

# DEWA SMART GRID REPORT 2023





## MD & CEO MESSAGE

**HE SAEED MOHAMMED AL TAYER**  
MD & CEO of DEWA

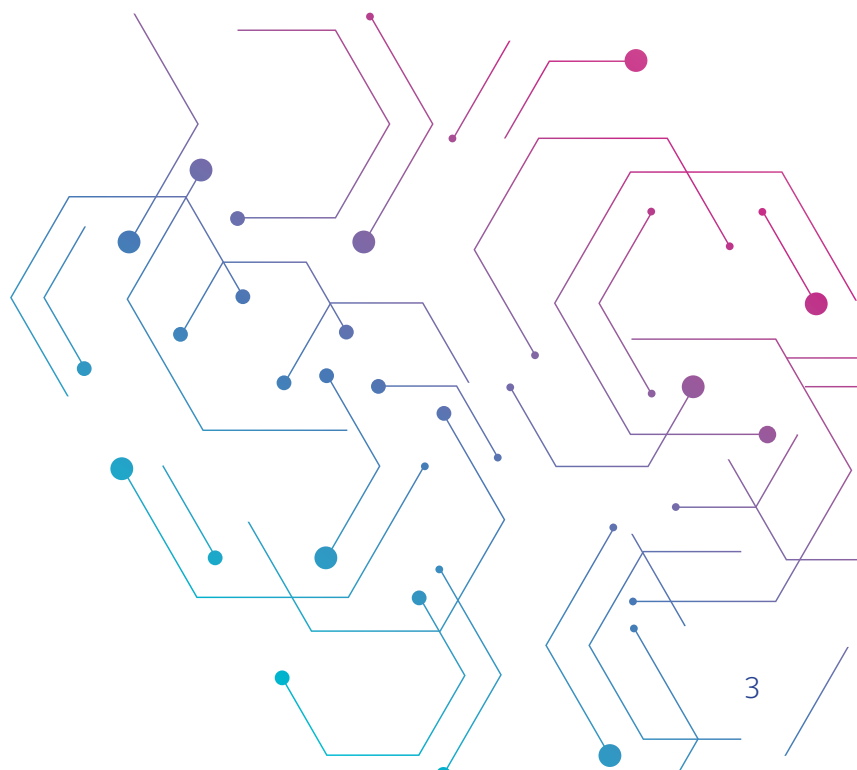
Dubai Electricity and Water Authority (DEWA's) Smart Grid stands as a pivotal cornerstone in our efforts to realise the visionary aspirations of His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai. With an unwavering commitment to transforming Dubai into the ultimate destination for living, working and visiting, in 2014, DEWA developed its first Smart Grid strategy up to 2035, which is a key component of a smart city, playing a crucial role in Dubai's journey to be the smartest and happiest city in the world. DEWA maintains its steadfast commitment to delivering electricity and water services that adhere to the utmost standards of availability, reliability, sustainability, and quality.

The Smart Grid is a vital pillar within DEWA's strategic framework, aiming to develop an advanced infrastructure for managing facilities and services via a smart and interconnected network. This network embraces the cutting-edge innovations of the Fourth Industrial Revolution, encompassing transformative technologies like Artificial Intelligence (AI), blockchain, energy storage, the Internet of Things (IoT), and more.

DEWA's Smart Grid enhances Dubai's sustainability and efficiency, uplifting the quality of life for its residents. It strengthens the city's adaptability, enabling it to swiftly respond to rapid changes and diverse social, environmental, and economic challenges. This advanced system guarantees seamless, round-the-clock availability of integrated services, facilitated by the Smart Grid's two-way communication. This interaction links the utility with its customers and enables the real-time monitoring of power and water network components. The Smart Grid boasts advanced features, encompassing full interoperability across the entire electricity and water network. This synergy ensures a streamlined, prompt, and efficient operation.

