unavoidable and causes a lot of damages around the world.

I. INTRODUCTION

Power outage is known as cutting the electrical power to consumers, when problem occur in any part of the process from power plants to the point of customer delivery, caused power outage, such as shutdown in power generation, failure in the transmission system or a failure in the distribution system, cutting electric power to consumers also called a power cut, a power out, a power blackout, a power failure, a power loss, or a blackout.

Most power outages will take short time, but some type of power outages take much longer up to hours or days or even weeks.

During a power outage, customers suffers from many problems including heating, air conditioning, lighting, hot water, or even running water and Sometimes lack of phone service.

II. CAUSES :

There are several effects causes power outages:

1- Fault on a power lines

1.1 Distribution failures

Distribution failures known as problems that appear in end part of electric network, this type of outage are the most common type of power outage, but they usually affect small area, when trouble occur in medium voltage lines, low voltage lines and distribution transformers.

Distribution system is a network that feed separate areas with electricity therefore problem in this part usually have a limited impact , affecting just a few block of customers or a neighborhood, because this part is the end of the grid system of electric power and directly connected to customers electric cable.

This type of failure includes conductor cutoff, insulation breakdown, pole or tower crash and conductor loosen from insulator and transformers problem (transformer burn, link fuse element melt, circuit breakers trip due to over load or short in low voltage side). Sometimes outage caused by feeder or transformer over loading.

There is a linear relationship between the length of distribution feeders and outages and duration of outages, in some areas feeder length are above standards that give weak points which causes more problems, below table shows abnormal length of feeders in district in Iraq.

Name of sub station	Feeder voltage in kV	Feeder No.	Length in km
Koya Mobile	11	2	120
TaqTaq	11	8	40

Table 1 Feeder length in district in Iraq

1.2. Transmission failures

Transmission systems are power lines that transmit electricity from electric generation area to next step of the system, usually connected across many different states and even countries.

Failures in this part of the system are much rarer than distribution failures or not cause most of power outages, but when they happen, they can have huge consequences and covers a wide area. Many transmission system failures are caused by weather, wars through direct targeting or bye terror explosion, also this type of outage can happen due to equipment failure, computer problems, and human error.

Sometimes transmission failures occurred as result if the system not managed properly such as improper design or in case of over loading.

2- A brownout

When demand in any electric power system is near or above the utility's maximum production capacity (load in MW ≥ Production in MW), the utility may intentionally throttle the flow of electricity in certain areas, resulting in a brownout, this happen especially in the time of peak load when demand exceed the whole production level. During a brownout, electricity is still flowing to your home, but at lower than usual voltage levels (Under voltage). The event gets its name from the dimming of incandescent light bulbs, which is common under brownout conditions.

3-Supply shortages

These outages happen when there is simply not enough power production from power plants to meet the demand which result in power stations tripping. or coldest winter when people are blasting In most parts of the country, this type of outage is most likely to occur on the hottest summer days the air conditioning and electricity demand is at its peak.

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This type of power outage is rare because the power system should be managed correctly by suitable plan by building new power plants that cover the demand rising , when according to standards this type of outage should happen only once every ten years.

In some countries the demand is higher than production because of unbalance between growth and building new power stations in such cases the trouble increase year by year and the authorities cannot overcome the problem because solution need a huge budget to build many power stations in one time.

For example in Iraq due shortage in power production there is power lose daily between (10-12 hours) to customers, that mean customers suffer in electric power outage daily due to high difference between demand and power production, the problem has been worsening for years, in some areas customer suffer from another problem is feeder and transformer overloading which cause double power cutoff, below table shows daily outage in one district in Iraq.

