# New approach of Electricity Monitoring

In this page we introduce our new approach to electricity monitoring.

The following paragraph is brought here for terminology and clarification.

### Electrical transmission vs. electrical distribution

The electrical path starts at the point where the electrical power is generated and ends at the electrical loads. This path is generally divided into two main parts:

- **Electrical transmission**: Electricity is transmitted for relatively long distances at high voltages of 100KV and above.

- **Electrical distribution**: Electricity is distributed for relatively short distances at medium to low voltages of 100KV and below. The last part of the distribution path is at buildings / homes / facilities. The voltage at this last part of the distribution network is 220V or 110V in most countries.

### Fault protection in the 110V / 220V electrical distribution systems

In the last part of the electrical distribution systems the voltage is usually in the range of 100V to 127V or 220V to 240V. This is the voltage that reaches buildings / homes / facilities. In this part of the electrical distribution systems there are fault protection devices that should be maintained by the users of that part of the electrical distribution system.

The most common fault protection devices in existing electrical distribution systems are:

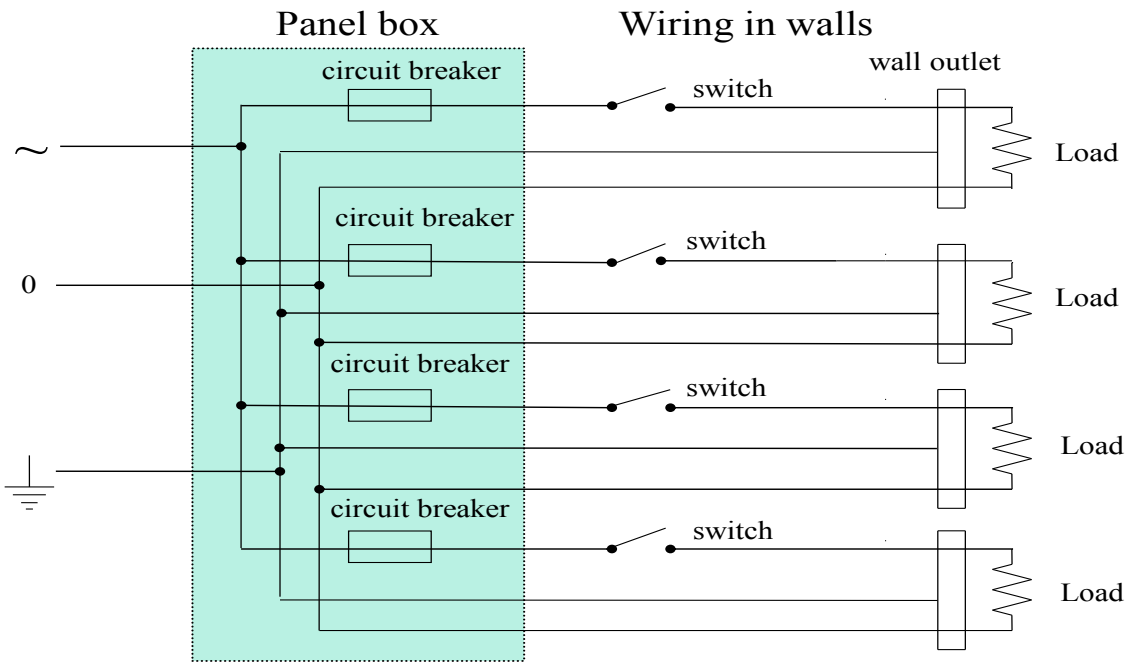
- Fuse,
- Circuit breaker,
- AFCI - Arc-fault circuit interrupter,
- GFCI - Ground-fault circuit interrupter. These devices

**Structure of existing electrical distribution systems**

In the existing electrical distribution systems the monitoring and protection functions are performed by devices located only at the entry point of the facility – as shown in the following diagram:

Structure of existing electrical wiring scheme

( simplified for clarity )



Main characteristics of existing structure of the electrical distribution systems are:

- Fault-detection units monitor current-related values
- Protection devices do not use nor Communication neither processing.

**Inherent limits of existing electrical distribution systems:**

- Not aware of voltage drop on the wiring between the entry point of the circuit and the load(s)
- Not aware of discontinuities
- Detects existence of a problem when it becomes almost a fire
- Cannot detect loose connections
- Cannot detect the presence of glowing connections