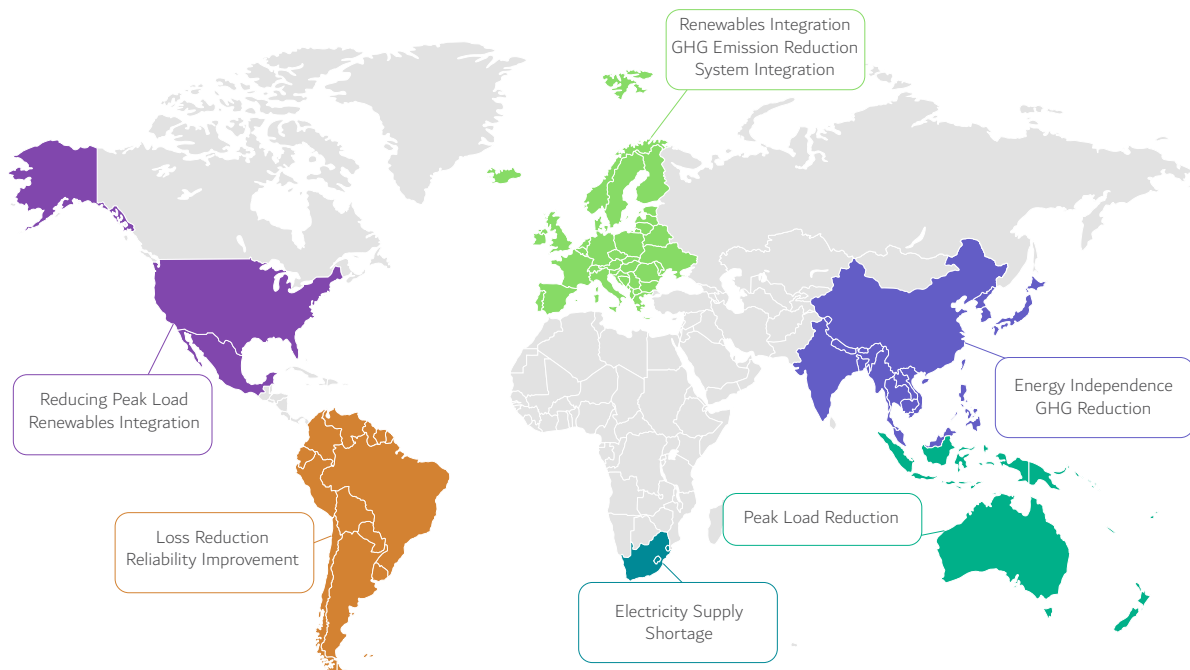
DEWA's updated Smart Grid Strategy for 2021 – 2035, currently being implemented with a substantial AED 7 billion investment, encompasses six core themes: Foundational Capabilities; Grid Automation; Smart Energy Solutions and Green Mobility; Smart Water; Smart Grid Artificial Intelligence; and Innovative Value-Added Services. These themes collectively encompass 19 smart grid capabilities, seamlessly aligned with DEWA's strategic objectives. These pioneering capabilities have effectively shaped the updated DEWA Smart Grid Strategy up to 2035. Through these strategic themes, our objective is to bolster Dubai's status as a the most future-ready city in the world, while realising DEWA's vision to be a globally leading sustainable innovative corporation committed to achieving net zero by 2050. This is in harmony with the directives of the Dubai Clean Energy Strategy 2050 and the Dubai Net Zero Carbon Emissions Strategy 2050, aiming for a 100% clean energy-powered Dubai by 2050.

The seamless, swift and effective operation of the smart grid supports the continuous provision of DEWA's services according to the highest standards of efficiency, availability, reliability, and sustainability. It also helped DEWA achieve competitive results that surpass prominent European and American companies in terms of efficiency and reliability. In 2022, losses from electricity transmission and distribution networks were reduced to 2.2% compared to 6-7% in Europe and the USA. Water network losses were also reduced to 4.5% compared to around 15% in North America. Also, DEWA has achieved a new world record in electricity Customer Minutes Lost (CML) per year. Dubai recorded 1.19 minutes per customer, compared to around 15 minutes recorded by leading utility companies in the European Union.



## PREFACE

A Smart Grid is a reinvention of how energy is transmitted, distributed and measured. It is becoming the new standard for utilities and consumers. The drivers for utilities to build a Smart Grid vary across the world. At Dubai Electricity and Water Authority (PJSC), we strive to smartly manage supply and demand with a lower carbon footprint, to extend our resources for future generations, in line with our strategic direction and the strategies of the local and federal government of the UAE.



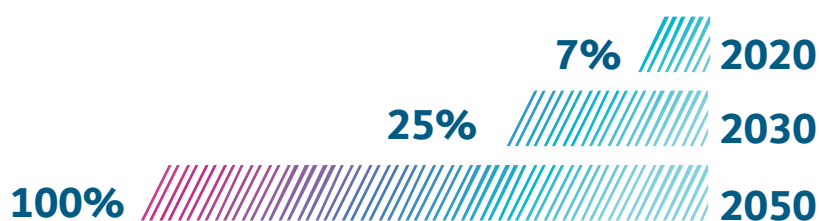
Smart Grid Business Drivers By region

In 2014, DEWA developed its first Smart Grid strategy up to 2035, which is a key component of a smart city. One of the most important factors for the success of smart cities is the seamlessness and availability of round-the-clock integrated and connected services that meet daily living requirements, which is only possible via a Smart Grid. A Smart Grid ensures two-way communication between the utility and its consumer and allows for monitoring along the power and water grids. A Smart Grid consists of controls, computers, automation, and equipment working together.

