

CHANGING THE FUTURE OF THE AUSTRALIAN UTILITY SECTOR THROUGH ARTIFICIAL INTELLIGENCE

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Techwave established in 2004, is a global end-to-end IT services & solutions company, which develops long-term relationship with clients by leveraging unique delivery models and expert frameworks.



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1. INTRODUCTION

The utility sector is undergoing an unprecedented change in the global market. Technology is undoubtedly taking us closer to an automated future, and artificial intelligence (AI) plays a significant role in disrupting energy companies to drive use cases at scale.¹ The sector is moving to a new dimension of innovation in the service-based industry. Decarbonization, deregulation, and decentralization are crucial in capitalizing on these shifts. It is imperative to have a balance between automation and artificial intelligence. Global energy and Utility companies are currently considered among the most innovative and influential sectors of the economy as they increasingly use intelligent automation.



1 - [https://www.capgemini.com/news/press-releases/intelligent-automation-in-energy-and- utilities/](https://www.capgemini.com/news/press-releases/intelligent-automation-in-energy-and-utilities/)

In the coming decades, Artificial intelligence for utilities will be essential for balancing supply and demand, increasing value chain efficiency, improving the consumer experience, and changing business paradigms.

According to the study "Intelligent Automation in Energy and Utilities: The next digital wave," only 18% of organizations are deploying quick-win use cases, and only 15% of those surveyed said their company is deploying multiple intelligent automation cases at scale. Nearly half of the respondents had underestimated the benefits they received from their intelligent automation initiatives.

Energy providers, from power and electric grids to oil and gas, have changed dramatically over ten years. Nevertheless, the emergence of new technologies, applications, and business requirements, along with the increasing reliance of businesses on IT platforms, will lead to drastic changes in the years to come.

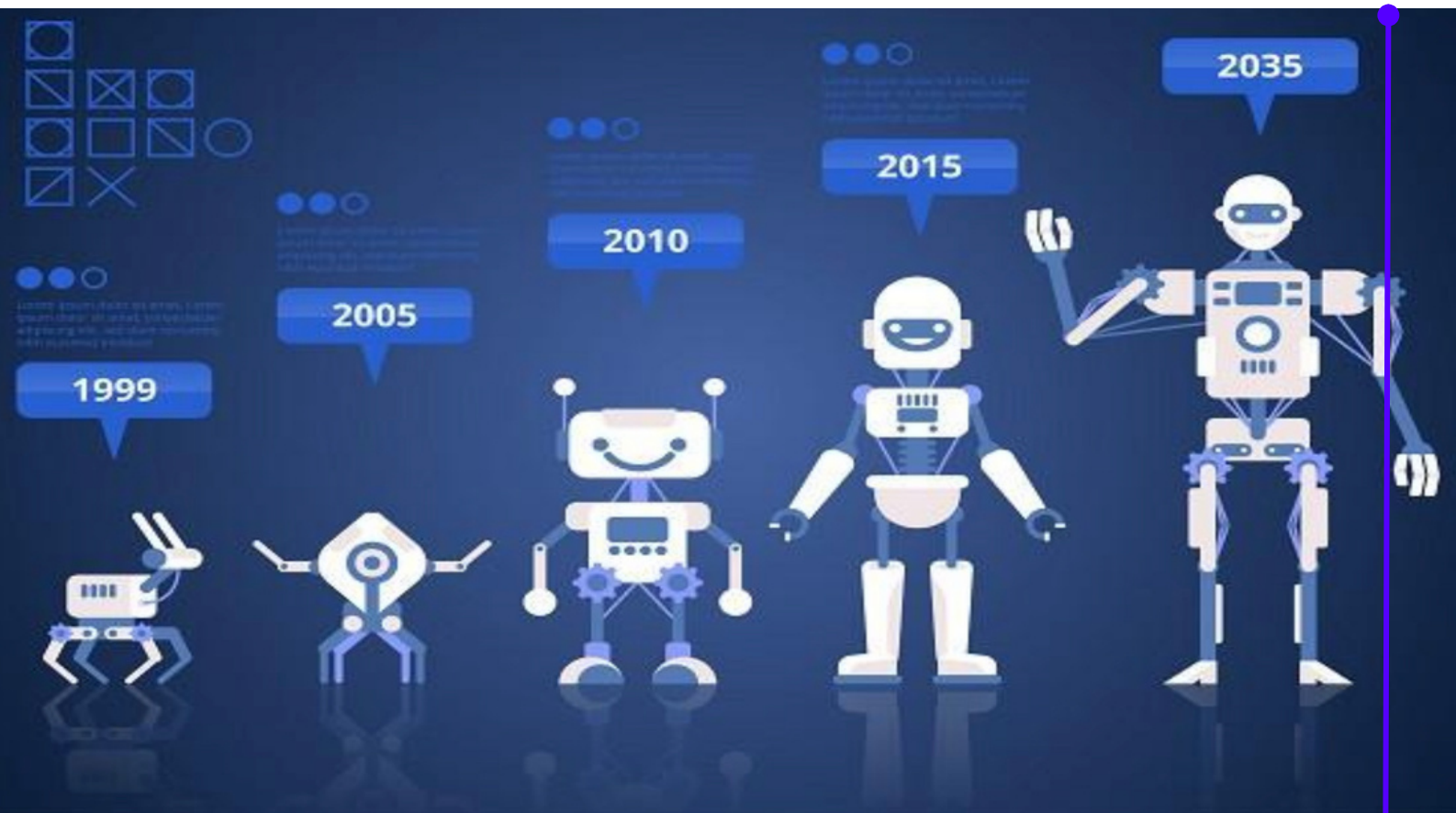
Artificial intelligence is a new fuel that accelerates any utility company to maximize its strengths while minimizing snags in energy generation, delivery, and trading operations. Let us scrutinize and expand upon the most profitable AI technology application cases.

