Questions and Answers about Electric Voltage Change from 127/220 volts to 230/400 volts
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Introduction:

The cabinet’s decision to change the electricity distribution voltage from 127/220 volts to 230/400 volts for residential and commercial purposes in the new areas and for new customers in existing areas is in support of the company’s efforts in providing a safe and reliable electric services. The change in voltage shall facilitate the standardization of electrical devices in accordance with the electrical standards in the GCC countries. It will bring several positive aspects to the Kingdom and the customers, importers, and providers of electric services. The change shall bring about a reduction in low energy losses in the distribution network and in the wirings in buildings. It shall also overcome the problem of voltage decline in the distribution networks and equipment. Moreover, the change in the electricity distribution voltage shall reduce the number of cables used, as well as the cross-sectional areas of the cables for the same power capacity; thus reducing the cost of establishing distribution networks and wiring installations in buildings.
Q1- Why use 230/400 volts instead of 127/220 volts?

A1- Saudi Arabia is one of the few countries in the world that uses the dual-distribution voltage (127/220 volts) in homes where standard voltage 127 volts is used for household appliances (lighting fixtures, refrigerators, microwave ovens, TV) and the 220 volts for high-load electrical appliances (air conditioners, elevators, pumps). Only 9% of the countries in the world use this dual-distribution voltage while more than 70% use the 230/380 volts, many of which are planning to adopt or change to the international standard voltage 230/400 volts being recommended by the International Electrotechnical Commission (IEC); the organization that prepares and publishes international standards for all electrical, electronic, and related technologies. Six percent (6%) of the countries of the world use voltage 110 volts while the remaining 15% use various voltages. The continued application of the dual-voltage in the Kingdom brings negative effects which include the following:

- Isolation from internationally-adopted standard voltage 230/400 volts which shall gradually become the standard voltage applied in different countries at international level.

- Increased incidence of accidents (electric shocks, damage to electrical appliances, and outbreaks of fires) when appliances are mistakenly plugged into wrong voltage due to the presence of dual-voltages 127/220 volts in the home.

- The need to use adaptors to connect electrical devices to power source, given a huge array of plugs and sockets, which weaken the levels of security and safety.

- Continue to allow entry of electrical appliances of less than 127 volts, as determined by the manufacturers, into the markets of the Kingdom and allow them to operate at non-rated voltage shall lead to a shortening of their service life and reducing their performance efficiency.

- Difficulty in the application of certificates of conformity with the Saudi standard specifications because the voltage rating of the imported equipment is different from the voltage rating used in the Kingdom.

- Manufacturing difficulty involved in the production of devices with operating voltage of 127 volts being encountered by exporting factories to the Kingdom requires additional cost to the consumer.
Q2- What are the benefits to be gained from this change?

A2- The use of voltage level 230/400 volts gives better results compared to voltage 127/220 volts. A study prepared by a dedicated team with the support of the Ministry of Water and Electricity has shown that there many benefits that can be derived from this change, as follows:

First: Benefits to the Kingdom

1- Improved level of safety in electrical wiring and, therefore, lack of incidence of fires caused by electricity.
2- Achieve uniformity in the electrical distribution voltages with the GCC countries to facilitate the standardization of electrical devices’ specifications within the GCC countries as well as in the rest of the Arab countries and the countries of the world.
3- Growth in Saudi exports of electrical appliances at competitive prices due to lower production costs resulting from the application of international standards on the national industry.
4- Standardization of screening procedures and allowing electrical equipment at customs ports at the level of Gulf Cooperation Council due to the standardization of voltage.
5- Ease of the appliances and wiring tests, which reflect on the laboratories performance, whether government or private.
6- Integration with global systems of voltages and thus take advantage of the technical transmission with minimum of disruption.