## STRATEGIC DIRECTION

Dubai Electricity and Water Authority (DEWA) is actively contributing to transform Dubai into the smartest city in the world. To support this objective, DEWA developed a comprehensive strategy to implement a smart water and electricity infrastructure. This is what we call a Smart Grid, which will provide advanced features and includes interoperability across the entire electricity and water network. DEWA's Smart Grid Programme, with investments totalling AED 7 billion, supports the directives and the vision of HH Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, to make Dubai the smartest and happiest city in the world.






### THE DUBAI CLEAN ENERGY STRATEGY 2050



The programme is a key element in DEWA's strategy to develop an advanced infrastructure. To implement the Dubai Clean Energy Strategy 2050, and Dubai's Net Zero Carbon Emissions Strategy 2050, DEWA has worked on major programmes to diversify its energy mix and manage the demand for electricity. The strategy aims to provide 100% of Dubai's total power output from clean energy by 2050. DEWA has reached a noteworthy milestone in Dubai's journey towards clean energy, accounting for 14.6% of the city's total energy mix, totaling 2,127 MW, produced by the Mohammed bin Rashid Al Maktoum Solar Park as of the end of 2022. By 2030, 100% of DEWA's desalinated water will be produced through a mix of clean energy that uses both renewable energy and waste heat. Currently, DEWA has an electricity generation capacity of 14,617MW and a water production capacity of 490 Million Imperial Gallons per day, providing its services to over one million customers across Dubai.

DEWA's Smart Grid strategy was developed in 2014, in alignment with the Dubai Plan 2021. In 2021, DEWA launched its updated Smart Grid Strategy up to 2035, evolving from a technology-led approach to a value-driven approach, as well as transitioning DEWA's smart grid programmes into themes. This allows for expanded smart capabilities and provides increased flexibility and agility as new opportunities and needs arise.

The updated DEWA Smart Grid Strategy through 2035 will enable DEWA to develop a globally leading set of smart grid capabilities that map to key policy areas and meet the following strategic objectives:

 <p><b>Business optimisation</b></p> <p>reduce operating costs through asset management, reduced field staff, increased operating time while improving revenues through new customer services</p>	 <p><b>Renewables Integration</b></p> <p>Cost effectively integrate intermittent renewable energy through the combined use of grid automation capabilities, large scale solar storage dispatch, distributed solar management, and data analytics</p>	 <p><b>Innovative Customer Solutions</b></p> <p>Enable new customer solutions and improve customer experience and happiness through AMI data and demand-side infrastructure including distributed generation and electric vehicles</p>	 <p><b>Digital and AI Technologies</b></p> <p>Apply state-of-the-art technologies like AI and blockchain to improve internal processes and business performance and generate new revenue from data-driven services</p>	 <p><b>Security</b></p> <p>Securing Smart Grid systems requires implementing international best practices and world-class standards for both IT and OT systems, based on cybersecurity team guidelines and frameworks.</p>
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DEWA's vision to become 'A globally leading sustainable innovative corporation committed to achieving Net-Zero by 2050.' is based on delivering sustainable electricity and water services at a world-class level of reliability, efficiency, and safety. This vision will result in the connection of renewable energy resources to DEWA's grid and it supports the adoption of electric vehicles in Dubai. In turn, this will lead to a greener and cleaner environment, better energy and water conservation, improved demand side management and a more efficient management of infrastructure investments and grid operations.

DEWA constantly enhances its services and operations using the latest technologies to become one of the leading pioneers in system reliability, sustainability, and availability worldwide. DEWA's transmission network availability is typically above 99.9% reflecting world-class standards of performance. Moreover, DEWA has adopted several international standards to validate its performance excellence such as System Average Interruption Frequency Index (SAIFI) and Customer Minutes Loss (CML). In 2022, DEWA recorded a SAIFI score of 0.04 and achieved the lowest CML worldwide at 1.19 minutes, highlighting DEWA's ability to restore power during faults or unplanned outages.

Moreover, DEWA continues to enhance its water network by identifying and remotely managing potential leaks throughout its transmission and distribution network by utilising its Supervisory Control and Data Acquisition (SCADA) system. By using specialised leak detection technology and implementing other improvements to its network, DEWA has been able to reduce losses in its water network to 4.5%; one of the lowest in the world.