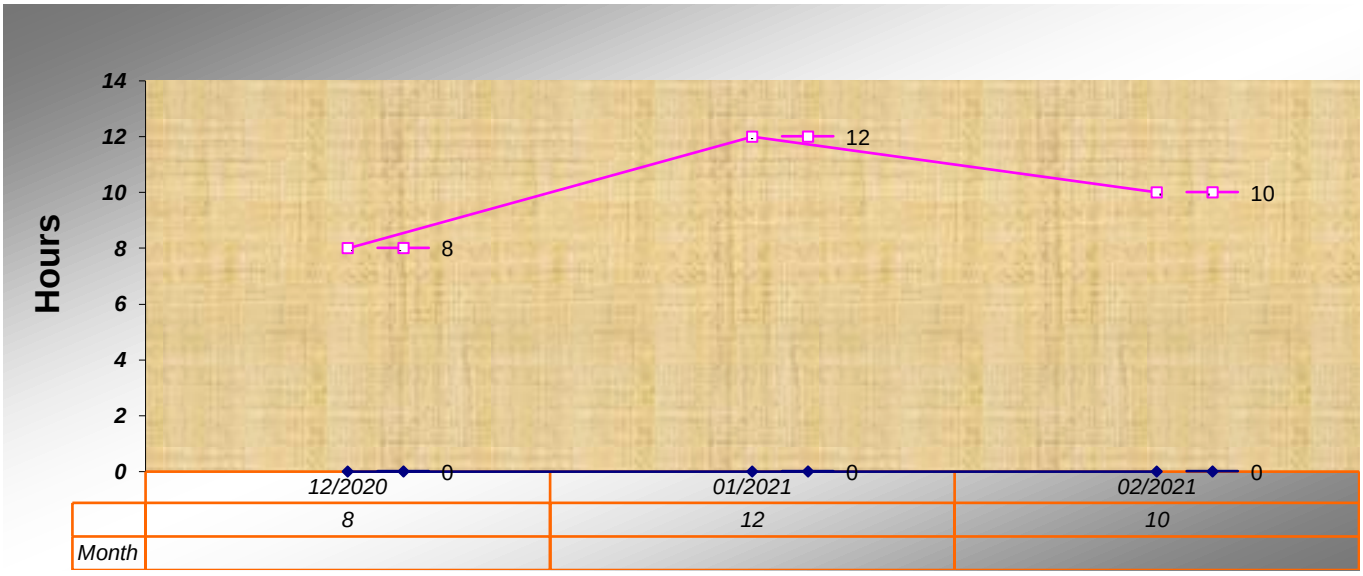

Table 1 / daily outage in one district in Iraq

4- Animals

Electric power reaches all areas including rural areas, it is possible animals appearing around the infrastructure. Animals may cause power outages when they climb on or inside equipment, which can create contact between components which causes short circuit between energized parts and lines, to prevent this activity done by installing custom covers that fit over infrastructure, special fencing around substations, insulated tape wrapped around wires and animal deterrents such as reflectors and disk barriers and in case of underground cables to prevent damages use armor type.

5- Weather

Weather are some of the most visible causes of power outages. Weather can damage electrical equipment. Lightning strikes are one of the top drivers of customer outages, storms, high winds and floods may cause collapsing towers and destroy sub stations. In the other hand weather prevent all normal electric teams activities which lead to delay customer service.

6- Trees and vegetation

In several areas growth of trees, vines and other vegetation on or near infrastructure is an ongoing effort, strong winds , storms and lightning may knock down branches or even whole trees that fall and knock down distribution lines, this is the cause of most storm related outages. In some areas trees roots can effect underground cables.

7- Public safety power shutoffs and planned or Scheduled outages

In this type of outages electric turn off to customers by order form electric authorities In the case of planned outages, a utility might shut down certain portions of the grid in order to perform routine maintenance, but there is usually redundancy built into the electric grid that allows utilities to perform maintenance without shutting off the power.

Needless to say, intentionally shutting off the power for what can be extended periods – particularly to millions of people over multiple days – is simply unacceptable. Utilities can (must!) do better, planned outages are unavoidable in below :

1- To perform Periodic maintenance, or to make necessary extension in the network or to complete large repairs. In this type of outages it is possible to notify customers of planned outages before they occur. In case of work in distribution system, effect small areas but if work includes transmission lines, outage areas increased.

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2- To avoid power system damages in certain weather conditions (e.g. high winds and low humidity) can elevate the risk, for above reasons utilities occasionally decide to shut off the power altogether to ensure their equipment does not start a fire.

8-Equipment failure

Power outages can happen because of failures in any equipment at any point in whole power system, Power delivery system is a large system, and it is possible that equipments failure occurs, such as transformers in (power plants, substations, distribution) , insulation breakdowns , control and protection system failures.

9-Public failure

Some activity that done by public can impact system infrastructure and cause service interruptions for electric customers Examples include vehicle accidents, and unsafe digging that cause underground cable damages, also vandalism or metal theft are another causes that lead to outages due to missing parts of electric system. In some areas noticed that people robs parts from electric towers which cause collapsing.

III. CONCLUSION

No doubt we live in a world where electricity has become essential to everyday life in homes, factories, hospital, and all other areas. Therefore outages leave bad effect on families and big damage on economic, to prevent reaching this bad situation we need to :

1- We should make investments to increase grid resilience to prevent power outages from happening in the first place, we should also deploy distributed energy resources and micro grids that can reduce reliance on the transmission and distribution systems by building power plants in each center load to decrease lines. In case of outages due to supply shortages it should apply planning into the future to ensure we have enough power plants on the grid. In practice, we need to apply a suitable plan to overcome load demand increases by building sufficient power stations because any delay makes the problem worse and more outages.
2- Electric power distribution infrastructure has aged, and it need renewable by modernizing the electrical power grid through weatherization and in deployment of real-time monitoring systems and move to apply smart grid for controlling consumption. Installing smart meters are a good step to correlate with a reduction in outage frequency.
3- Planning to encourage customers to Rationalize use of electricity and avoid using bad quality of electric equipments .In the other hand work in order to reduce losses in electric systems, through this ways it is possible to decrease demand.
4- When any system suffer from shortage in power production, load shading or under frequency protection should activate in many stages to prevent national power shutdown, by automatically turn off power from some feeders till system recovered.
5- Power outages causes risk in some services, such as hospitals, sewage treatment plants, telecommunication and mines, to avoid risk may depend on another power sources such as standby generators, or private solar plant to provide emergency equipments with electricity when power off.
6- Planning for a power outage will also help customers to prepare for emergencies, availability of emergency kit, so that you and your family can be self-sufficient for essential requirements at least 72 hours during a power outage.

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