FUJITSU

Whitepaper
Transforming energy utilities with AI to meet modern Australia's needs

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Introduction

The Australian energy industry is experiencing a major transformation fueled by technological advancements, climate concerns, and changing consumer preferences. Key trends include the rapid adoption of renewable energy, particularly rooftop solar, which is altering the traditional utility model. The balance between electricity and gas markets remains tight, pushing retail prices upward. The rise of 'prosumers' is also changing how energy is produced and consumed, requiring utilities to adapt or risk obsolescence.

Utilities face challenges around strained business models, high prices and energy debt, ageing infrastructure, and the need to invest in renewables. Artificial intelligence (AI) can provide a powerful solution to address these challenges. It can help reduce consumer costs, improve infrastructure management, meet climate change goals, identify opportunities to invest in new technologies, and increase overall energy efficiency and reliability. Utilities can transform their operations, enhance customer experiences, and develop new business models that are better suited to the evolving energy landscape by leveraging AI technologies.

This whitepaper explores how utilities can adopt AI technologies effectively.

Implementing AI in energy utilities: a roadmap

Energy utilities should follow a structured roadmap to successfully integrate AI into their operations, based on several key strategies:

Strategy 1
Implement a robust data infrastructure

Collect, store, and process data from various sources, including smart meters, sensors, weather stations, and external databases. This data integration creates a unified view of operations and customers, essential for managing a decentralised energy system with a high penetration of rooftop solar.

Strategy 2
Improve customer service through AI tools

AI tools offer numerous ways to enhance service delivery and improve customer experiences. Generative AI (GenAI) solutions can transform call centre operations by delivering contextual information to operators, supporting them in managing challenging customer interactions. AI segmentation models identify customer groups, aiding in the development of targeted marketing campaigns and personalised offers. Advanced AI pricing models introduce more flexible options, such as dynamic pricing, that adapt to customer behaviours and market demands. Additionally, AI usage models identify abnormal patterns, triggering pre-emptive alerts to help customers monitor their usage and avoid bill shock.

Strategy 3
Improve asset reliability

Enhance asset reliability and performance with AI tools. Modern power generation plants are equipped with numerous sensors that generate detailed data on operational efficiency. AI solutions analyse this data to optimise maintenance and service schedules, extending the lifetime of assets and reducing the risk of unexpected outages. AI models analyse telemetry data to refine plant operations to improve efficiency and overall performance.

Strategy 4
Improve planning and forecasting through AI

AI tools improve forecasting accuracy for future consumption. This strengthens planning processes and resource allocation, while also optimising strategies for market trading. Data-driven insights support more informed decisions that help meet demand and reduce inefficiencies.

Strategy 5
Enable AI innovation

Create a robust AI platform, operating model, and standards to support the rapid and reliable deployment of AI solutions. Develop standard processes for monitoring and managing AI tools to maintain accuracy over time. Promote innovation and experimentation by equipping business experts with the tools and frameworks needed to identify and trial AI solutions that address business challenges and deliver value to the organisation.

Implementation roadmap

Once an energy utility has identified the AI strategies that will have the biggest impact, an implementation roadmap is crucial for success. This process begins with a comprehensive assessment of current capabilities and challenges, followed by the definition of clear objectives and key performance indicators (KPIs) for AI implementation.

Developing a roadmap aligned with overall business goals is essential for long-term success. The implementation roadmap should include the following steps:

1. Enhance data infrastructure

The first critical step is auditing existing data sources and quality. This involves implementing data governance frameworks and investing in scalable data storage and processing infrastructure.

Utilities should consider implementing a robust data platform that can handle the volume, velocity, and variety of data generated by smart metres, sensors, and other Internet of Things (IoT) devices. Cloud-based solutions can provide the necessary scalability and flexibility.

The better the quality of the data, the more value an organisation can extract from it. Utilities should implement data cleansing and standardisation processes to ensure the accuracy and reliability of their AI models. This may involve using advanced data quality tools and establishing data stewardship roles within the organisation.

2. Identify high-impact areas for initial AI implementation

It's crucial to develop pilot projects to demonstrate value and gather learnings. For example, AI can identify customers who may face unexpectedly large bills in the coming month by analysing usage patterns and historical data. Proactively alerting these customers lets them take steps to manage their energy consumption to improve their experience and build trust.

Predictive maintenance is another potential high-impact area. AI-powered systems can analyse data from sensors on grid equipment to predict potential failures before they occur to reduce downtime and maintenance costs.

3. Scale AI across the organisation

Integrating AI solutions with existing systems and processes is key to scaling up successful pilots. This involves developing application programming interfaces (APIs) and interfaces for seamless data exchange for system-wide integration.