2. FOUNDATION OF FUTURE TECHNOLOGY: AI AND MACHINE LEARNING

The current technological trends are compelling organizations to expand their focus beyond automation and digital transformations. The seamless proficiency of AI and ML channels human-machine interaction to provide expected results corresponding to changing technological conditions.

The close combination of artificial intelligence and machine learning platforms has massively increased the scope and scale of AI development across your daily life to create trust and deliver highly impactful solutions to real-world problems. Evolving industries and embryonic organizations seek AI technology for enhanced productivity and reduced costs.

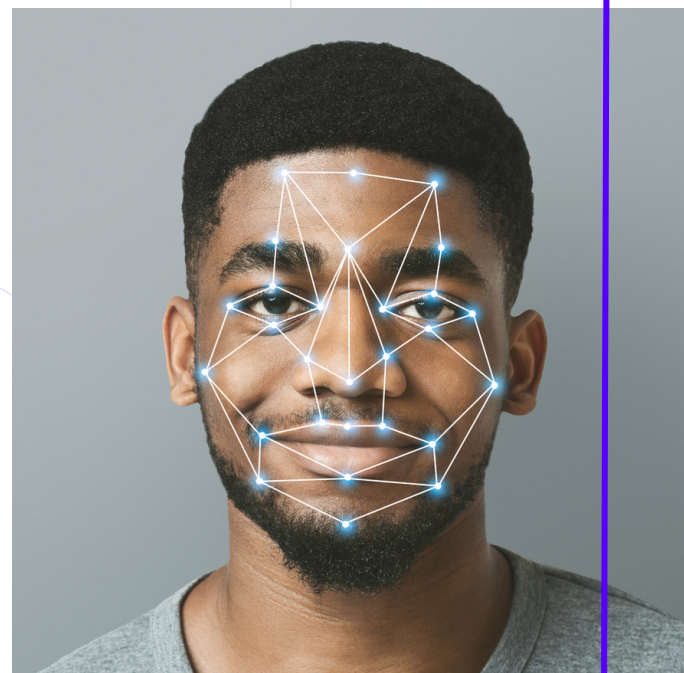
Over the coming years, digital transformation will be considerably improved by developing cognitive and creative AI capabilities. Artificial intelligence for utilities allows business managers to monitor market trends and make more informed decisions.



Considering the potential for artificial intelligence software to increase human productivity, 92% of Energy & Utilities organizations have already invested in AI technology or plan to do so soon. 35% of energy executives see the value of AI for automating routine tasks and performing predictive maintenance.² Companies can now avoid leaks thanks to sensor-rich AI system utilities.

MACHINE LEARNING APPLICATION

Machine learning is a significant expansion, enabling robots to learn from data, recognize patterns, comprehend issues, and make judgments with less human involvement. Furthermore, a machine learning algorithm predicts and completes tasks based on the learned design rather than following a predefined set of instructions. The application of machine learning in our day-to-day lives is actively used through several real-world applications, including Google Assistant, Alexa, and Maps.



