Utility Strategies for Grid Modernization in South Asia

South Asia Regional Session

Session 2: Sharing Energy, Sharing Risks: Intelligent Power Grids for a More Secure South Asia

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Unique complexities in South Asia

~2.1 bn

Population

By 2030, nearly **90%** of South Asia's population could face escalating climate-related threats. (World Bank, 2025)

6.2%

Annual GDP Growth

One of the world's fastest-growing, with a combined GDP of **$4.51 trillion** in 2024.

1,100 kWh

Units Per Capita Electric Power Consumption

Remains well below the global average of **3,558 kWh**, pointing to substantial unmet demand.

99.4%

Access to Electricity

Access is largely achieved; the next priority is reliable, affordable and cleaner electricity supply.

Source - IEA Energy Statistics Data Browser, International Energy Agency (IEA)

Key Sector Opportunities

- Power demand to **more than double by 2050** — creating long-term investment needs in generation, transmission, and grid resilience.
- **584 GW renewable target by 2030** — building on **~264 GW in 2025**, with strong RE potential (+2,600 GW).
- **~3x growth in BBIN power trade** — from 7.8 TWh in 2013 to 21 TWh in 2024, with potential to reach **~43 GW** by 2040.
- **US$94 billion savings** and **8% lower GHG emissions** — possible through deeper regional grid integration during 2015–2040.

Key Challenges

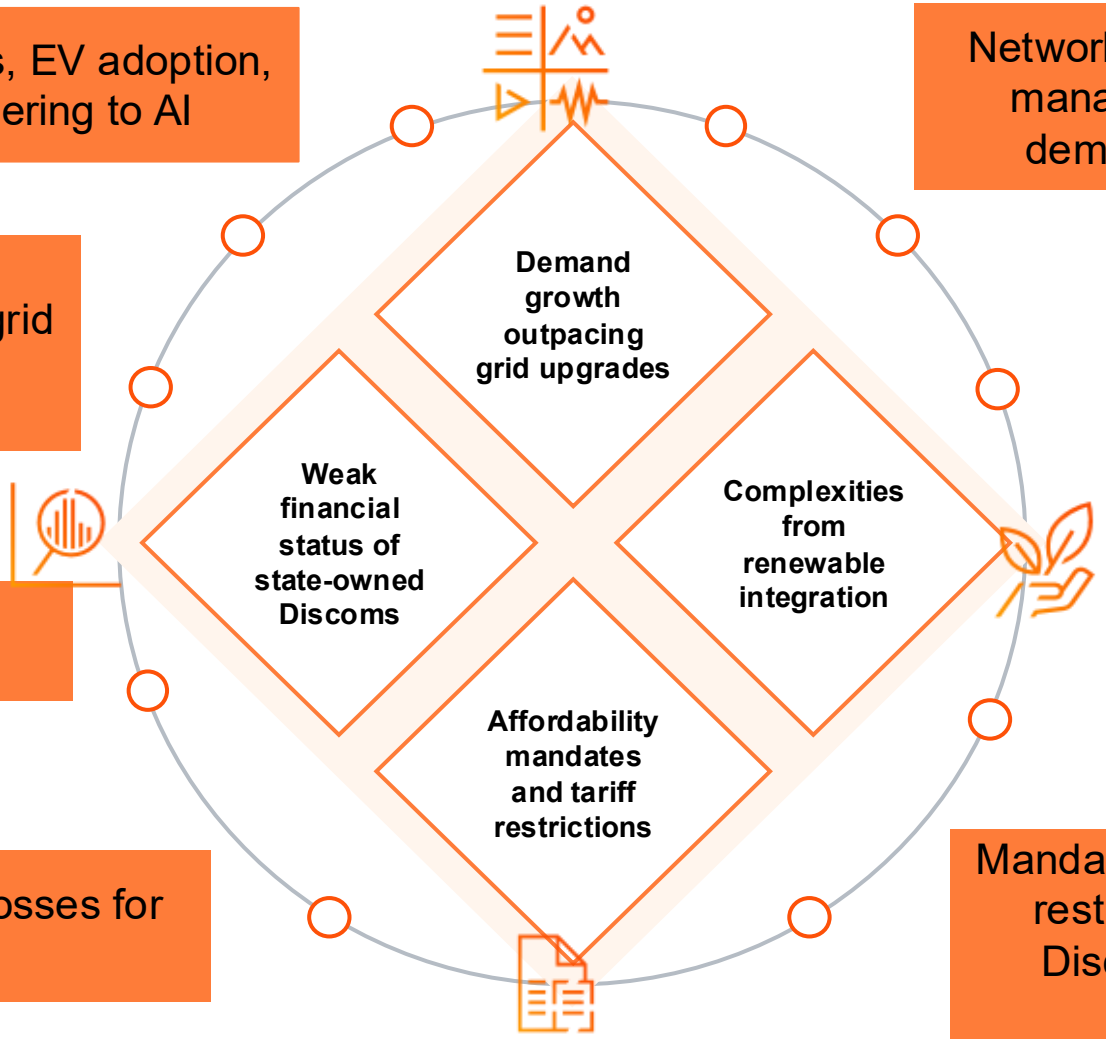
- High AT&C losses (15–30%+)
- Financially stressed DISCOMs
- Legacy infrastructure
- Rapid demand growth
- Rural + urban mix complexity
- Limited digitalization baseline