Second: Benefits to electric service providers

1- Lowers the costs of electric meter and electrical box to be installed in the customer’s premises due to low current and, therefore, the use of smaller meter and the elimination of current transformer from the meter.
2- Less energy losses in the electrical distribution networks and equipment due to lower amount of current level.
3- Overcomes the problem of voltage decline in the distribution network, thus contributing to performance improvement and protection of household appliances.
4- Less number of cables used and smaller cross-sectional area of cable for the same power capacity, thus reducing the cost of establishing electrical distribution networks.
5- Reduces the circuit breaker capacity and the copper conductors within the panels.
6- Increases the number of customers that can be connected to one transformer having the same current capacity.
7- Standardization of low voltage for all customer categories.
8- Standardization of equipment used in low voltage.
9- Reduces the amount of equipment inventory in service provider’s warehouses in different regions in the long run, owing to the standardization of equipment.
10- Standardization of procedures for training, installation, and operation of distribution networks.

**Third: Benefits to customers**

1- Avoids risks of plugging electrical appliances to the wrong voltage due to the existence of two different voltages.
2- Reduces the price of electrical appliances due to conformance of Saudi standard specifications with international standards.
3- Improves the performance efficiency of electrical appliances and increases their useful life as they are operated at their rated voltage.
4- Use of cheaper and smaller size distribution panel in buildings.
5- Use of electrical wires with smaller cross-sectional area, which cost less, for the internal wirings of the building.
6- Lesser energy losses in electrical wirings lead to energy savings.
7- Standardization of electric plugs and sockets in the facility.

**Fourth: Benefits to factory owner and importer of appliances**

1- Creates export opportunities due to compatibility of electrical appliances specifications with international standards.
2- Allows ease of importing manufacturing equipment that are compliant with international standards and ease of exporting electrical appliances and equipment products.
3- Eliminates the operation of production lines operating on different voltage standards, but one production line with a standard voltage to reduce costs. It facilitates the transfer of technology for the plant and lowers production costs which makes it easier to sell at competitive prices both locally and abroad.
4- Cuts import cost as well as ease on re-export.
Q3- Will this trend affect the existing homes?

A3- Existing homes will not be affected now but will have to change the voltage 10 years after the issuance of a decision to shift to the international voltage in accordance with the voltage-change plan adopted by the Ministry of Water and Electricity. Its implementation will be supervised in cooperation with concerned authorities for electricity services to achieve the best interest of the customer and the electricity service provider.

Q4- What about the new buildings in existing neighborhoods?

A4- Only 220 volts will reach the new buildings in existing neighborhoods (between two electrified lines). The electrical wirings for these buildings shall be designed for operation on this voltage. This shall facilitate the change to 230 volts at the right time (at the start of the final stage) while taking into account that all switches, circuit breakers and switches plugs (if any) are bipolar type separating electricity loads of the two lines together at the same time, and not only the separation of one line.

Q5- Is it necessary to replace the existing electrical household appliances? What considerations should be taken when buying household electrical appliances from now on?

A5- Existing home residents are not required to change their current devices, but when you buy a new appliance, it must be suitable to operate on either or both voltages 127/220-volt and preferably on a single voltage (220) volts. Everyone shall avoid buying any device running on single-voltage 127 volts or 110 volts.

Q6- Who will bear the cost of modifying the internal wiring in existing homes after ten years?

A6- The facility owner will not bear the costs of modifying the internal wiring if electricity services had reached the facility before the issuance of the decision until 12/30/1432 AH. Saudi Electricity Company will assume the cost of modification for those who have been provided with electricity until this date and only during the implementation phase which will begin after 10 years from the date of the decision and shall lasts for 15 years.
**Q7- Who will modify the internal wirings in existing buildings?**

A7- A company or specialized and qualified companies will modify the internal networks of existing buildings under the supervision of the Saudi Electricity Company, according to the change program.

**Q8- Does the new voltage 230/400 volts pose a danger to user safety?**

A8- There is no danger to user or tenant if he adheres to the requirements of safety and security in electrical wirings and the use of plugs and sockets that comply with the Saudi standard specifications.