² - <https://mindtitan.com/resources/industry-use-cases/ai-for-utilities-use-cases-and-examples/>

APPLICATIONS OF MACHINE LEARNING

Image
Recognition

Medical
Diagnosis

Stock
Market
Trading

Online Fraud
Detection

Virtual
Personal
Attention

Email Spam
and Malware
Filtering

Image
Recognition

Speech
Recognition

Product
Recommend
ations

Self Driving
Cars

Traffic
Prediction

Let's look at some of the top machine-learning applications.



Today's voice recognition AI apps frequently employ machine learning techniques. Google Assistant, Siri, Cortana, and Alexa use speech recognition technologies for voice instructions.



One of the applications of machine learning we are employing is how our email providers help us eliminate spam. The wrong email is identified by spam filters using an algorithm, which then sends it to your spam folder.



To reduce fraud and enhance the effectiveness of their recommendation engines, many e-commerce organizations also combine additional IT security measures with machine learning algorithms.



Another famous use case is self-driving cars; for example, Tesla trains its car models to recognize people and objects while driving using unsupervised learning techniques.

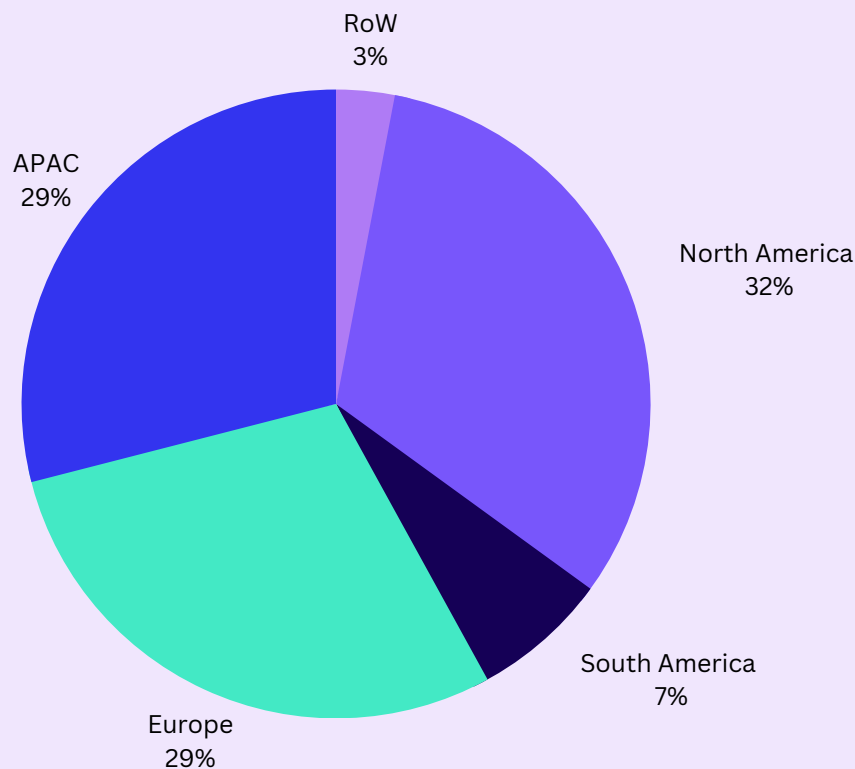
HOW AI IS PENETRATING THE UTILITY SECTOR.

The rapid growth of AI/ ML technologies in the last few years has created an interesting paradox. On the one hand, these technologies have improved security and simultaneously made it easier for hackers to access systems without human intervention. The transformation of the energy infrastructure gets advanced with the rapid change in energy-storing technologies. The industry for energy and utilities

includes electricity production, gas extraction, and other energy-related operations. The energy and utility sectors are experiencing a massive change in price collision and energy-storing technology as technologies advance.

The artificial intelligence (AI) market will grow at a CAGR of 32.75 percent from 2021 to 2026, reaching \$4.5 billion by 2026. In the next two to three years, 35% of power business executives will explore cloud computing, and 42% will explore analytics, AI, and ML.³

By 2022, 55% of utilities will orchestrate, automate, and improve their assets, processes, customers, and staff using a core digital platform. About 75% of utilities' essential assets will be digitally connected by 2023 to forecast and avoid equipment breakdown and lengthen asset life cycles. Artificial intelligence technology "may enhance global GDP by \$15.7 trillion, or a full 14%, by 2030," according to a PriceWaterhouseCoopers report.⁴



ARTIFICIAL INTELLIGENCE MARKET IN ENERGY AND UTILITIES SECTOR-BY APPLICATION

The demand for artificial intelligence for utilities and energy businesses is increasing exorbitantly. Some vital applications are energy application, failure management, load forecasting, storage automation grid, device management, and energy theft.

