Subject: Voltage Surges and their ill effects

(Voltage surge destroys electronic goods, locals demand compensation

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COIMBATORE: Televisions and other electronic goods in more than 100 houses were damaged at Kuniyamthur sparking a protest by the residents. They demanded the government to provide compensation for them. More than 100 families from Sathy Nagar at Kuniyamthur, most of whom are employed as daily wage labourer’s, gathered on the road on Sunday evening. They said televisions, refrigerators, fans and mixers stopped functioning after a voltage spike in the area on Sunday afternoon.

The residents said that the sudden surge caused the household gadgets, like TV, refrigerator etc. to catch fire. There were homes where tube lights also busted due to the heavy voltage. Tangedco officials were immediately informed and residents demanded compensation for the damaged goods."

The above news item in web edition of “Times of India” prompted me to write this note. When I was working for Tata Power at their Hydro station in Bhira during 1980, a similar incident had happened, in this case one phase of the overhead wire snapped and came in contact with the neutral, people having their supply on the healthy other two phases had 400V, and all the working equipments blew up. The fuses took time to clear the fault due to high earthing resistance.

What causes Voltage Surges?

In electrical engineering, spikes are fast, short duration electrical transients in voltage (voltage spikes), current (current spikes), or transferred energy (energy spikes) in an electrical circuit. Fast, short duration electrical transients (over voltages) in the electric potential of a circuit are typically caused by

- Lightning strikes.
- Power outages.
- Tripped circuit breakers.
- Short circuits.
- Power transitions in other large equipment on the same power line.
- Malfunctions caused by the power company.
- Electromagnetic pulses (EMP) with electromagnetic energy distributed typically up to the 100 kHz and 1 MHz frequency range.
- Inductive spikes.

The effect of a voltage spike is to produce a corresponding increase in current (current spike). However some voltage spikes may be created by current sources. Voltage would increase as necessary so that a constant current will flow. Current from a discharging inductor is one example.

For sensitive electronics, excessive current can flow if this voltage spike exceeds a material's breakdown voltage, or if it causes avalanche breakdown. In semiconductor junctions, excessive electric current may destroy or severely weaken that device. An avalanche diode, transient voltage suppression diode, varistor, overvoltage crowbar, or a range of other overvoltage protective devices can divert (shunt) this transient current thereby minimizing voltage.

Voltage spikes may be created by a rapid buildup or decay of a magnetic field, which may induce energy into the associated circuit. However voltage spikes can also have more mundane causes such as a fault in a transformer or higher-voltage (primary circuit) power wires falling onto lower-voltage (secondary circuit) power wires as a result of accident or storm damage.

Voltage spikes may be longitudinal (common) mode or metallic (normal or differential) mode. Some equipment damage from surges and spikes can be prevented by use of surge protection equipment. Each type of spike requires selective use of protective equipment. For example a common mode voltage spike may not even be detected by a protector installed for normal mode transients.

An uninterrupted voltage increase that lasts more than a few seconds is usually called a “voltage surge” rather than a spike. These are usually caused by malfunctions of the electric distribution system.

Why Equipment gets damaged due to Voltage Surge?

A spike in voltage can be harmful to appliances and electrical devices in your home. An increase in voltage above an appliance’s normal operating voltage can cause an arc of electrical current within the appliance. The heat generated in the arc causes damage to the electronic circuit boards and other electrical components.

Smaller, repeated power surges may slowly damage your electronic equipment. Your computer or stereo may continue to function after small surges occur until the integrity of the electronic components finally erode and your satellite system, cordless phone, or answering machine mysteriously stops working.

How to Protect your costly equipment?

- If your area is prone to voltage surges, use voltage stabilizers.
- Check your wiring and grounding, periodically.
- Use outlet surge suppressors.
- Shut down power supply to equipment when not in use.

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