**Q9- Is there a need to change the electric meter and meter breaker? If so, who will bear the costs?**

A9- All the required changes in the distribution network including changes in electric meter and meter breaker, if required, the Saudi Electricity Company will handle these changes and bear the costs.

**Q10- If an existing home is currently fed with voltage 127/220 volts, what are the actions that the occupant shall take to change to voltage 230/400 volts?**

A10- The occupant must not buy any additional device running on 127 volts, and if there is a need to replace a device having a single voltage 127 volts, replace it with a dual voltage 127/220 volts device. Yet, it is preferred that the replacement is a single-voltage 220 volts device to facilitate future transition to the international voltage 230 volts.

**Q11- What about the new schemes?**

A11- As regards the new schemes, the international voltage 230 volts will be delivered to homes and voltage 230/400 volts to factories and large commercial centers.
Q12- When building a new home in a residential area or in a new area, or setting up a factory in a new industrial area or in an existing area, what is required?

A12- All electrical wiring installations in new homes and facilities shall conform to the new voltage standard, so that electricity can be delivered to these areas with this voltage.

Q13- The existing plants are currently fed by the current industrial voltage 230/380 volts, will this be changed to international voltage 230/400 volts?

The difference between the current industrial voltage 220/380 volts and the new international voltage 230/400 volts falls within the allowable voltage variation, and that the buildings and facilities that are fed by industrial voltage 220/380 volts will not be affected by the change to voltage 230/400 volts.

Q14- What effect does changing to voltage 230/400 volts have on importing and manufacturing electrical devices that run on voltage 127 volts and on dual voltage 127/220 volts?

A14- Importation and manufacture of devices that operate on single-voltage 127 volts must immediately stop. On the other hand, the importation and manufacture of devices that operate on dual-voltage 127/220 volts may continue and bolster the importation and manufacture of devices that operate on voltage 230 volts.

Q15- Will the change to new voltage bring about savings in construction costs?

A15- Yes, the change in this case has economic and technical benefits. With this change, small size cables and distribution panels in the distribution network are used, and lower breaker capacity as well, which lead to savings in wiring costs especially in homes and buildings.
Q16- Will this change affect electricity consumptions in homes and factory?

A16- The energy consumption is calculated in kilowatt-hours, and will not be affected by the change of voltage.

Q17-Does voltage change have any effect on frequency?

There is no effect on the frequency. The electrical network frequency in the Kingdom is 60Hz and this will not change as a result of voltage change.

Annex

Technical Advices and instructions:

The change will include electrical wiring networks in the buildings and the electrical appliances plugged into these networks as well. For the purpose of ensuring compliance with safety requirements, as well as the protection of individual users and facilities serviced by the electrical network prior to the application of the new voltage system, the Ministry of Water and Electricity has issued an instructional guide for the modification of electrical wirings in residential and commercial buildings to conform to the international voltage 230/400 volts. The technical guidance can be accessed through the Ministry of Water and Electricity’s website www.mowe.gov.sa under the title “Releases” or at the Company’s website www.se.com.sa under the title “General Information” which includes general and simple information, instructions, and technical procedures directed to the citizens, technicians, municipal engineers, engineering offices, and contracting companies as regards compliance with the new voltage system; all with full observance of safety measures and security to protect the user and appliances connected to this power source. In addition, the websites provide information about the protection of the users’ property and their appliances against damage, as a result of voltage change in certain cases. These instructions are divided into two parts:
Part one:

Electrical wiring instructions for the new buildings in the existing areas, as well as for new customers in the new areas which will be supplied with 230/400 volts.