3-https://finance.yahoo.com/news/global-artificial-intelligence-ai-market-120900324.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLnNvbS8&guce_referrer_sig=AQAAA EF5zMAu1Tu5mCqCf7Nc9G3kPTAsGBVxE0lh5AXku9eFq_vDyQ6tOxdxhpkevlfx_SkEXe-BRft1iYf7MT0e2ZF

4- <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>

ARTIFICIAL INTELLIGENCE MARKET IN ENERGY AND UTILITIES SECTOR-BY GEOGRAPHY

North America likely holds a 42.1% market share in the artificial intelligence market for energy and utilities in 2020 due to the region's increasing embrace of technological advancements. While AI usage in energy and utilities has skyrocketed, APAC still dominates the market in terms of usage and penetration of AI in these sectors.⁵

ARTIFICIAL INTELLIGENCE MARKET IN ENERGY AND UTILITIES SECTOR -BY END-USE INDUSTRY

The utility industry has witnessed a significant share among end-use sectors, with a 50.3% share in 2020.⁶ AI may be integrated into all phases of the power cycle, including production, transmission, and energy distribution to end customers. The autonomous energy grid is a novel technology that uses advanced AI machine learning techniques to construct robust, practical, and cost-effective energy systems that can optimize themselves.

3. AI AND MACHINE LEARNING EXPANSION IN AUSTRALIAN UTILITY SECTOR

Globally, utility service providers are utilizing wearable technology, real-time streaming analytics, and "paint-by-numbers" build-your-own AI software tools. Google Glass Enterprise Edition now incorporates ML and AI capabilities, providing frontline workers with a lightweight line-of-sight display for job guidance in the field. Glass allows for real-time collaboration and problem-solving by connecting with remote specialists and providing workers with access to checklists, training videos, and instructions. 75% of Australian utilities' essential assets will be digitally connected by 2023 to forecast and avoid equipment breakdown and lengthen asset life cycles.

The growing significance of AI in Australia is reflected in the fact that artificial intelligence is a core tenet of the government's Digital Economy Strategy. In a 2019 Deloitte report, 79% of Australian organizations predicted that AI would have a "critical" impact on their industry. To identify and reduce risks and manage compliance requirements, Australian financial institutions are collaborating with RegTech firms offering AI-driven solutions.

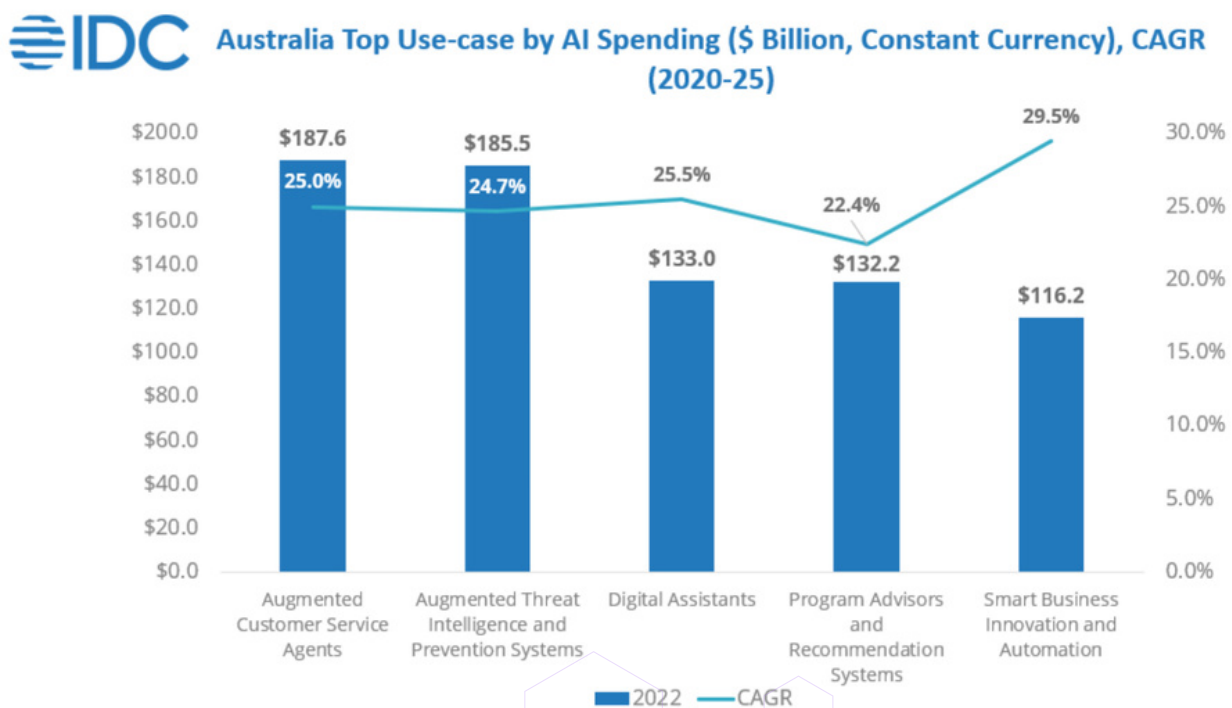
5- <https://www.researchandmarkets.com/reports/5616279/artificial-intelligence-market-in-energy-and>