DEWA has also implemented the requirements of the IDCXS (International Digital Customer Experience Standard) and achieved the highest score worldwide of 100% in the updated IDCXS (International Digital Customer Experience Standard) for 2022. The certificate, provided by the International Customer Experience Institute, is an international standard to annually evaluate the customer service experience in large organisations. The auditing process from the British Standards Institute (BSI) included physical visits and tours as well as direct broadcast from DEWA's customer happiness centres that were evaluated with a result of 100% as result of their assessment. DEWA has adopted a strategy-focused approach in achieving its goals and strategic objectives revolving around an outstanding stakeholders' management and had developed a full-fledge strategy to surpass from satisfaction to happiness of its stakeholders.

In line with the increasing prominence of happiness concept in the UAE and in Dubai in particular, the same was reflected in the strategic direction of many of the new national and local development plans including the UAE Vision 2025, Dubai Plan 2040, Smart Dubai, Happiness Agenda, UAE Artificial Intelligence Strategy, Blockchain and Dubai Paperless Strategy. On the other hand, DEWA has always recognized the importance of customers happiness to the achievement of its business objectives and this was accomplished via adopting a state-of-art Customer Happiness Framework, that is aligned with Dubai and DEWA's Strategy

## WHAT FORMS DEWA'S SMART GRID?

The following are the main governance themes that ensure a smooth, quick, and effective functioning of DEWA's Smart Grid.

### FOUNDATIONAL CAPABILITIES

Focuses on key enabling infrastructure such as advanced metering infrastructure for electricity and water, telecommunications, and IT infrastructure that form the technical "backbone" of the smart grid.

### GRID AUTOMATION

Focuses on deployment of sensors, controls, and real-time applications to orchestrate transmission and distribution grid operations.

### SMART ENERGY SOLUTIONS AND GREEN MOBILITY

Focuses on deployment of distributed renewables and storage technologies to effectively manage grid operations.

### SMART WATER

Focuses on water network monitoring, automation, and optimisation.

### SMART GRID ARTIFICIAL INTELLIGENCE

Unlocks additional value from AI-derived data insights, whether internally or externally for wider commercial application and increased customer happiness.

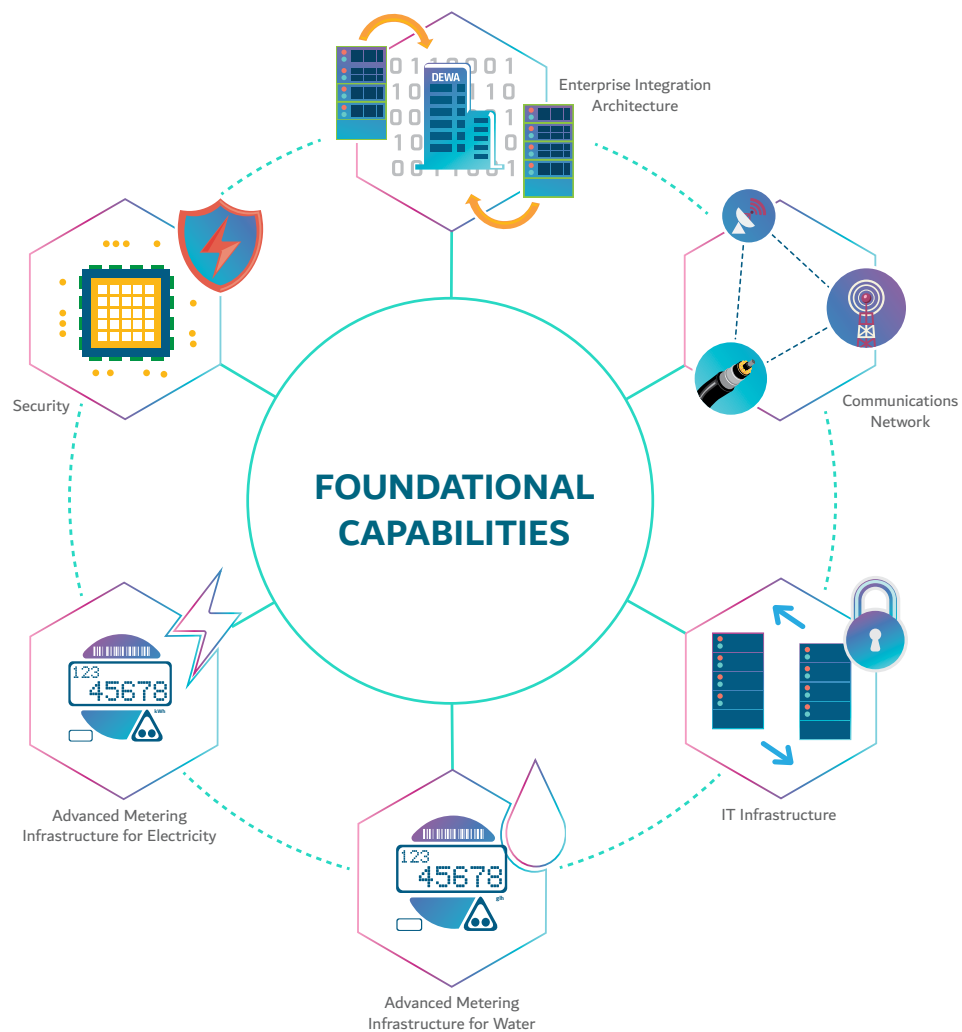
### INNOVATIVE VALUE-ADDED SERVICES

Unlocks customer value behind DEWA's current and future smart grid investments by enabling new products and services while enhancing current ones.

