

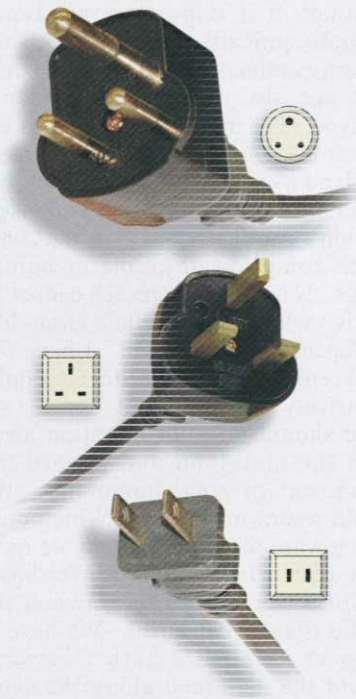
Voltage

By Takashima Hatsuhisa

Upon leaving Japan to travel around the world, there are a number of things that one finds curious. Perhaps what is most different from country to country are the electric outlets and the power voltage. Electrical appliances in Japan come with instructions saying that the product is for use with 100-volt current and a plug that has two thin prongs. If you take such products to Europe, Africa, the Middle East, Latin America and most of the nations of Asia, they will be absolutely unusable. Even in America, the voltage is 120 and the outlets have a third slot for a grounding prong, so one is a little nervous when using an appliance brought from Japan.

According to the Japan Electrical Manufacturers' Association (JEMA), of the 190 or so countries of the world, the only ones which use 100-volt current are North Korea and Japan. Neighboring South Korea, China and Taiwan have been using 110 volts but are currently busy raising the voltage to 220. In this global community, the only other nations still using between 100 and 199 volts are the United States and Venezuela, each of which uses 120 volts.

Europe is now making progress toward implementing a unification plan whereby all the member countries of the European Union would use 230 volts by the end of 2003. Among the leading industrialized countries of the world, Japan is conspicuous by its use of such low voltage. Due to these factors, JEMA in March of this year released a report on electric power announcing the start of a campaign: "Raise Japan's power to 230 volts and join the world standard." It is a provocative campaign interspersed with slightly sensational phrases such as "Left the way things are, will Japan remain an orphan of the world?" When I heard about this movement, I immediately recalled a West German movie I saw some 40 years ago.



A Japanese plug (bottom) has only two thin prongs while regions using higher voltage employ three-pronged plugs, including a ground

The movie was titled, *Der Schwarze Blitz*, and it was a thrilling, entertaining film starring Toni Sailer, the great Austrian skier who was the first to achieve victory in three Alpen events in the Cortina d'Ampezzo Winter Olympics in 1956. But it was not the skiing scenes nor the beautiful Tyrolean mountains that I remembered. It was rather a brief scene where the young proprietor of a mountain lodge, played by Sailer, was conversing with a passerby. If my memory serves me correctly, he said happily to this person, "It's certainly convenient now that the voltage has been raised to 200."

That I remember this insignificant moment even now is because I could not imagine the meaning of 200-volt current. It seemed odd to me that there could be some unknown and mysteri-

ous convenience by the mere increase of voltage to 200 volts.

And now 40 years have passed. I had forgotten all about this movie, but when I read the newspaper article about the campaign to boost Japan's electrical power to 230 volts, the puzzlement I had contemplated 40 years earlier returned.

Immediately requesting information on the subject from JEMA, I found the following explanation: "With high voltage, it is easy to produce greater energy. Even an electromagnetic stove can produce powerful heat equivalent to a gas burner so one can cook within a short time. It is now possible to produce an instantaneous water-heater without using gas, and in homes with elderly people and children it's possible to do household chores without the use of a flame. It would increase the power of air conditioning and make possible an even more comfortable life. And there are many other merits."

According to this, because greater heat and energy is possible if the voltage is raised, the efficiency of various electrical products, especially those employing Nichrome wire and motors, is greatly improved, and consequently one can achieve more convenient work operations and life. As I continued reading the pamphlet, I came to realize there were actually other advantages.

"Electric energy is calculated by multiplying voltage by current, and if one electric appliance makes use of the same amount of energy, then if the voltage is doubled, the current that is necessary is reduced to only half. Given this, the heat loss that occurs in power distribution equipment and electric cords is reduced to one-fourth, so one can expect big savings of energy. Further, if the end voltage is 230 volts, because the electric energy could be transmitted from the power stations via the transformer substations into homes with a higher voltage than at present, it

is possible to reduce the loss of electric power during transmission.”