The South Asian Energy Paradox

The growth of prosumers, EV adoption, and data centers catering to AI

Network operators are having to manage an increasing peak demand with aging assets

Capacity additions far outstrip grid upgrades



Can't keep up with the rate of energy storage capacity additions required

Complexity in Supply and Grid Reliability

Growing accumulated losses for Discoms

Mandates on affordability, subsidies, and restrictions on tariff revisions leave Discoms with little room to recoup expenses

"The challenge is not just adding clean energy —it is doing so while catering to the growing demand and consumption."

Future-Ready Grid : Integrated, Flexible, and Intelligent

Integrated

A grid that unifies generation, transmission, and distribution assets including storage, and end-use across sectors

- Integrated assets sharing near real-time data on grid status, renewable generation, storage availability, etc.
- Integrated dispatch and balancing markets
- Integration of Distributed Energy Assets including rooftop solar, EV assets, etc.

Flexible

A grid that manages and absorbs variability and uncertainty through storage, demand response, etc.

- Implement utility-scale battery energy storage solutions or Pumped Storage systems to handle variabilities
- Enable Time-of-Use (ToU), dynamic tariffs, and demand side response initiatives to ensure consumer buy-in
- Transition for a standard hub-and-spoke to a distributed assets model with peer-to-peer exchanges

Intelligent

A grid that senses, learns, predicts, and acts autonomously — powered by data and AI

- Ensure data collected via smart metering and IoT-enabled distribution assets are utilized to sense and predict the grid
- Enable predictive load, renewable generation forecasting, with AI-based predictive fault detection
- Enable Digital Twins of distribution networks for simulations and analysis

Utilities are taking initiatives to align with the need for grid modernization to meet the challenges:

- Implement smart metering, SCADA/ADMS, and Distributed Resource Monitoring solutions
- Ensure common data exchange mechanism (e.g., CIM) to ensure future flexibility

- Implement firm renewable generation capacity with built-in storage
- Implement tariff reforms to allow dynamic pricing, demand management initiatives to ensure user buy-in

- Implement AI-enabled demand forecasting mechanisms, fault detection, etc.

Utility Grid Modernization: Shift to an Intelligent Energy System

1. Grid Architecture

- Centralized → Distributed
- Supply-led → Demand-flexible

2. Operations & Technology

- Reactive → Predictive
- Manual → Digital
- Limited visibility → Real-time control
- Reactive O&M → Predictive operations

3. Business & Operating Model

- Asset operator → System orchestrator
- Capex-driven → Data-driven decisions
- Supply-focused → Prosumer management

Utilities are strategizing to evolve from infrastructure-centric operators into intelligent, data-driven energy orchestrators.

Expand & Reinforce Grid Infrastructure	• Accelerate T&D expansion for rising electricity demand • Modernize ageing grids for resilience and reliability • Strengthen regional interconnections for RE integration and power balancing
Deploy Smart & Digital Grid Technologies	• Deploy GETs to maximize grid capacity • Use AI and analytics for predictive grid management • Enable cloud-based orchestration and real-time monitoring
Enable Distributed & Flexible Energy Systems	• Integrate DERs including solar, storage, and EV ecosystems • Improve grid flexibility to manage intermittent renewable generation • Expansion aligned with future demand growth
Strengthen Investment & Delivery Models	• Create innovative financing & PPP investment models • Ecosystem partnerships with tech, engg., and infrastructure players • Upskill workforce to support accelerated grid transformation

Thank you