# THEME

## FOUNDATIONAL CAPABILITIES

Foundational Capabilities are DEWA's capabilities that form the backbone of the 'smart' grid. DEWA's advanced metering infrastructure provides interval meter reading data, with the data transported over the communications network and exchanged, processed and stored across DEWA's Enterprise Integration Architecture and IT Infrastructure. A key function of the foundational capabilities is to keep DEWA's and DEWA's customer data safe through the deployment of advanced cyber security controls across the organisation.



### Capability: **ADVANCED METERING INFRASTRUCTURE FOR ELECTRICITY AND WATER**

This capability is an enabler for rolling out the electricity and water smart grids, which provides advanced metering services and applications for customers. DEWA deployed fully automated and secure advanced metering infrastructure, using the latest technologies, across Dubai. This infrastructure includes multiple head-end systems to ensure on-time communication with smart field devices, a centralized meter data management system to orchestrate the huge amount of data received from smart devices and seamless integration with DEWA Enterprise, and customer-facing applications for billing and providing value-added services to customers. All of this is implemented by ensuring end-to-end security through latest tools and



technologies. This enables them to manage their electricity and water usage and preserve natural resources. DEWA also facilitates faster opening and closing of customer accounts by utilising on-demand meter reading. Between 2015 and 2020, DEWA successfully replaced all of its mechanical electricity and water meters with smart electricity and water meters, a deployment of over 2.1 million smart meters. As of December 2022, DEWA deployed approximately 1,108,530 smart electricity meters and 996,935 smart water meters across Dubai. With 100% of DEWA's customers utilising smart meters, this enables smart grids for DEWA's electricity and water networks.

#### Capability: **IT INFRASTRUCTURE**

This capability provides the IT infrastructure of all DEWA's Smart Grid themes and their associated projects. It provides a dedicated state-of-the-art enterprise architecture to store business data and a platform the applications to run the Smart Grid Programme, allowing for interoperability across all Smart Grid themes. As part of this capability, Moro Hub carbon neutral TIER-III+ certified data centers, including world's largest solar powered data center, which has been implemented with a high availability and fail-over construction.

#### Capability: **COMMUNICATIONS NETWORK**

This capability provides the vital connectivity for information necessary to conduct core operations as well as enabling new services for DEWA's smart grid. This capability is critical for enhancing and maintaining the communications infrastructure of DEWA's Smart Grid programme and initiatives. This capability is also instrumental to identify gaps, evaluate and analyse leading communications technologies, and identify the best-fit communication configurations for DEWA's Smart Grid themes, including security capabilities for telecommunications infrastructure. This ensures privacy, integrity, authentication, and authorisation, along with encryption. As part of this capability, the existing MPLS network was enhanced, and an RF-mesh network was commissioned across Dubai. The RF-mesh network provides the last mile communication between DEWA's fibre-optic network and its smart meters. To complement its terrestrial IoT communication network, Dubai Electricity and Water Authority (DEWA) has integrated nanosatellite technology into its Space-D program. The successful launch of DEWA-SAT 1 in January 2022 via a SpaceX Falcon 9 rocket from the Cape Canaveral Space Launch Complex opened up new opportunities for DEWA to enhance its monitoring and detection capabilities in various use cases. These include secondary substation pre-fault detection, improved distribution network visibility, solar power plant monitoring, better solar forecasting, transmission operation planning, power planning, transmission line patrolling, infrastructure change detection, and water leak detection.

In May 2022, DEWA signed an MoU with Eutelsat, the French global satellite operator, to provide technical support for the Space-D program and DEWA-SAT 1. The collaboration aims to explore the potential integration of Eutelsat Earth Low Orbit (ELO) satellites with the Space-D program, expand the fleet of nanosatellites for both parties, and develop use cases that can advance the utility sector worldwide. As part of this effort, the two parties plan to design, develop, and implement the first use case at DEWA's Research & Development (R&D) Centre, which involves combining IoT sensors and Eutelsat ELO satellites.