6- <https://www.industryarc.com/Report/17916/artificial-intelligence-market-in-energy-utilities.html>

Australian utility sector can seize the potential of automation, manage the transition, and ensure the benefits are widely distributed with foresight, proactive leadership from the government, industry, and education sectors, and a willingness to act.

THE MARKET FOR AI IN AUSTRALIA'S ECONOMY

By 2030, every Australian might be earning an additional \$4,000 to \$15,000 a year, given the market potential of AI in utilities, which could boost the economy between \$1.1 trillion and \$4 trillion over the next 15 years.⁷



By 2025, the top five use cases will account for 1.4 billion dollars, up from the current \$0.75 billion, or 40%, global AI spending. Investments get organized in digital assistants, program advisors, recommendation systems, enhanced customer service agents, enhanced threat intelligence and protection systems, intelligent business innovation, and automation.⁸

Due to increased corporate investment in the expansion of their assets and expanded software applicability, the Australian artificial intelligence as a service market gets to have spectacular growth in the next five years.

There is a rising demand for automated services among various corporates to enhance the software's quality and increase the demand for data-backed solutions.

7- <https://www.mckinsey.com/featured-insights/future-of-work/australias-automation-opportunity-reigniting-productivity-and-inclusive-income-growth>

8- <https://www.businesswire.com/news/home/20220317005110/en/Spending-on-Artificial-Intelligence-Solutions-Will-Double-in-the-United-States-by-2025-According-to-a-New-IDC-Spending-Guide>

The growth of artificial intelligence technologies is observed as e-commerce expands. In the coming years, this advancement is anticipated to propel AI in Australia as a services market and increase the competitiveness of the business landscape.

AUSTRALIA ARTIFICIAL INTELLIGENCE ACTION PLAN

A significant component of the Australian government's digital economy strategy is the AI Action Plan. According to the Australian Government's objectives, by 2030, Australia will have a leading digital economy and society. The plan envisioned Australia as a global leader in developing and adapting trusted, secure, and responsible AI. It builds on whole-of-economy foundations, technology, and digital policy settings that the government has put forward for Australia's future prosperity.

This plan aims to adopt Artificial Intelligence to support businesses, attract the world's best AI talent, and solve national challenges.

The plan identifies four focus areas:

- Increase AI usage and development to generate more employment and increase productivity.
- Expand and draw top-tier talent and knowledge.
- To address societal issues and benefit all Australians by taking advantage of industry-leading AI capabilities.
- Make sure AI technologies are ethical, inclusive, and consistent with Australian ideals.

As part of the plan, the Australian government is planning for a new form of investment to build Australia's AI capability. The government's initiative has seen about half a billion-dollar rise in AI expansion in business. Some of the core aspects of the plan include the following-

- Establishing the National AI Centre and 4 AI and Digital Capability Centres will be about \$53.8 million over four years. ⁹

These facilities will encourage Australian businesses to adopt and use AI technologies, boosting their productivity and competitiveness. By unifying Australia's AI expertise and national capabilities, this initiative will lay the groundwork for Australia's strong AI and digital ecosystem.

9- [https://www.globalaustralia.gov.au/news-and-resources/news-items/action-plan-positions-australia-be-global-leader-artificial-intelligence#:~:text=Australia's%20first%20Artificial%20Intelligence%20\(AI,to%20solve%20significant%20national%20challenges.](https://www.globalaustralia.gov.au/news-and-resources/news-items/action-plan-positions-australia-be-global-leader-artificial-intelligence#:~:text=Australia's%20first%20Artificial%20Intelligence%20(AI,to%20solve%20significant%20national%20challenges.)



Securing the backing of Australian companies to collaborate with the government for about \$33.7 million in four-year AI Project Pilots.

It aims to develop AI solutions to meet national challenges and expand employment and social benefits opportunities and boundaries



Creating the Next-Generation AI Graduate Program for about \$24.7 million over six years.

