

Analyzing and Improving Energy Efficiency in Electrical Systems

Part 1: Dialogue

Context: An electrical engineer is discussing energy efficiency improvements in electrical systems with a colleague.

Emma: We just completed the **energy audit** for the factory. The reports show a high level of reactive power consumption.

Liam: That could be due to poor **power factor correction**. Have you checked if we need to install capacitor banks?

Emma: Not yet, but it's on my list. I'm also looking at **demand-side management** strategies to reduce peak energy usage.

Liam: Good idea. Another issue is harmonic distortion. We may need **harmonics mitigation** measures like filters.

Emma: That makes sense. Reducing harmonics will improve efficiency and extend equipment life.

Liam: Exactly. We should also consider **load shedding** to prevent unnecessary power consumption during non-peak hours.

Emma: Agreed. If we schedule certain processes during off-peak times, we could lower demand charges.

Liam: Yes, and optimizing motor loads can also help stabilize power usage throughout the day.

Emma: I'll analyze which machines contribute most to energy waste and propose a corrective plan.

Liam: Perfect. Let's present our findings to the management team next week.

Part 2: Comprehension Questions

1. What issue did Emma find in the **energy audit**?
 - (A) Low voltage supply
 - (B) High reactive power consumption

- (C) Overloaded transformers
 - (D) Frequent power outages
2. What solution does Liam suggest for improving **power factor correction**?
 - (A) Installing capacitor banks
 - (B) Increasing voltage levels
 - (C) Replacing circuit breakers
 - (D) Upgrading transformers
 3. What method do they discuss to reduce **harmonics** in the system?
 - (A) Adding resistors
 - (B) Installing filters
 - (C) Lowering voltage
 - (D) Using aluminum wiring
 4. How do Emma and Liam suggest using **load shedding** to reduce power consumption?
 - (A) Running equipment at full capacity
 - (B) Increasing generator output
 - (C) Installing additional transformers
 - (D) Scheduling processes during off-peak hours
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Part 3: Key Vocabulary with Definitions

- **Power factor correction (力率改善)** – A method to reduce reactive power and improve energy efficiency.
- **Energy audit (エネルギー監査)** – A detailed assessment of energy use in a facility to identify efficiency improvements.
- **Demand-side management (需要側管理)** – Strategies to control energy demand and optimize power consumption.

- **Harmonics mitigation (高調波対策)** – Techniques to reduce electrical noise and improve system performance.
 - **Load shedding (負荷遮断)** – The practice of turning off or shifting power loads to balance energy consumption.
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Part 4: Answer Key

1. **What issue did Emma find in the energy audit?**
☒ (B) High reactive power consumption
2. **What solution does Liam suggest for improving power factor correction?**
☒ (A) Installing capacitor banks
3. **What method do they discuss to reduce harmonics in the system?**
☒ (B) Installing filters
4. **How do Emma and Liam suggest using load shedding to reduce power consumption?**
☒ (D) Scheduling processes during off-peak hours