In April 2023, DEWA successfully launched its second nanosatellite, DEWA SAT-2, aboard the Falcon 9 rocket of SpaceX from Vandenberg Space Force Base in California, USA. The launch represents another milestone in DEWA's mission to leverage the latest technology and innovations to improve its utility services and enhance its customers' experience.

#### Capability: **ENTERPRISE INTEGRATION ARCHITECTURE**

This capability is responsible for integrating information, transactions and events between smart grid systems, enterprise back-off systems, and operation technology (OT) systems to improve innovative

and efficient business processes. As part of this capability, DEWA has implemented an enterprise service bus integration platform to enable seamless data exchange between Smart Grid applications by implementing the planned Smart Grid integration architecture. Through this capability, DEWA will integrate its current and future business and operations systems using service buses on a service-orientated architecture (SOA). This means Smart Grid applications can exchange and synchronise data in a system-independent way.

### Capability: **SECURITY**

The Security capability maintains the confidentiality, integrity, and availability of assets across all Smart Grid programs' IT and OT systems, by implementing world-class security standards and best practices. This capability provides security guidelines, assurance and implementation support to the entire Smart Grid program based on security governance, data privacy and management, identity and access management, cryptography, and security operations. Security is a crucial part of the entire Smart Grid program. Information and cyber security provide an end- to-end resilient system to respond to and recover from any infringement or breaches with minimized business disruption, for both DEWA's IT and OT infrastructure. To maintain a robust security, DEWA follows the Information Security Regulation of Dubai (ISR), Dubai Electronic Security Center Industrial Control System, ISO/IEC27001:2022, IEC 62443, and IEC 62351 standards for its IT/OT critical infrastructure. Furthermore, an ISO/IEC 27001 certified ISMS framework is maintained and incorporates relevant requirements from NERC-CIP, and NIST SP800-53.

The smart grid Safe & Secure Principle for DEWA smart grid program as follows:

"Security is a key consideration in Smart Grid Architecture. Ensure the highest security and encryption capabilities are in place, enforced and maintained".

The Safe & Secure Principal is built on five main principles as follows:

- Security Governance
- Data Privacy and Management
- Identity & Access Management
- Cryptography
- Security Operations

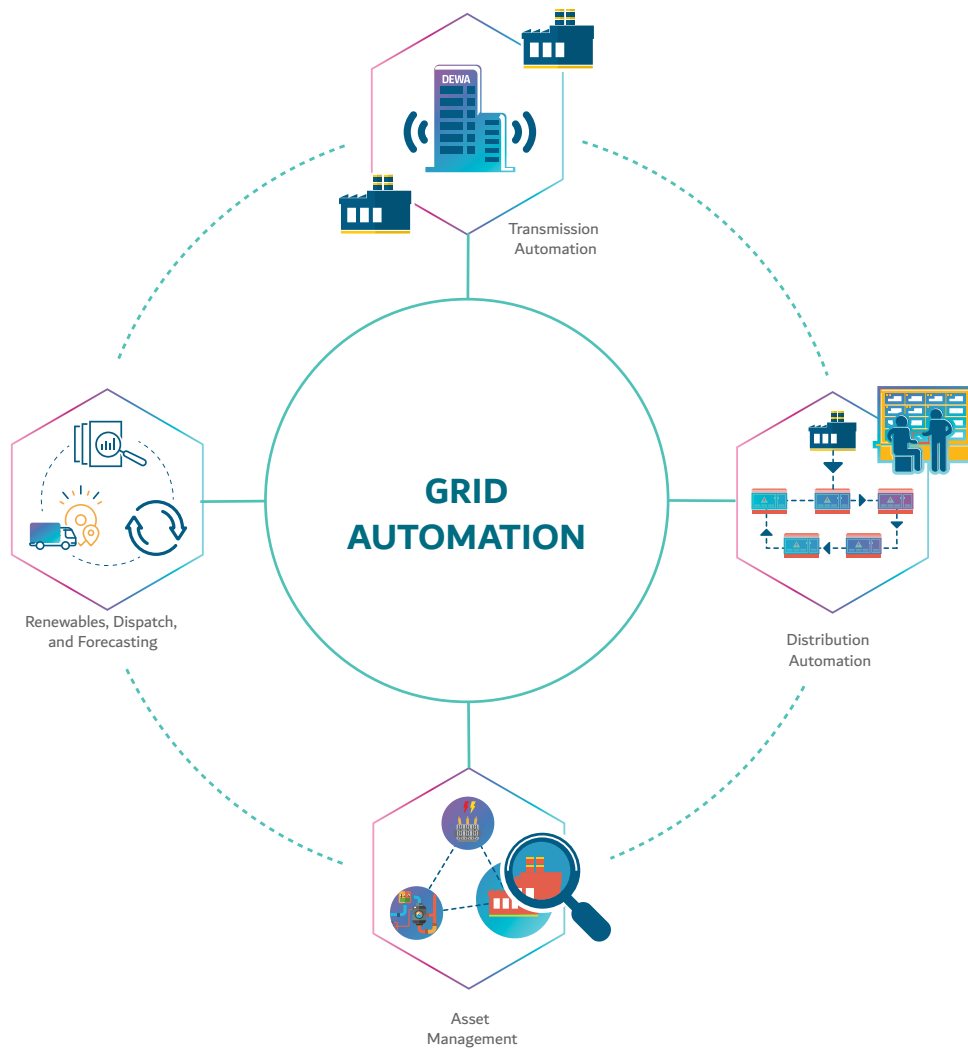
These overarching principles apply to all applications, assets, data, infrastructure components and integration points. The cyber-security team ensures when any part of smart grid is being designed, built, tested, and operated; these principles are in place before production go-live. With the evolving of such critical infrastructure to be connected Online, DEWA has implemented various security controls, solutions, technologies, measurements and conducted security assessments to ensure Dubai Smart Grid infrastructure is Safe & Secure. The cyber-security team ensures end-to-end security coverage with various advanced security controls and 24/7 security and availability monitoring including back-end systems, field devices and communications of all kinds of potential threats.



