Restoration of Electric Power Supply from The Hanshin-Awaji Earthquake

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Summary

The Hanshin-Awaji Earthquake struck the greater Kobe region at 5:46 am on January 17th, 1995. The epicenter was only about 20km away from the center of Kobe City where about 1.5million live. A magnitude of the earthquake was 7.2 on the richer scale. Because such severe earthquake stuck the densely populated area, resulting damage was enormous. The Hanshin-Awaji Earthquake came to be the Japanese worst natural disaster since the end of the Second World War. This paper describes the damages and restoration of the power system caused by the earthquake and our lessons from this experience.

The electric power system suffered substantial damages from the earthquake. We found damages in 50 substations, 125 transmission lines and 660 distribution lines, which caused blackout to 2.6 million customers immediately after the earthquake. It took 153 hours, about 7 days, to complete temporary restoration.

Considering the extreme destruction in and around Kobe City, 153 hours were not so long for restoring electricity supply. We estimate that the following points are key to restore electricity supply quickly after such a big earthquake.

- **A robust and flexible power system**
  275 kV system suffered extensive damages leading to power outages over a wide area. But damages in 77kV system were not so bad. Since 77kV system linked well to 275kV system, we used 77kV system as much as possible to reduce the blackout area.
- **Restoration by overhead distribution lines**
  Identification of damages and restoration of overhead distribution lines are rather easy, while it usually takes long time to identify the damaged section of underground cables. We used overhead distribution lines for temporary restoration. Damaged underground cables were by-passed by overhead lines. We made best use of the undamaged equipment and materials remaining at the damaged site.
- **A private communication system with strong aseismic design**
  Our private communicating system survived the earthquake. It was a critical factor to perform restoration work quickly and safely, because public phone system did not work well by the damages of the earthquake and by the enormous number of calls among public people.
- **A nationwide system to receive assistance from other electric power companies**

We received invaluable assistance from all other electric power companies in Japan including 319 work personnel, 52 high voltage power generation vehicles, 77 working vehicles and other materials.

- **Application of aseismic design and other measures against the earthquake**
  We have adopted aseismic design standard taking resonance of the equipment into account since the 1978 Off-Miyagi earthquake. Equipment designed by this standard got much less damages than others.

There is a Japanese proverb saying “natural disasters strike when you least expect it”. We have to make an effort continuously to prepare well against it. Sharing our experience must be beneficial to all the attendants of the conference.