Session: Different Types of Single and Three-Phase Energy Meters

Learning Objective	Evaluation Criterion
Differentiate between the various types of single and three-phase energy meters and their tamper-proof features	Interactive Questioning

	**Duration**	60 Minutes
	**Resources**	PowerPoint Presentation, Whiteboard, Markers, Screen and Projector
	**Facilitator's Notes**	In this session, take the participants through an interactive presentation with video snippets on different types of single and three-phase energy meters and their tamper-proof features.

End of Notes

		**1.**	**Tell:** Welcome to the video presentation on "Different types of single and three-phase energy meters and their tamper-proof features".
			**Facilitator's Notes:** • Display the slide • Read out the objectives and ask learners to note them down • Inform them that they will be asked questions during the session **End of Notes**
		**2.**	**Tell:** By the end of this session, you will be able to differentiate between the various types of single and three-phase energy meters and their tamper-proof features.
			**Tell:** Although the latest meters are of electronic type, there still exist a lot of electro-mechanical meters in the power distribution networks.
		**3.**	**Tell:** Let us hence start with a discussion on electro-mechanical meters. There are single and three-phase electro-mechanical meters. A mechanical meter is usually in a metal case or polycarbonate body. Let me explain how this meter works. **Facilitator's Note:** Click to play the video.
		**4.**	**Tell:** This disc revolves due to the magnetic field built by the current passing through the current coil and the pressure coil. This disc is attached to the spindle which, in turn, is attached to the counter. The counter works due to the revolutions of the disc. **Facilitator's Note:**

			Continue to play the video.
		5.	**Tell:** It is necessary that the spindle remains fixed and stays vertically at a 90-degrees angle. If we try to tilt or twist the meter, it will reduce the speed of revolutions of the disc. This will lead to suspicions that the meter can be slowed down by tilting or twisting it. The meter reading could thus be 'suspect', that is, it is not giving the correct reading. Also, mechanical parts, such as the spindle, deteriorate over time. The meter revolutions can also get slowed down because of this, leading to a lower meter reading. **Facilitator's Note:** Continue to play the video.
		6.	**Tell:** As per the CEA regulations, usage or installation of such meters has been stopped from 2005. Instead, electronic metes are being used. **Facilitator's Note:** Continue to play the video.
		7.	**Tell:** Electronic meters are more beneficial than electro-mechanical meters. These have an LCD display and the reading is clearly visible due to the back-lit screen. You can view the date, time and MDI reading in this meter. Electronic meters have many advantages over electro-mechanical meters. They can show the connected load as well as the current passing through the meters. Along with the current MDI, these meters also save the MDI for the previous four months. **Facilitator's Note:** Continue to play the video.
		8.	**Tell:** Let us now look at the features of a single-phase electronic energy meter in detail. Single-phase meters are used for loads from 1 kW to 10 kW. **Facilitator's Note:** Click to play the video.
		9.	**Tell:** Before meter installation, you need to physically check the meter-packaging box. The box contains a meter and a test certificate. **Facilitator's Note:** Continue to play the video.
		10.	**Tell:** The meter has two seals. One seal is provided by the company manufacturing the meter. The second seal is put in place by the distribution company. **Facilitator's Note:** Continue to play the video.

		11.	**Tell:** The four meters displayed here are from four different companies. They are: • Secure • L&T • Genus and • Landis +Gyr **Facilitator's Note:** Click to play the video.
		12.	**Tell:** Let us know about L&T company's single-phase meter. The nameplate here is blue in colour. It is mentioned on the meter that it is a single-phase meter or two-wire AC static watt hour meter. **Facilitator's Note:** Continue to play the video.
		13.	**Tell:** IS indicates that the meter is certified by Indian Standards (IS). You can see the manufacturing date of the meter. This meter was manufactured in February 2016. **Facilitator's Note:** Continue to play the video.
		14.	**Tell:** Let us now learn about the tamper-proof features of a single-phase meter. The meter consists of three components. They are: • Meter base • Meter cover and • Meter block The base and block are pasted with ultrasonic welding. **Facilitator's Note:** Click to play the video.
		15.	**Tell:** The date and time are displayed. It is immune from magnets. Thus, it cannot be tampered using magnets or electro magnets. A single-wire tamper will be visible and the recording is done. **Facilitator's Note:** Continue to play the video.
		16.	**Tell:** The needle at the top of the meter has to be used to open the cover. Here, an optical port is given for communication. Through this port, all parameters can be downloaded onto a computer. **Facilitator's Note:** Continue to play the video.