# THEME

## GRID AUTOMATION

Automating the transmission and distribution grids, as well as asset management practises, is a key contributor and a prerequisite to achieving a Smart Grid. Grid Automation focuses on deploying sensors, controls and software orchestrating its' operation. As the deployment of such technologies accelerates, the grid becomes increasingly resilient, better utilised, more secure and autonomous. Another key driver is enabling the integration and dispatch of distributed and intermittent resources.



### Capability: **TRANSMISSION AUTOMATION**

The capability provides advanced transmission automation and control at high-voltage substations, those 132kV or higher. It focuses on substation automation architecture, digital substations, wide area monitoring systems (WAMS) with deployment of phasor measurement units (PMU), cybersecurity, and artificial intelligence. It also provides the optimal architecture for the SCADA control systems to integrate with the automated distribution substations. This improves the reliability and security of transmission substations, with enhanced substation control and monitoring (SCMS) capabilities, compliant with cybersecurity requirements. Moreover, DEWA has implemented digitally optimised substations (DOSS), as part of its efforts to digitise and enhance transmission substation technology by way of the latest

Intelligent electronic devices (IEDs), IEC61850-9-2 process bus digital communication, enhanced Cyber security, improved energy efficiency, reduced carbon footprint and smart monitoring opportunities for transmission 132kV substations. Additionally, an operations training centre (OTTC) has also been completed, which supports DEWA employees to be aligned with international best practices to leverage new technologies and standards. Moreover, DEWA has developed the capabilities of the existing control centre SCADA systems by improving integration with utility-scale renewables and other distributed energy resources.

Capability: **DISTRIBUTION AUTOMATION**

This capability covers the technologies to continuously monitor and control DEWA's electric distribution system infrastructure in an optimal manner. It provides advanced distribution system automation, protection, and control at low to medium voltages. With thousands of substations and electric components, the system provides scalable connectivity to support the introduction and expansion of automated functions to manage the distribution system. It is designed to increase customer satisfaction, improve reliability, optimisation, and efficiency, and increase asset use and workforce productivity. For its distribution network, DEWA uses SCADA for the monitoring, supervision, and control of its 33 kV, 11kV, and 6.6 kV primary and secondary substations. As part of its efforts to update its SCADA and ADMS for its distribution control centres, DEWA has implemented a fault location isolation and service restoration (FLISR) system, which includes the replacement of ring main units (RMU) with smart RMUs for centralised and decentralised self-healing functionalities. The capability also includes outage management, transformer load management, switching procedure management, optimal network reconfiguration (ONR), voltage variance control and optimisation, power quality monitoring and analysis, an outage management system, a crew management system, real-time power network analysis applications, short-term load forecasting, distributed energy resources management, predictive fault location, dynamic equipment ratings, and electric vehicle management. The power network applications integrated into the SCADA/ADMS system include distribution short circuit calculation (DSCC), distribution system power flow (DSPF), optimal feeder reconfiguration (OFR), contingency evaluation (CE), dispatch power flow (DPF), state estimator (SE), automatic smart grid restoration (ASGR), intelligent alarm processor (IAP), advance network application (ANOP).

