AI-Driven Power Management in Hybrid Renewable Energy Systems

AI transforms energy management through data analysis and optimization.

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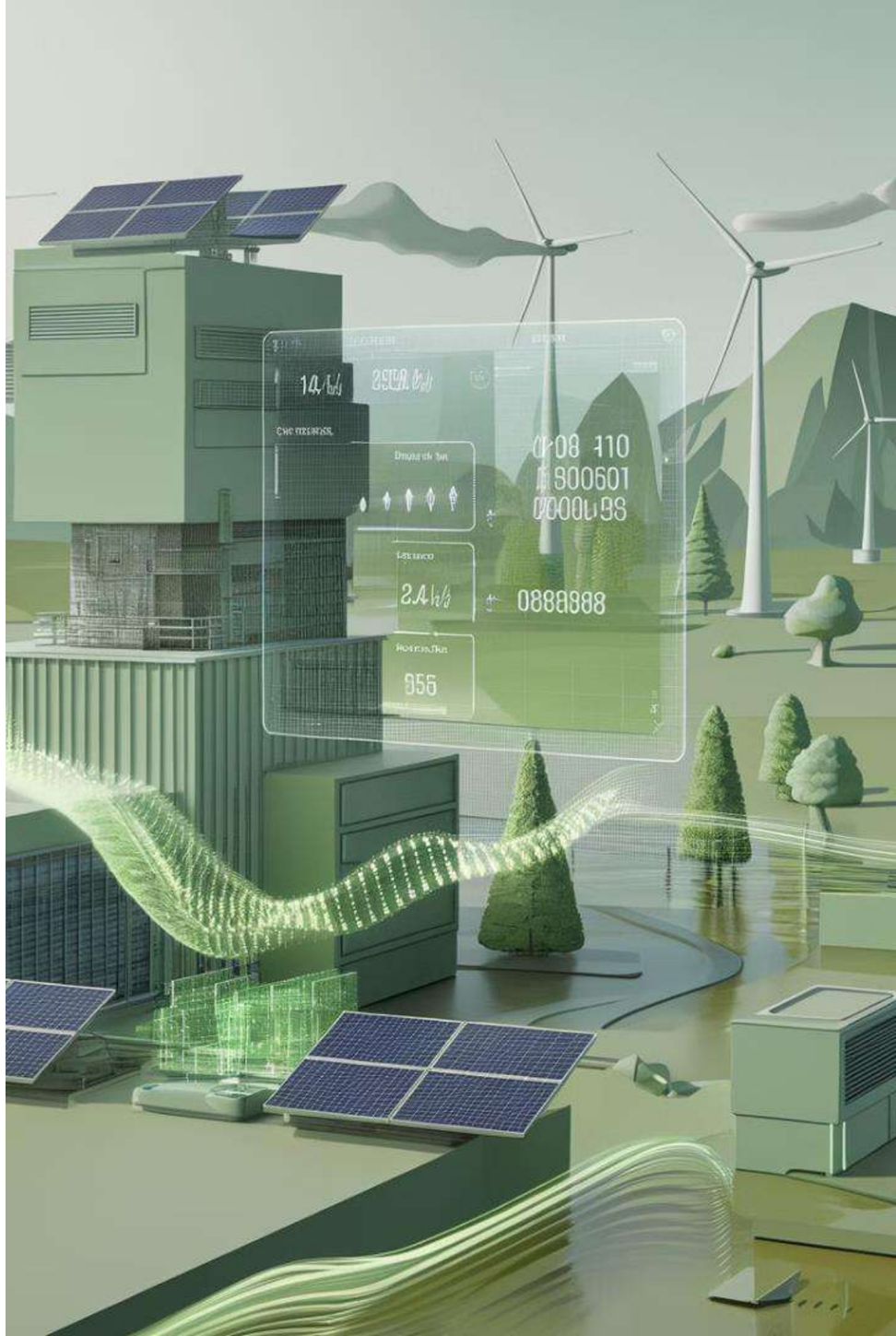
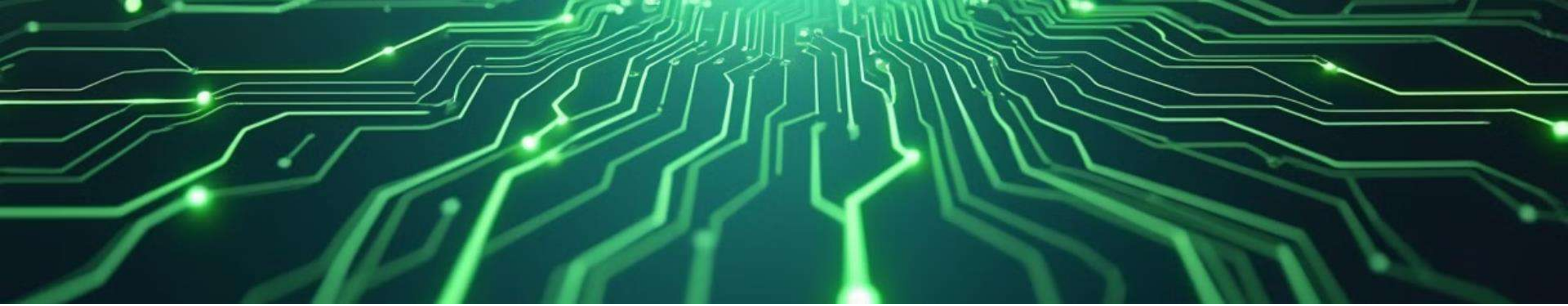