		17.	**Tell:** When we press the scroll button, it displays the meter number, date and time, reading, and the Maximum Demand or MD. **Facilitator's Note:** Continue to play the video.
		18.	**Tell:** Four types of MD are available. 'M D' 1, 2, 3, 4 are recorded in the meter. Every month, this MD gets reset. The meter has four terminals. **Facilitator's Note:** Continue to play the video.
		19.	**Tell:** Two terminals each are on the left hand and the right hand sides. The terminals in the left corner and the right corner belong to phases. The terminals in the middle are neutral. One is an incoming neutral and the other is an outgoing neutral. **Facilitator's Note:** Continue to play the video.
		20.	**Tell:** Inside the display, there are two types of indicators. The first indicator shows earth leakage. The second indicator shows time reversal. So far, we have seen the features, functioning and types of single-phase meter. **Facilitator's Note:** Continue to play the video.
		21.	**Tell:** Let us now look at another type of meter called poly-phase meter, which is used for loads of more than 10 kW. **Facilitator's Note:** Click to play the video.
		22.	**Tell:** This meter is used to record energy consumption simultaneously for more than one phase. The three-phase meter has the same parameters as the single-phase meter. There are a few differences and changes in usage of the three-phase meter, since three phases are used. **Facilitator's Note:** Continue to play the video.
		23.	**Tell:** We know that a single-phase meter has four terminals. However, in a three-phase meter, there are eight terminals to meet the three-phase four-wire distribution system requirements. The eight terminals are arranged in this way – three phases come from above and one neutral. Four wires are incoming and 4 wires are outgoing naturally. **Facilitator's Note:** Continue to play the video.

		24.	**Tell:** If we observe the nameplate, we notice that the meter is manufactured by Secure company. The display parameters will be the same as those of the single-phase meter. It will show the requirements as per the three phases. Like the single-phase meter has 10-60 amperes, this meter is of 20-100 amperes. This Secure meter is used for up to 40 kilowatts. But we will use this for up to only 25 kilowatts. Here, 800 impulses per kW hour are used, like 3200 impulses are used in the single-phase meter. If 800 impulses are completed, then the reading will increase by 1 unit on the display. **Facilitator's Note:** Continue to play the video.
		25.	**Tell:** Let us now discuss about the display parameters. The display parameters will be the same. The meter will show the requirements as per the three phases. That is, the kilowatt hour reading. MD reading, date and time will also be displayed. Parameters are displayed instantly on how much is the instant load the consumer is using and how much of power factor is running. The three-phase sequences are visible in this, as to which phase is available or coming in and which phase is not coming in or unavailable. Suppose of the 3 phases, 1 phase is being used by the machine. Then, the phase being used by the machine is also displayed. **Facilitator's Note:** Continue to play the video.
			With this, we have seen the video presentation on different types of single and three-phase energy meters. We have also examined the tamper-proof features of energy meters.
Key Learning Outcomes			
		26.	**Tell:** Let us quickly recollect the key points of this session. • A mechanical meter is usually in a metal case or polycarbonate body • Electronic meters have an LCD display and the reading is clearly visible due to the back-lit screen • Single-phase electronic meters are used for loads from 1 kW to 10 kW • Poly-phase meter is also called three-phase whole current electronic energy meter • The three-phase meter records consumption in kVAh and kVArh