Next the most important instructions that must be done in the new buildings situated in new schemes that will be supplied with voltage (230/400) volt:

1- These buildings will continue being supplied with 230 volts between the electrified and neutral lines from the new 230/400 V transformers.
2- The building’s internal network and distribution panel shall be designed for a single 230 V power supply between the electrified and neutral lines.
3- The building’s internal network shall include an effective earthing system that is compatible with 230 V between the electrified and neutral lines in accordance with the Saudi Electrical Code.
4- There shall be an effective electrical protection system to protect the conductors against power surges higher than the rated current-carrying capacity of the conductor.
5- The network shall include an effective electrical protection system against exposure to electric shock.
6- The protection system in the distribution boards shall be designed in such a way that every circuit has a dedicated circuit breaker (single switch) that is compatible with the rated current of this circuit.
7- All plugs and sockets shall be of the type specially designated for 230 volts and compatible with Saudi Standards specifications.

All household electrical appliances and their accessories, as well as the lighting units should have a rating of 230 volts. Appliances that are rated 220 V may be suitable if their system is designed to allow voltage variations of ± 10% of the rated voltage.
Part two:

New and old buildings, current and new customers in the existing areas fed by 127/220 volts:

This part applies to existing or new buildings in the areas currently supplied with 127/220 volts. The new voltage will differ from the currently used voltage which requires wiring modification suitable for the new voltage and to make sure of the suitableness and safety of wirings to ensure the user’s safety. This part is divided into two sections:

Section one:

The following are the most important instructions that shall be adhered to in the new buildings and by the new customers in the existing areas supplied with 127/220 volts.

1- These buildings will be fed by 220 volts power system between two electrified lines.
2- The internal home network and distribution panels should be designed based on one single voltage 220 v between two electrified lines.
3- The internal network of the buildings shall include an effective earthing system (compatible with the 220 volts between two lines) according to the Saudi Electrical Code.
4- There must be an effective protection system against excessive current (depends on dual switches protection breakers), to protect the conductors against the passage of a current higher than the rated current as per the size of every conductor. The system shall disconnect the two electrified lines altogether in case of an increase in the current. The Guide issued by the Ministry contains tables specifying the measurements and suitable current for every measurement at 220 volts level.
5- The network shall contain an effective protection system against exposure to electric shock depending on the circuit breaker protection that disconnects the two electrified lines together in case of excessive current leakage which may lead to electric shock. The Guide issued by the Ministry includes more detailed instructions for protection against electric shock.
6- The protection system in the distribution panels should be designed in such a way that every circuit will have a dedicated breaker (dual switch) with a rated current that is suitable for the rated current of this circuit. The instructions and information issued by the Ministry contain more explanation with illustrations.
7- All sockets shall be of the type designated for 220 volts, compatible with the Saudi Standards specifications including that of their switches (if any) which shall be of the type that will disconnect the supply of electricity from the two electrified lines together.
8- The electrical switches used in controlling the loading operation shall be compatible with the Saudi Standards specifications, with dual disconnection function to disconnect the two electrified lines together.
9- All household appliances, lighting, and accessories should have a rating of 220 volts or 230 volts or based on whether the appliance’s system is designed to allow voltage variations of ± 10% of the rated current.

Section two:

Following are the most important instructions that shall be adhered to in the existing buildings and by existing customers in the existing areas with 127/220 volts supply.

1- These buildings will continue being supplied with dual voltage current 127/220 volts for 10 years during the preliminary stage as of the approval date in accordance with the voltage change plan. Thereafter, there will be a gradual shift of power feeding to 230 volts between electrified and neutral lines over 15 years period (implementation period) from new transformers to be installed during these years as per the plan approved by the Ministry of Water and Electricity.

2- During the implementation phase for shifting to the 230 volts, SEC shall supervise the modification of the electrical wirings in the buildings in a manner that matches the instructions guide.

We hope that everyone shall ensure compliance with the instructions that shall be issued by the concerned authorities regarding health security, safety, and the implementation of the electrical wiring procedures in accordance with the new voltage system. Our valued customers are requested to consider purchasing suitable household electrical appliances and devices that conform to the new voltage.
Our Services will be Quick and Simple through our website

www.se.com.sa