

ZConverter

# Case Study: KEPCO Hybrid DR Architecture

Korea Electric Power Corporation's journey to hybrid cloud disaster recovery

## Executive Summary

Korea Electric Power Corporation (KEPCO), the nation's largest electric utility serving over 22 million customers, implemented a hybrid disaster recovery architecture using ZConverter to protect critical power grid management and customer service systems.

### The Challenge:

KEPCO's power grid management systems are classified as national critical infrastructure, subject to the strictest availability requirements. Any disruption could affect power supply to millions of homes and businesses.

### Requirements:

- Zero data loss for power grid control systems (RPO = 0)
- Recovery within 5 minutes for grid management (RTO < 5 min)
- Compliance with Ministry of Trade, Industry and Energy regulations
- Support for air-gapped environments (SCADA/ICS systems)
- Hybrid architecture spanning on-premises and government cloud (G-Cloud)

### Solution Highlights:

- 230 servers protected across 4 geographic regions
- Dual-path replication (on-premises + G-Cloud)
- Air-gapped replication for SCADA systems via secure data diodes
- Automated failover with manual override for grid control systems

## Architecture & Implementation

### Network Architecture:

KEPCO operates four regional data centers (Seoul, Daejeon, Busan, Gwangju) with ZConverter providing:

#### Primary DR Path (On-Premises):

- Dedicated fiber connections between regional centers
- Synchronous replication for grid control systems
- Physical isolation from corporate network
- Hardware security modules (HSM) for encryption key management

#### Secondary DR Path (G-Cloud):

- Encrypted VPN tunnels to government cloud infrastructure
- Asynchronous replication for non-critical systems
- Automated scaling for seasonal demand variations
- Geo-redundant backup storage across two availability zones

### SCADA/ICS Protection:

- One-way data diodes ensure air-gap integrity
- Custom ZConverter module for unidirectional replication
- Verified by KISA (Korea Internet & Security Agency) security audit
- Separate management plane with role-based access control

### Implementation Timeline:

Phase 1 (Months 1-3): Grid control systems (45 servers)

Phase 2 (Months 4-6): Customer service platforms (85 servers)

Phase 3 (Months 7-9): Corporate systems (100 servers)

Phase 4 (Months 10-12): Optimization and compliance validation

## Results & Impact

Operational Results (18-month evaluation period):

Availability Metrics:

- Grid control system availability: 99.9999% (6 nines)
- Customer portal availability: 99.998%
- Corporate system availability: 99.99%
- Zero unplanned failover events triggered

DR Test Results:

- 18 monthly DR tests: 100% success rate
- Grid control failover: Average 3.8 minutes
- Customer service failover: Average 8.2 minutes
- Full regional failover drill: 22 minutes (all 230 servers)

Compliance:

- Ministry of Trade, Industry and Energy: Full compliance
- KISA Critical Infrastructure Protection: Certified
- ISO 27001/27019 (energy sector): Recertified
- National Intelligence Service security assessment: Passed

Cost Savings:

- Previous DR solution: \$4.8M annual operating cost
- ZConverter hybrid solution: \$2.9M annual operating cost
- Annual savings: \$1.9M (39.6% reduction)
- Projected 5-year savings: \$9.5M

Business Impact:

- Power grid reliability improved from 99.98% to 99.999%
- Customer complaint resolution time reduced by 65%
- New service deployment time reduced from weeks to hours
- Environmental monitoring data now backed up in real-time

Awards & Recognition:

- 2024 Korea IT Innovation Award (Disaster Recovery category)
- Ministry commendation for Critical Infrastructure Protection
- Featured in Gartner case study for utility sector DR

"ZConverter's hybrid DR architecture has set a new standard for critical infrastructure protection in the energy sector."

- CIO, Korea Electric Power Corporation