Utilities should consider adopting a microservices architecture for more flexible and scalable AI integration with existing systems. This approach facilitates faster AI model deployment and easier updates as technologies evolve.

4. Invest in workforce development

Implementing training and upskilling programmes for employees will add significant value to the industry. Key components include recruiting AI and data science talent to build internal capabilities, improving AI and data literacy across the organisation, and building a culture of innovation and data-driven decision-making.

Working with technical partners with deep AI experience will support utilities to develop tailored AI and data science programmes.

5. Establish feedback loops

Continuously improving AI models and algorithms is essential for maintaining an industry-leading position in AI adoption. This involves staying informed about emerging AI technologies and their potential applications, and collaborating with technology partners.

Utilities should establish a dedicated AI innovation team responsible for monitoring technological advancements and identifying new opportunities for AI application. Regular benchmarking against industry best practices supports ongoing innovation.

Additionally, utilities will benefit from participating in industry collaborations and research initiatives. For instance, the CSIRO conducts research on AI applications in the energy sector to provide opportunities for knowledge sharing and collaboration.

Success depends on a well-planned strategy that aligns AI efforts with business goals. Energy utilities can leverage AI to address the challenges of the energy transition, improve operational efficiency, and deliver better outcomes for customers and the environment by following this comprehensive roadmap.

Use case: successful AI implementation in utilities

Meridian Energy: Predictive maintenance for transformers

Background: Meridian Energy, a leading New Zealand electricity generator and retailer, faced the challenge of detecting oil leaks in transformers before they led to equipment failure.

Solution: Fujitsu implemented an AI-powered predictive maintenance model to monitor transformer health and predict potential issues.

Outcome: Within a few months of implementation, the model detected an unusual transformer breakdown that would have gone unnoticed for several months using traditional methods. This early detection prevented potential equipment replacement costs of several hundred thousand dollars.

Overcoming barriers to AI adoption in utilities

As energy utilities embark on their AI journey, they face several challenges that must be addressed for successful implementation and adoption. One of the primary hurdles is the issue of data quality and accessibility. Utilities must implement robust data cleansing and standardisation processes to overcome this, so that the information fed into AI systems is accurate and consistent. Additionally, they need to develop strategies for integrating data from various siloed sources within the organisation to create a unified and comprehensive dataset. Securing access to operational data for AI applications is also crucial, balancing data availability with stringent security requirements.

Regulatory compliance and privacy concerns present another significant challenge for retail utilities. They must stay abreast of the latest AI regulations and implement robust data protection measures to safeguard sensitive information. Engaging proactively with regulators is essential to both maintain compliance and help shape AI-friendly policies that support innovation while protecting consumer interests.

Resistance to change within the organisation can be a substantial barrier to AI adoption. Utilities should develop comprehensive change management strategies that focus on educating employees about the benefits of AI and addressing concerns about potential job displacement to address this. Implementing reskilling initiatives helps allay fears and prepares the workforce for new roles in an AI-enhanced environment. Demonstrating the value of AI through early wins and clear communication will build trust and enthusiasm for these new technologies.

Balancing short-term costs with long-term benefits is another critical consideration. Utilities need to build compelling business cases for AI investments and clearly articulate the expected return on investment (ROI). Identifying quick wins that demonstrate immediate value builds momentum and support for larger AI initiatives. Developing a phased approach to AI implementation lets utilities manage costs while steadily advancing their AI capabilities.

Finally, AI model reliability is essential, especially in critical infrastructure like energy utilities. Implementing rigorous testing and validation processes helps confirm that AI models perform as expected under various conditions. Developing explainable AI models that provide insight into decision-making processes for critical applications is essential to build trust and meet regulatory requirements. Establishing ongoing monitoring and refinement processes keeps AI models accurate and effective over time, adapting to changing conditions and new data.

Embracing AI for a sustainable and efficient future

AI is a powerful tool to address current challenges and seize future opportunities. Utilities can improve demand forecasting, enhance grid stability, optimise asset management, and deliver personalised customer experiences by implementing AI solutions.

Successful implementation requires a commitment to data-driven decision-making, investment in technology and talent, and a willingness to innovate and adapt. Utilities that embrace AI will be better positioned to manage the complex energy landscape, meet sustainability goals, and deliver value to their customers and stakeholders.

AI's role in transforming utilities will only grow in importance as Australia transitions towards a more sustainable and efficient energy future. Utilities can take the lead in this transformation by starting their AI journey now, driving innovation and shaping the future of Australia's energy industry.

Fujitsu provides tailored expertise and industry-specific tools to support utilities in implementing AI successfully. Contact the team today to learn how AI can help your organisation achieve its goals.