



Neural Networks in Energy Efficiency: A Revolution?

- The role of neural networks in the modern energy sector
- How AI integration improves efficiency, reliability, and resilience

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*United Nations Economic and Social Council
Group of Experts on Energy Efficiency*

*Tenth session
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The Current Energy Landscape

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Challenges in the energy sector:

- Demand and supply imbalances
- Aging infrastructure and Integration of renewable resources
- Cybersecurity threats
- The need for a more adaptive and intelligent approach

Neural Networks Defined

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What is a Neural Network?

Mimicking the human brain: layers of interconnected neurons

Processing input data, recognizing patterns, and making predictions/decisions

Types of neural networks and their applications in energy systems

Predictive Maintenance using Neural Networks

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Reducing unplanned downtimes

Prolonging equipment lifespan

Case study: Using neural networks to predict turbine maintenance in wind farms

Demand-side Management & Neural Networks

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Real-time energy consumption forecasting

Adapting to user behaviors and trends

Optimizing grid loads, reducing strain and inefficiencies

Enhancing Renewable Energy Integration

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Predicting renewable output (e.g., solar, wind)

Optimizing storage solutions based on forecasted demand and production

Reducing the reliance on non-renewable backups

Cybersecurity & Neural Networks

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Real-time monitoring and threat detection

Training models on threat patterns and evolving attack strategies

Reference to "Key considerations and solutions to ensure cyber resiliency in the smart integrated energy systems"

Big Data, Energy, and Neural Networks



Importance of Big Data analytics in energy systems

How neural networks process vast data sets for improved system efficiency

Reference to "Improving efficiency and reliability of energy systems by means of big data analytics"

Conclusion & Future Directions

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The undeniable impact of neural networks
in driving energy efficiency

The marriage of digitalization and energy for a sustainable future

Call for collaboration, research, and exploration in harnessing
the full potential of neural networks in the energy sector



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