**Fault protection vs. detection**

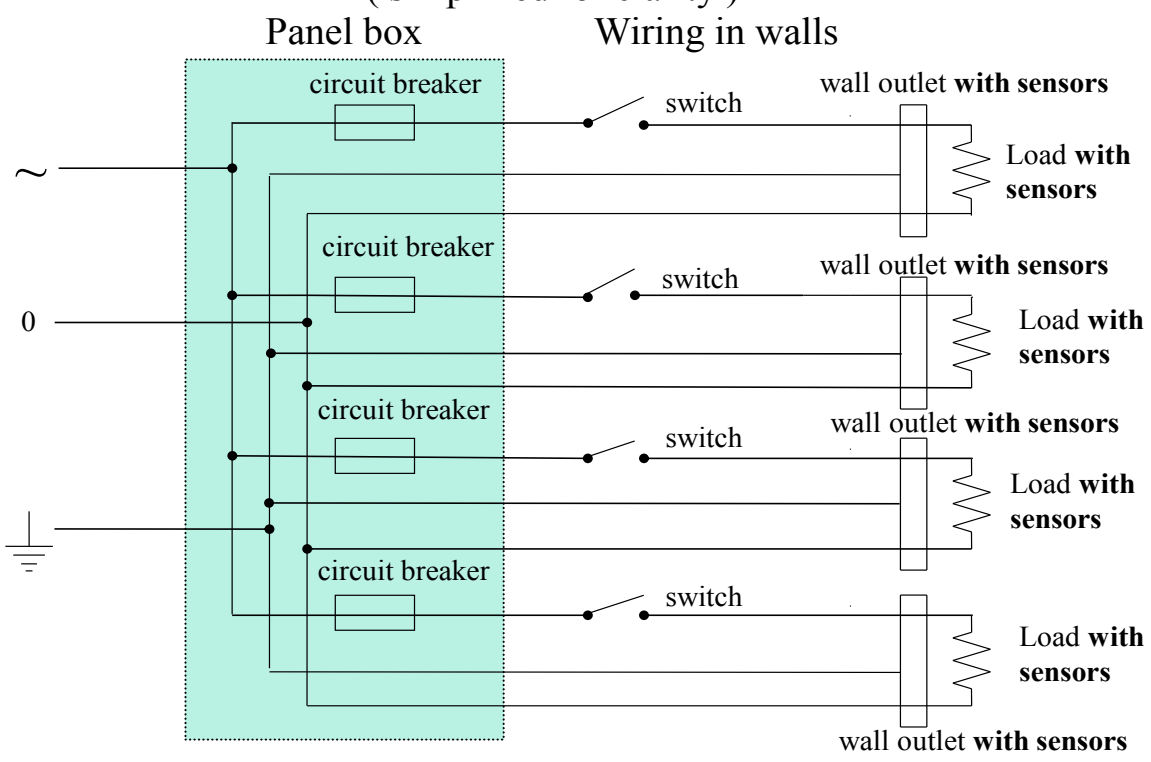
It should be noted that in the existing electricity monitoring systems the 110V / 220V devices that detect the electrical faults also perform the protection function by disconnecting the electrical power. Although this sounds rational, the combination of the two functions was derived by the technological.

**New structure introduced**

- Monitoring is done close to the loads or inside the loads
- Using IoT concepts – sensors located inside appliances or close to them
- Uses Communication – opposite to the existing “non-communicating”
- Using processing - not only relying on analog decisions.
- Big-Data concepts.

Structure of the new electrical wiring scheme

( simplified for clarity )




**Advantages of the new structure**

- Early detection of fault formation
- Detection of problems not detected by existing equipment
- Can detect loose connections
- Aims at detecting the presence of glowing connections

## Limitations of the new method

Ruling:

Monitoring and protection systems need rules that will set limits when to alarm and when to disconnect the electrical power.

At present, the only known official rule is the limit on the voltage drop between the entry point of a facility and the loads.

Effect on usage:

As the electricity monitoring method introduced here is novel and not yet covered by regulations, Isra-Juk addresses these developments to several market segments:

- Manual monitoring – will be used by first responders, electricians and home inspectors and home owners without relying on any software that will decide when to alarm.
- Automatic monitoring - will be implemented by software that will run on Industrial-IoT and home control systems.

**Comparison table**

The following table compares important fault detection capabilities between the existing monitoring structure and the monitoring scheme introduced by Isra-Juk.

| Parameter | Existing structure | Structure introduced by Isra-Juk | Suggested Ruling |
|---|---|---|---|
| **Location of monitoring** | **At entry to the facility** | **Close to the loads** | **--** |
| **Ability to detect excessive current** | **Yes** | **Yes** | **Same ruling for both methods** |
| **Ability to detect** | **No** | **Under investigati** | **Under investigation** |

| Parameter | Existing structure | Structure introduced by Isra-Juk | Suggested Ruling |
|---|---|---|---|
| presence of a glowing connection | | on | |
| Ability to detect voltage-drop issues | No | Yes | 1. Voltage-drop at a sensing unit that monitors a load that consumes power – is above the allowed percentage<br>2. Voltage-drop at a sensing unit that monitors a load that does not consume power – affected by power consumption of another load. |
| Ability to detect presence of a loose connections or broken wiring | No | Yes | 1. Differences between continuity-readings from sensing units – above a predefined limit<br>2. Restarting occurs at one sensing unit while other sensing units do not restart |
| Time of problem detection before fire ignites | Sub 1 second | Days / weeks | |