



PART 3

Read the text below and answer questions 27–40.

THE SMART GRID: REVOLUTIONISING ELECTRICITY NETWORKS

A

The legacy electricity grid was engineered for a world of centralised power stations and passive customers. Large plants produced electricity in predictable blocks, and energy flowed largely one way through transmission and distribution networks to homes and factories. This architecture delivered economies of scale, but it also embedded rigidity: operators had limited real-time visibility of what was happening at the edge of the system, faults could propagate before they were diagnosed, and the simplest response to growing demand was often to add more generation capacity rather than to optimise usage.

B

A smart grid, by contrast, is best understood as a cyber-physical upgrade to this legacy infrastructure. It embeds digital sensing, communications, and automated control into substations, feeders, and customer connections so that the network becomes data-rich and responsive. Instead of being “blind” between scheduled readings, utilities can observe conditions continuously, isolate disturbances earlier, and coordinate responses in near real time. The result is not just faster outage restoration, but a shift in how the system is operated: from reactive maintenance and conservative margins toward predictive management, dynamic balancing, and more granular decision-making.

C

A core enabler of this shift is advanced metering infrastructure, which includes smart meters capable of recording consumption at short intervals and sending those readings automatically to the utility. Crucially, communication is two-way. Beyond billing, the meter becomes an operational node: it can help detect abnormal patterns that signal equipment problems, support remote connection or disconnection, and enable more sophisticated tariffs such as time-of-use pricing. While these capabilities promise efficiency, they also introduce governance questions about data ownership, consent, and how granular information should be stored and shared.

D

Time-based pricing illustrates how the smart grid turns information into behavioural leverage. If electricity is priced higher during peak hours—when networks are stressed and marginal generation is expensive—customers can shift flexible activities to cheaper



periods without necessarily reducing total comfort. Laundry, water heating, charging devices, and some industrial processes can be moved in time, producing “load shifting” that smooths the demand curve. System-wide, this matters because a flatter demand profile reduces dependence on peaker plants, the relatively inefficient generators that run for short spikes. In effect, a tariff can function as demand-side management, replacing some supply expansion with coordinated flexibility.

E

The need for flexibility becomes sharper as renewables grow. Wind and solar introduce intermittency: output fluctuates with weather and time of day, complicating frequency and voltage control. Smart-grid tools help in two distinct ways. First, forecasting can improve scheduling by predicting short-term generation patterns. Second—and more importantly—fast operational control can adjust the system as reality deviates from forecasts. Demand response programmes allow the grid to treat consumption as a controllable resource: participating customers, or automated devices on their behalf, can reduce or increase usage within agreed limits. During a solar surplus, electric vehicles may charge and commercial chillers may pre-cool buildings; during a shortfall, non-critical load can be reduced briefly. Forecasting helps, but it does not eliminate variability by itself; the stabilising value comes from rapid coordination across many small adjustments.

F

Smart grids also accelerate decentralisation by integrating distributed energy resources at the distribution level. Rooftop solar, home batteries, and small generators turn some customers into prosumers—both producing and consuming electricity. When coordinated, thousands of such assets can behave like a virtual power plant, collectively supplying capacity, absorbing excess generation, or providing ancillary services without constructing a new central station. A further resilience layer is the microgrid: a local cluster—such as a campus, hospital, or neighbourhood—that can operate while connected to the wider grid but can also island during a major outage. With local generation, storage, and controls, a microgrid can keep critical loads running and reconnect once the wider network stabilises.

G

However, modernisation creates new frictions rather than removing all constraints. The upfront investment in meters, sensors, communications networks, and software platforms is substantial, and the benefits may be unevenly distributed. Cybersecurity becomes a central concern because connectivity expands the attack surface, turning electricity infrastructure into a target-rich environment. Data privacy is equally sensitive: detailed consumption profiles can reveal household routines, raising questions about whether



such information should be used for marketing, policing, or credit scoring. Finally, regulation and market design must evolve alongside technology. If tariffs, interconnection rules, and incentives are poorly aligned, customers may not participate in demand response and utilities may not be rewarded for efficiency improvements. Most experts therefore frame the smart grid not as a one-off product, but as a socio-technical transition whose success depends on standards, skilled operators, and public trust as much as on hardware.

Questions 27–31

Which paragraph contains the following information?

27 a description of electricity mainly moving one way from central power stations to users in the past.

28 an explanation that smart meters record usage frequently and send the information automatically.

29 an example of shifting everyday activities to cheaper times to reduce peak demand.

30 a description of local networks that can run independently during a wider blackout.

31 the point that rules and incentives must be adjusted to make the new system work effectively.

Questions 32–36

Choose **YES** if the statement agrees with the claims of the writer, choose **NO** if the statement contradicts the claims of the writer, or choose **NOT GIVEN** if it is impossible to say what the writer thinks about this.

32 The passage suggests that time-based pricing can reduce reliance on peaker plants.

33 The writer argues that better forecasting alone is sufficient to manage the instability created by wind and solar power.

34 The writer states that smart grids will be fully implemented worldwide within ten years.

35 The writer suggests that smart-grid development removes the need to invest in new equipment and systems.

36 The passage states that detailed consumption records may reveal aspects of household routines.

Questions 37–40



Complete the notes below. Choose **NO MORE THAN TWO WORDS** from the text for each answer.

Key features of a smart grid

- Smart grids rely on digital monitoring and control.
- A basic element is advanced metering **37**, which enables two-way communication and supports time-of-use pricing.
- Shifting demand away from peak periods can reduce the use of expensive **38**
- In addition, coordinated distributed resources can behave like a virtual **39**
- During a major outage, a microgrid can separate itself from the wider grid by choosing to **40**

Answer Key

27. A

28. C

29. D

30. F

31. G

32. YES

33. NO

34. NOT GIVEN

35. NO

36. YES

37. infrastructure

38. peaker plants

39. power plant

40. island