With the help of this program, domestic AI experts will be attracted and trained. It will address the lack of skilled workers in the business and create a varied pipeline of talented professionals



Catalyse the AI Opportunity in all Regions program for about \$12.0 million over five years.

Under this clause, up to 36 co-funded, competitive awards may be given out. Funding will encourage AI specialists to work with regional businesses to develop AI solutions for regional problems.

4. VARIED RANGE OF AI IMPLEMENTATIONS IN THE UTILITIES SECTOR

Utility providers are merging traditional practices and modern AI competencies to build intricate networks to overcome challenges. Let's explore a few use cases of Artificial intelligence for utilities' service-based industries.

USE CASE 1:

AI ENGINE FOR ACCURATE DRONE IMAGERY

A leading utility giant created an image analytics application powered by artificial intelligence (AI) that analyses pictures in real-time and spots issues like cracked or broken insulators using an AI platform. The absence of accurately annotated photos is made up for by image augmentation. It alters the lighting, angles, or item placement in each original image to produce up to 12 newly tagged images. As a result, the analytics application's learning capacity and accuracy increased considerably. This AI model instrumented by the organization is self-sufficient enough to notify the utility maintenance team of repairs.

The Australian utility sector has benefited from an industry-wide switch to advanced metering infrastructure (AMI), which enables providers to manage peak-load situations and satisfy demand changes in real-time

USE CASE 2: AI'S ROLE IN CONTROLLING ENERGY THEFT

Global damages from energy theft total over \$100 billion annually. Energy is the third most stolen good in the US, with yearly losses from piracy amounting to \$6 billion.¹⁰ Energy piracy can be deterred by using artificial intelligence and machine learning technologies, which provide utility providers access to the massive data sets generated by AMI enhancements. The utility sector has benefited from advanced metering infrastructure (AMI), which enables providers to manage apex situations and fulfill demand changes in real-time

USE CASE 3: AI'S ROLE IN GENERATING ELECTRICITY

US-based electric and gas utility, Xcel Energy, uses data from sensors on wind turbines to develop high-resolution wind forecasts through predictive analytics and artificial intelligence. As a result, the company has reduced costs to end customers by \$60 million by increasing generation efficiency. The forecast margin of error has been reduced by 40% thanks to improved projections and enhanced accuracy. Additionally, it reduced the re-dispatching of conventional coal and gas generation by 25,000 tonnes annually and increased the use of renewable energy.¹¹

USE CASE 5: AI'S NEW-AGE EMISSION TRACKING

A survey found that Shell has reduced overall emissions, including those created when the oil and gas it sells is burnt, by 16% since 2016. The amount of carbon dioxide equivalent produced by its own activities has fallen by 18% during the same period to 68 million tonnes. Digital algorithms can speed up equipment design for operations like methane cracking, which produces hydrogen for fuel without producing carbon dioxide, and help make current processes more efficient. The amount of boil-off gas from evaporation and related flaring was decreased by 70% in Nigeria with the help of Shell's real-time process optimizer on equipment settings for a liquid natural gas facility. Data collection and storage play a vital role as it drives energy providers to make data-driven decisions that will change the narrative for the utility sector.

10- <https://www.forbes.com/sites/peterdetwiler/2013/04/23/electricity-theft-a-bigger-issue-than-you-think/?sh=1fd3475a5ed7>

11- <https://www.sciencedirect.com/science/article/pii/S2211467X20300353#b8>

5. DIGITAL BY TECHWAVE

Utility companies have little insight into on-field data gathering because they have limited access to data science knowledge and scant condition-based monitoring data. Digital transformation remains the core objective for Techwave, and we strive to expand the real-time automation in the utilities through our DigitAI solution. We have successfully garnered pole surveys and object detection with AI tools for efficient tower maintenance. Let's explore a few use cases of Artificial intelligence from Techwave's expertise in utility service-based industries

AI USE CASES IN VIDEO ANALYSIS

Artificial intelligence in video analytics provides a solution for municipalities and urban administration to manage the movement of vehicles and enforcement of the law. Analytics can predict or give information on the car's type, speed, direction, and color from the CCTV videos. It also generates Automatic Number Plate Recognition (ANPR) to extract the vehicle registration number from the video.

AI USE CASES IN OBJECT DETECTION

Evaluation of the components' states and identification for power distribution thoroughly explain the abnormal situation and include all the resources to which the network has access. The article offers a thorough method for finding each component's odd occurrences and the components' scattered locations around the network.

