

# AI-Driven Predictive Energy Analytics for the Department of Energy

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Leveraging AI to Optimize Energy Management and Enhance Security

**Accenture  
Federal  
Services**



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# Department of Energy Overview

DOE Mission: Ensure energy security, promote sustainable energy, manage energy grids.

- Energy demand forecasting to prevent grid overloads
- Efficient integration of renewable energy sources
- Infrastructure vulnerability management



# Problem Statement: Challenges in Energy Demand Management

- **Unpredictable Energy Demand:** The DOE faces significant challenges in accurately predicting energy demand, leading to inefficiencies in energy production and allocation.
- **Renewable Energy Integration:** As the nation transitions to renewable energy sources, variability in availability makes it difficult to balance supply with fluctuating demand.
- **Infrastructure Vulnerabilities:** Aging infrastructure and increasing energy demands make the grid more vulnerable to overloads and failures, impacting national security.



# Proposed Solution – AI-Powered Energy Consumption Prediction

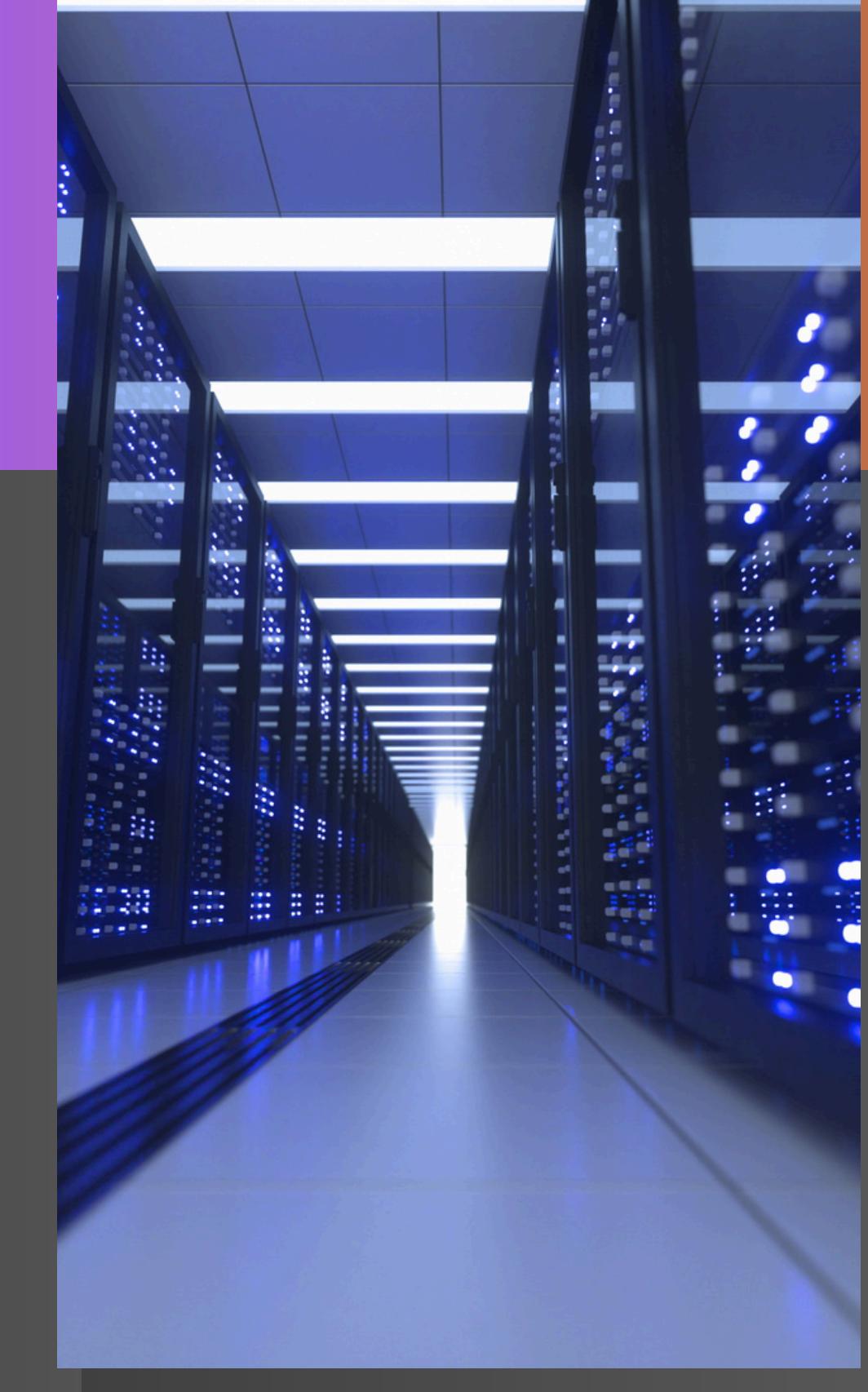
**Solution Overview:** AI-driven predictive analytics using a Random Forest Regression machine learning model to forecast energy demand based on real-time data.