Putting these factors together, JEMA estimates that on a nationwide level, if an electricity supply of 230 volts were implemented, the annual savings of electric power would amount to 7 billion kilowatts, the equivalent of the annual output of a small-scale nuclear power plant. In terms of global warming, this figure is the equivalent of an annual reduction of 3 million tons of carbon dioxide emissions. JEMA concludes, “Raising the voltage to 230 is truly an excellent idea, serving a dual purpose. We certainly hope to realize this plan within the next 15 years.”

It's easy to understand why Toni Sailer smiled so happily in the movie, but when something sounds so good, there is usually another side to the matter.

At present a current of 100 volts is sent to each of Japan's 50 million households, where refrigerators, washing machines and 86 million television sets are operated with 100-volt current. What would happen if the voltage were suddenly raised to 230? I certainly did not intend to carry out any experiments, but at our house we recently experienced something that would normally not happen. We have a British 240-volts television and video cassette recorder, which I bought when I was a television correspondent in London. When I was transferred to the headquarters 13 years ago, I brought them back to my house in Tokyo in order to watch British PAL-system videos of old movies that I collected while I was there. Both are plugged into the electric socket of the Japanese standard through a transformer which raises the voltage to 240. One day a member of my family bought a new CD/MD player and mistakenly plugged it into that socket, and did we have a problem on our hands. The new player began to issue smoke with a strange smell and was instantly destroyed. It became entirely unusable. It seemed that the electric circuitry literally burned up. I felt as if I had witnessed the force of 240 volts.

Actually in every region where people use a power supply of 200 volts or

more, they use a three-pronged plug. The thick prong in the middle is a ground for safety to prevent accidents from misuse, leakage and short circuiting. In the United Kingdom, which uses 240 volts, the wall socket is as big as a pincushion in a sewing box, and it has a small fuse inside. When you insert the largest of the three prongs of the plug – which is a ground – it opens a lid that allows the other two prongs to be inserted, and this prevents children from mischievously sticking a piece of metal wire into the socket.

A power supply of 230 volts in Japan would require a number of measures including the replacement of circuit breakers and electrical outlets, the deployment of transformers to lower the voltage for 100-volt home appliances, and the provision of transmitters and transformers. Ultimately this change would require, over a certain period of time, the purchase of 230-volt home appliances to replace the current 100-volt products now in use throughout the nation. JEMA estimates that the cost to adjust power distribution facilities alone would come to ¥1.2 trillion and that over a period of 15 years ¥80 billion in new investment would be needed per annum. In addition, on top of the large-scale replacement purchases of home appliances, manufacturers would be able to rationalize production lines by no longer having to produce 200-volt standard products for export and separately producing 100-volt standard products for domestic consumption. Combining other factors with the merits of rationalizing production lines, this 230-volt argument must seem to Japan's electric appliance manufacturers – who have been experiencing sluggish growth – to be colored in the hues of a long-awaited salvation.

From the position of the electric power provider, Tokyo Electric Power Company holds to the position that it is not necessary to plunge into measures for a shift to 230 volts, claiming that the present system can provide 200 volts, if users so desire. In response to this, JEMA is energetically campaigning, saying, “As a national policy, South Korea commenced conversion in 1973 to increase voltage and the entire

nation is now in that transition, so that by 2005 every household will be on a 220-volt current. Europe will be unified at 230 volts. Is it acceptable for Japan to be the only one left out?”

According to an expert on the history of electric power in Japan, the original use of 100 volts dates from the end of the 19th century when electric lights were diffused throughout the country. At that time, the common voltage around the world was 110. It is said that in order to make the expensive electric goods imported from abroad last even slightly longer, the voltage was set somewhat lower in Japan. Also

Photo : Tokyo Electric Power Company



A power supply of 230 volts in Japan would require the deployment of transformers

it was at that time that eastern Japan began using a frequency of 50 hertz and western Japan began using 60 hertz. This division of the country, which continues even now, resulted from the fact that the Tokyo electric light firm first imported 50-hertz power generators from Germany, while its Osaka counterpart imported 60-hertz generators from America. It will certainly be interesting to see how Japan's electric power situation – which sprang from such eccentric origins – will respond to this 230-volt campaign. **JMI**

Takashima Hatsuhsa is a Director of the United Nations Information Center. He specializes in International Relations and Theories of Mass Communications.