AI USE CASES IN THE OPTIMIZATION OF SERVICE PERSONNEL

This AI tool is called optimization of utilization of service personnel. This analysis aims to provide strategies for improving the productivity of tower maintenance activities based on the investigation. The solution provides complete analytics with tower locations and service schedules for all personnel as well as all types of sites and all types of projects. The analysis computed calendar time to finish all scenarios and business rules.

AI USE CASES IN SENTIMENT ANALYSIS

One can create a unique consumer profile using AI technologies like sentiment analysis. The micro and macro levels of an individual's analysis remain in focus. The utility sector benefits greatly from this analytical segment since it provides a means of rewarding, identifying, and keeping loyal customers. In the utility sector, sentiment analysis enables more effective customer-specific marketing initiatives.



6. HOW AI OPTIMIZES RENEWABLE ASSETS IN THE UTILITY INDUSTRY IN AUSTRALIA

Global use of renewable energy has increased at an average yearly pace of 13.7% during the past ten years. For the first time in Australia, more than a quarter of the nation's total electricity generation will come from renewable sources in 2020.¹² The island state of Tasmania in Australia currently uses only renewable energy.

BloombergNEF predicts that solar energy will be used on 30% and 60% of the nation's residential, commercial, and industrial structures in the current future. By 2030, there will be 89 million assets connected to the grid, up from the current estimate of 36 million, including solar panels, electric cars, and energy storage.¹³ Electric grids become chaotic if millions of individual gadgets post and download electricity.

¹²- <https://www.rba.gov.au/publications/bulletin/2020/mar/renewable-energy-investment-in-australia.html>

¹³ - <https://about.bnef.com/new-energy-outlook/>

As dispatchable centralized generators like coal are phased out, many sporadic distributed energy sources in Australia (like wind and solar) will go online during the next 10 to 15 years. To balance supply and demand without causing the system to collapse will require a careful balance. The Australian Energy Market Operator (AEMO) has acknowledged the prospects for AI and machine learning in this field and the necessity to stay up with the private sector, which has long embraced machine learning technology. Machine learning evaluates massive data sets using algorithms to find trends and patterns. The algorithm predicts a target variable based on its internal "rules" and the data it gets. Machine learning can also be used in the electrical industry to optimize the grid's distribution and energy use. Utilities require better methods for estimating how much energy will be needed in the short and long term as more renewable energy sources come online continuously.

The Australian utility and energy market is among the most challenging in the world, requiring assets to trade at intervals of five minutes while including rising amounts of variable renewable energy. Operators of Australian renewable energy generation and storage assets in the NEM must manage trading strategies, frequency control ancillary services (FCAS) expenses, physical grid limits, and exposure to unfavorable price movements.

According to Fluence, it can increase the revenue from stand-alone renewable energy assets by over 10% and the revenue and operational effectiveness from battery-based energy storage by 40–50%. According to the statement, the software-based trading platform currently uses to optimize 1.5 GW of wind and solar renewable energy assets.¹⁴

7. WAYS DIGITALIZATION IS TRANSFORMING THE AUSTRALIAN UTILITY SECTOR

After the pandemic, there has been an enormous shift in digital transformation for Australian utility companies. A recent study found that about 300% rose over the business priority of Australian companies, economy, and industry sectors. Today's Australian utility leaders at the utility week at Melbourne Convention and Exhibition Centre recognize that firms can only increase revenue and customer satisfaction by correctly combining technology, attitude changes, and digital transformation.

¹⁴⁻ <https://blog.fluenceenergy.com/fluence-signs-over-1-gw-contracts-to-optimize-trading-renewable-energy-storage-assets-australia>

