

Grid Digitalization and Cybersecurity in Jordan

Strategic Digital Solutions for Secure Energy Infrastructures



INTRODUCTION TO GRID DIGITALIZATION

Smart Grid Digitalization

Jordan integrates smart grid technologies to improve energy efficiency, automation, and real-time monitoring.

Energy Security Priorities

Digital transformation addresses Jordan's reliance on imported fuels by optimizing system resilience.

Cybersecurity in Energy

Robust cybersecurity measures protect Jordan's energy systems from digital threats and disruptions.

Capacity Building

Jordan invests in workforce training and regulatory frameworks to support innovative energy management.



JORDAN ENERGY SECTOR CONTEXT

Reviewing the National Power System and Digital Transition



ENERGY DIVERSIFICATION & SECURITY

- ✓ **Strategic Energy Shift:** Jordan reduced reliance on imported fuels by diversifying its energy mix toward domestic and renewable sources.
- ✓ **Smart Grid Solutions:** Integration of SCADA systems and advanced metering for real-time monitoring and efficient distribution.
- ✓ **Renewable Milestones:** Wind and solar account for 27 percent of energy consumed, supporting sustainable growth targets.



REGIONAL ENERGY INTERCONNECTIONS



Egypt Link

Submarine cable with 600 MW capacity at 400 kV level active since 1999.



Syria Link

850 MVA capacity since 2003 (Currently out of service since 2011).



Regional Island Supply

NEPCO successfully supplied island load to both West Bank and Iraq.



Future KSA Connection

Connection via back-to-back converter (1100 MW) expected in the near future.



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CURRENT ACHIEVEMENTS

Pioneering Operational Advancements and Grid Automation



GRID MONITORING MILESTONES

SCADA/EMS

SCADA for DSO & SCADA/EMS for TSO enable real time control and improve stability.

AGC Implementation

AGC implemented to mitigate RES impact and improve national system stability.

ICCP Coordination

Connecting DSO's control center with TSO control center for synchronized operations.

WAMS/PMU

Implemented to monitor and mitigate the impact of interarea oscillation across the grid.

ASSET & AUTOMATION PROGRESS

- ✓ SAS implementation in all 400 kV substations (Standard: IEC 61850).
- ✓ Transformer monitoring system for all primary 400/132 kV transformers.
- ✓ AMI for transmission active since 2014; distribution completion imminent.
- ✓ PQMS project on all RES projects to ensure full grid code compliance.

CYBERSECURITY & AI ROADMAPS

Renewable Integration Control

Advanced systems allow full operational control of solar and wind despite natural variability.

Risk Assessment

OT+IT asset register completed Q4 2025.
Preparation of policies ongoing for 2026 delivery.

AI Strategic Plans

Developing roadmap to support high-accuracy RES generation and load forecasting analysis.

KEY CHALLENGES

Navigating Systemic Hurdles and Cybersecurity Threats



SYSTEMIC & TECHNICAL OBSTACLES

- ✓ **Renewable variability** and overgeneration challenges system stability and economic returns.
- ✓ **Storage Deficit:** Lack of pump or battery storage limits RE penetration accommodation.
- ✓ **Grid Flexibility:** Conventional units lack agility to respond effectively to fluctuations.
- ✓ **Cyber Risks:** Connectivity exposes the grid to threats requiring high-end governance.
- ✓ **Infrastructure:** Aging systems and the need for specialized technical talent.

STRATEGIC FUTURE VISION

Smart Enhancement

Expanding monitoring and automation using AI and machine learning to optimize systems.

System Flexibility

Integrating energy storage and demand-side management to balance supply.

Cyber Resilience

Establishing governance frameworks and threat detection to protect infrastructure.

Human Capital

Developing skilled personnel to operate next-gen digital technologies.



Thank You

Advancing Jordan's Secure and Digitalized Energy Future.

National Electric Power Company (NEPCO)