## How It Works:

**Data Inputs:** Historical energy consumption, weather data, household and appliance usage profiles.

**Model:** The app we created uses machine learning to predict hourly energy consumption.

**Demo:** We can create a functioning web app that models energy consumption predictions, which can be scaled up for DOE use at a national level.



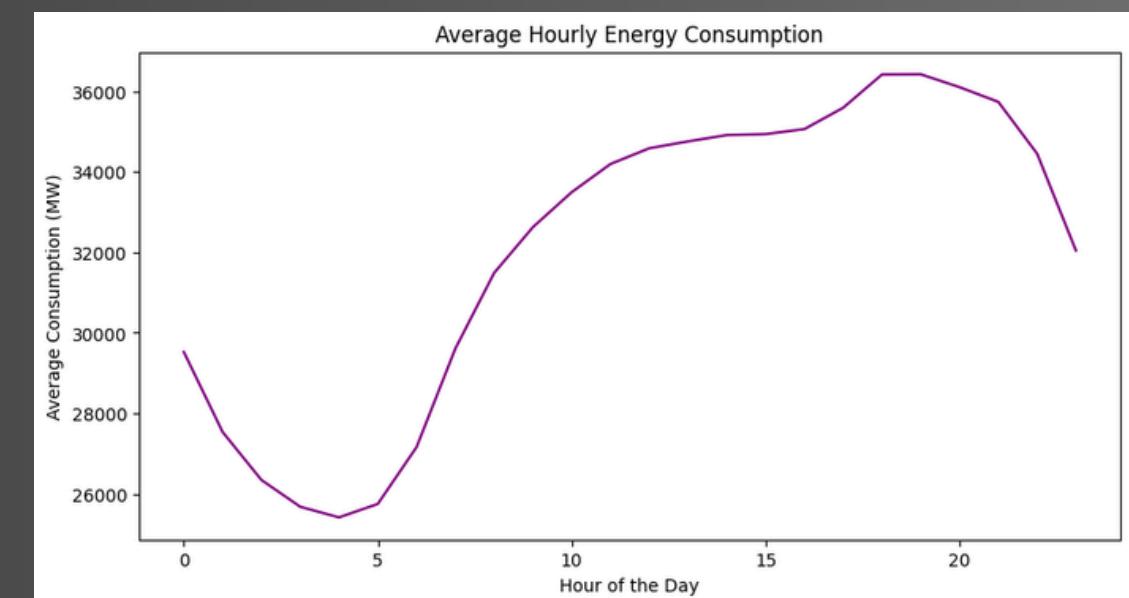
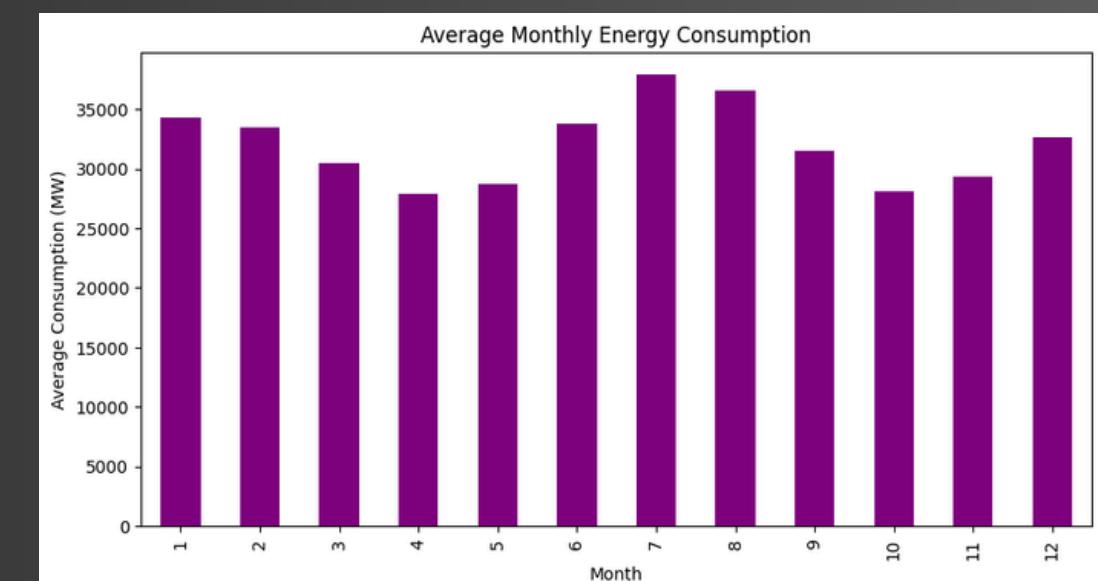
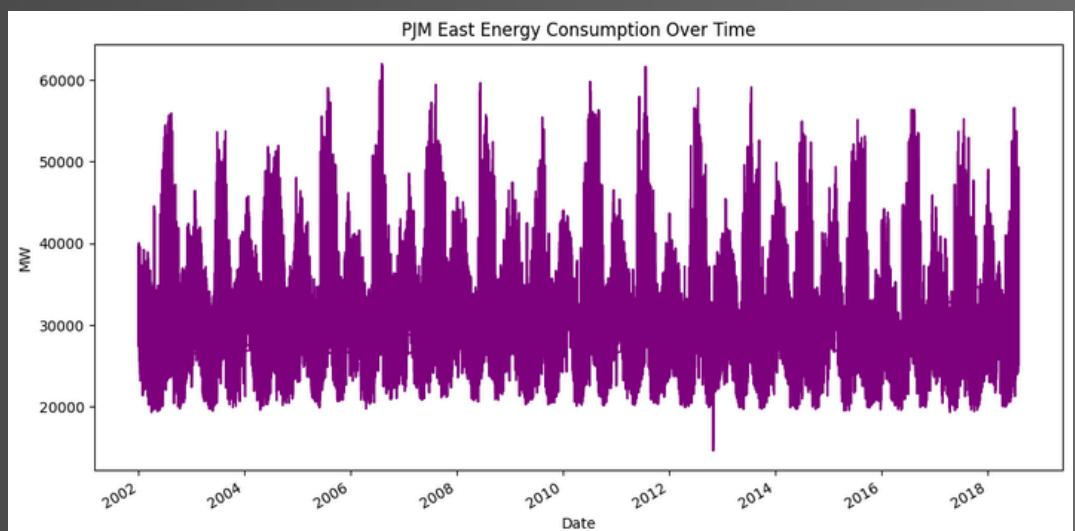
# Business Benefits of AI-Powered Prediction for DOE

**Efficiency:** Improve resource allocation by accurately predicting demand, avoiding energy wastage, and reducing costs.

**Sustainability:** Predict renewable energy availability, balancing it with demand to enhance green energy integration.

**Grid Stability and Security:** Proactively detect anomalies in consumption that may indicate infrastructure issues, enabling preventive maintenance.

**Scalability:** Your model, which runs on a web app, can scale to DOE's infrastructure, handling larger datasets and incorporating real-time national data



# Conclusion and Key Takeaways

**Summary:** AI-driven predictive analytics, as demonstrated by the model and app, can support DOE's energy forecasting, efficiency, and security goals.

**Scalability:** The model can be scaled to handle nationwide data, pulling from various sources to support DOE operations.

**Final Thought:** This solution positions the DOE to harness the power of AI for a sustainable, secure, and resilient energy future.





# ML Model and Web App Demonstration