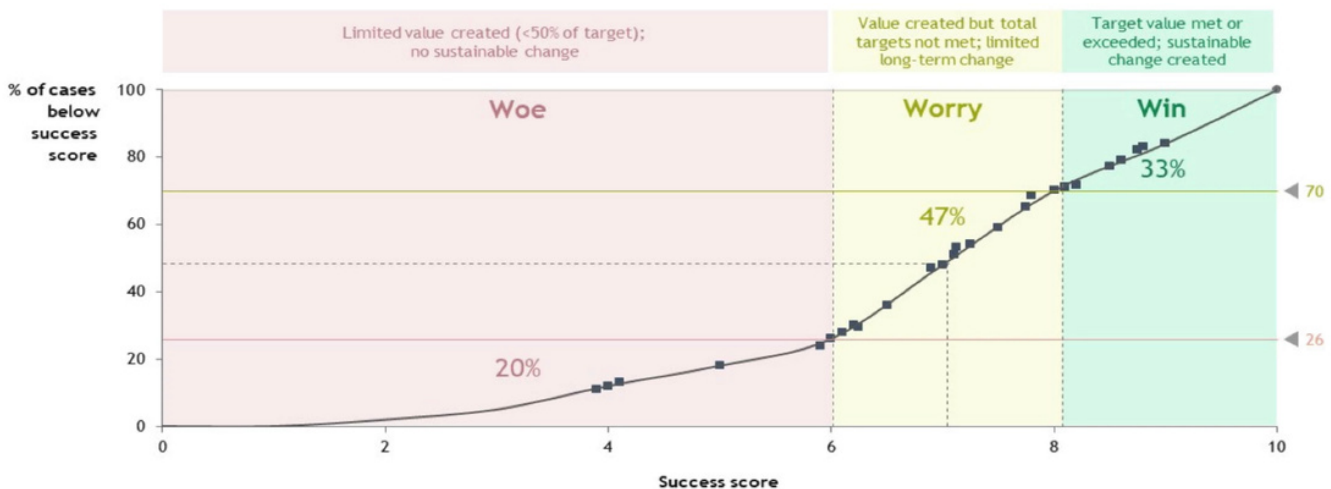


The digital transformation in utilities significantly impacts how financial and customer experience targets affect the energy sector. Overall, this has improved the utility sector's competitive business drive due to the change to digital channels, customer experience, IT flexibility, agile maturity, and time-to-market, all experiencing about 60% of the impact of the new channels. This is emboldened by the fact that digital economies are growing more significantly than offline economies.

The keynote address of Andrew Bettenay, the Chief Information Officer of Endeavour Energy, was titled "Building the Agile Utility with Real-Time Responsiveness". He explained that when he joined the critical NSW utility energy distributor last year, just after it had sold, the new owners had recognized that there had been significant underinvestment in technology over the previous ten years. However, although he was hired to "enact change from a technical perspective".

Considering the honest and instructive keynote, it is clear that executives are rightly wary of large transformation programs with high failure rates, which may result in a loss of time, performance, and strategic advantage.

CORPORATE AUSTRALIA'S DIGITAL TRANSFORMATION TRACK RECORD IS MORE WOE AND WORRY THAN WIN Australia | Digital Transformation Success Scores



Source: BCG analysis

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Let us focus on some of the factors that have helped utility providers keep themselves ahead of the game with innovation-

Technological Transformation

Australian utility providers have created an “explosion of data” through an increasing technological capacity. It also has a diversified gateway of opportunities for innovation in the broader space and creates a snowball effect of technological transformation. Currently, Australia energy sector has been more proactive about sustainable development concerning climate change. Regardless of what size of business or service, the leaders are transforming their business models to cater to the region’s sustainability imperative.

One of the firm's most recent innovations is Ausgrid's Virtual Power Plant, which feeds extra electricity from home solar battery systems back into the grid. Homeowners with solar panels on their rooftops may compensate for the electricity they generate. The additional power source helps to reduce grid strain during peak hours.

More Open Market

The innovation to attract top talent and create a broader scope of opportunities is another tremendous challenge the Australian utility industry encountered after the subsequent pandemic lockdown. Now the primary focus of business leaders is to create a positive employee experience. The increased competition level in the market created a more customer-oriented environment and retained its presence in the market.

Field employees can now quickly and safely complete orders using a mobile device, sending data to the back office for compliance verification and further analysis. This enhances the technical abilities of the workforce and drives them to be more self-sustained.

Meeting the Cybersecurity Threat

The Australian power company's biggest difficulty is safeguarding the financial data stored in the IT system. Hackers focus more on businesses that manage vital infrastructures, such as electricity, gas, and water. However, as human error leads to the most successful attacks, it is crucial to give staff members the proper training, including disaster recovery drills and other readiness scenarios. According to research, cloud-based solutions are necessary for every comprehensive cybersecurity strategy.

CONCLUSION

The energy sector is going through a rapid transformation in a more inclusive, faster, and open gateway of transformation with the power of digitalization. In the future, the utility industry will have more exciting phases. By improving safety, streamlining energy consumption, and considering the environment and customer experience, machine learning technologies can transform the Australian utility sector and create a better society.

Future energy is envisioned as a digital, decentralized, and varied ecosystem with real-time price variations and the presence of many different energy sources. There is little question that providers worldwide will take something valuable away from Australian utilities' transformation to more environment-friendly business models and follow in their footsteps to handle a variety of interruptions safely and securely, ushering in a brighter future. The long-term objective will be to keep up this positive trend because it is the only way for utilities to adapt to the shifting energy market and deal with upcoming issues.