AI is transforming energy management

1 **Data Analysis**

AI analyzes vast amounts of consumption data

2 **Prediction**

Forecasts energy demand and production

3 **Optimization**

Enhances energy usage in commercial settings

4 **Fault Detection**

Predicts inefficiencies and reduces operational costs

Energy Management Challenges

Inconsistent Production

Wind, solar, and grid price variations, Interconnectors

Fluctuating Demand

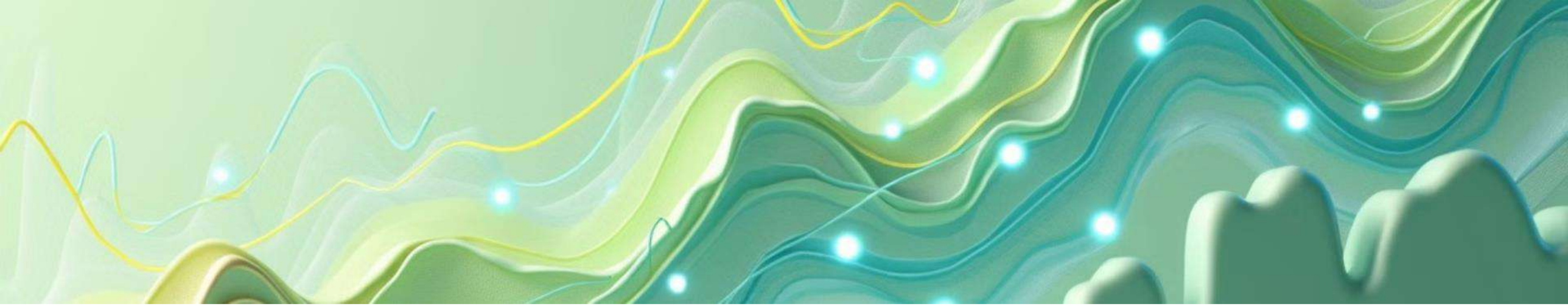
Changing energy needs over time

Expensive Storage

High costs of energy storage solutions. Non-solid State storage storage is promising

Energy Production Efficiency

Faults decrease overall energy efficiency



Pattern Recognition and Trend Analysis

1

Pattern Recognition

AI identifies seasonal trends and daily usage patterns

2

Data Segmentation

Analyzes building floors or areas for improvement

3

Anomaly Detection

Identifies faults using historical and real-real-time data

Data Acquisition

Temperature sensor

Occupancy sensor

Light intensity sensor

Motion sensor

Humidity sensor

Weather

Energy prices

Thermostats

ACs and heat pumps

Appliances

Machines

Lighting

Advanced Predictive Analytics

1

Historical Data

Analyzes past consumption patterns

2

External Factors

Considers weather forecasts and real time data

3

Demand Forecast

Predicts future energy needs

4

Optimization

Suggests strategies for efficient energy management

Demand Response Strategies

1 **Adaptation**

AI adjusts energy demand to supply conditions

2 **Load Reduction**

Decreases non-critical usage usage during grid stress

3 **Backup Power**

Switches to auxiliary sources for sources for balance

4 **Decision Making**

AI chooses the best energy use use mix

Optimizing Energy Usage

Dynamic Management

Continuous adjustment of energy usage

Scheduling

Optimizes operation during off-peak hours

Enhance efficiency and reduce costs

Turning insights and predictions into actionable strategies

Digital Twin in Predictive Maintenance

- Virtual representation of a physical asset
- Asset Health Monitoring
- Performance Prediction
- Failure Anticipation
- Redundancy Necessity

Enhancing Renewable Energy Integration

Prediction

Forecasts solar and wind energy availability

Energy Optimization

Maximizes clean energy usage

Preventing Maintenance

Ensures optimal operation and sustainability

sustainability

Environmental Impact and Cost Reduction

Sustainability	Reduced emissions and carbon footprint
Efficiency	Decreased reliance on fossil fuels fuels
Cost Savings	Lower energy consumption and operational costs
Balance	Sustainability goals with financial financial performance

Thank You

I appreciate your time and interest in exploring the potential of AI-driven power management for hybrid renewable energy systems.

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