Capability: **ASSET MANAGEMENT**

This capability focuses on the preventative and proactive maintenance of DEWA's transmission, distribution and water assets, thus optimising asset life cycle management and ensuring the smooth running of the Smart Grid through the use of data analytics. DEWA is developing an Asset Health Centre, which uses software with data analysis functionality to collect and analyse data from existing assets and systems to quantify the health and risk of failure of these assets, based on certain end of life indicators and their associated use cases. This allows DEWA to minimise its service outages and maximise its assets' expected life. To further enhance its asset health center, DEWA will utilise an asset performance management solution which supports a number of use cases. DEWA has also successfully completed a pilot for unmanned aerial vehicles (drones) for overhead line inspections and maintenance.

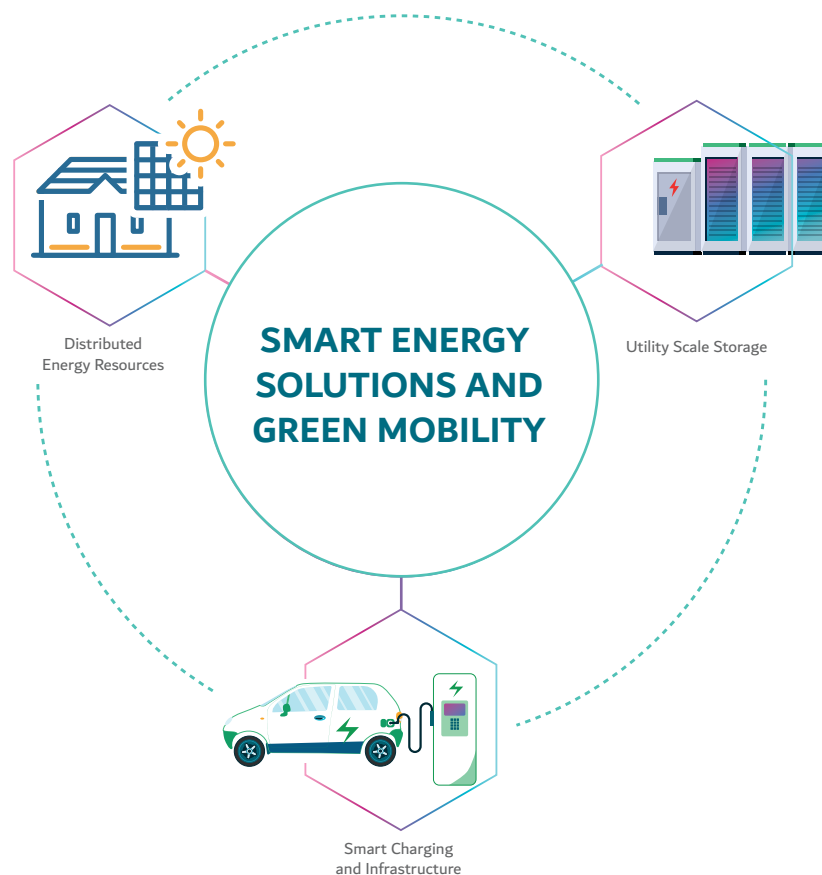
Capability: **RENEWABLES, DISPATCH, AND FORECASTING**

This capability focuses on the set of assets and technologies that creates near autonomous dispatch and control of renewable energy sources. Unlike traditional forecasting and dispatching regimes that are based on stand alone or manual controls, this capability integrates distributed energy resources and sensor data, as well as data from external information providers such as weather data services. This will become increasingly more important and more complex, as increasing amounts of renewable energy and storage technologies are introduced into the DEWA network. Forecasted loads and renewable energy generation output and management will integrate with SCADA and distribution control centre technologies to maintain reliability, enhance the value of these sources and provide support to the distribution network.

## THEME

# SMART ENERGY SOLUTIONS AND GREEN MOBILITY

DEWA's renewable energy goals support the Dubai clean energy strategies and as such greater levels of distributed renewables are expected on the grid, mainly in the form of rooftop solar generation. Moreover, as storage technologies mature and become more affordable, DEWA will remain at the forefront of assessing the technologies that become available. Through pilots and test projects, DEWA is currently evaluating the viability of storage solutions that are most suitable to the environmental conditions of Dubai. With a growing fleet of electric vehicles charging on the DEWA distribution grid, managing demand and supply to avoid hotspots on the network will become a priority for grid stability. DEWA will monitor, control and optimise the distributed generation, storage and loads so as to optimise the supply/generation mix.



### Capability: **DISTRIBUTED ENERGY RESOURCES**

This capability is a set of services and technologies that enable the procurement, installation and operation of distributed energy systems and smart energy solutions. The Shams Dubai initiative was launched in support of HH Sheikh Mohammed bin Rashid Al Maktoum's vision to make Dubai the smartest and happiest city in the world and to promote renewable energy within

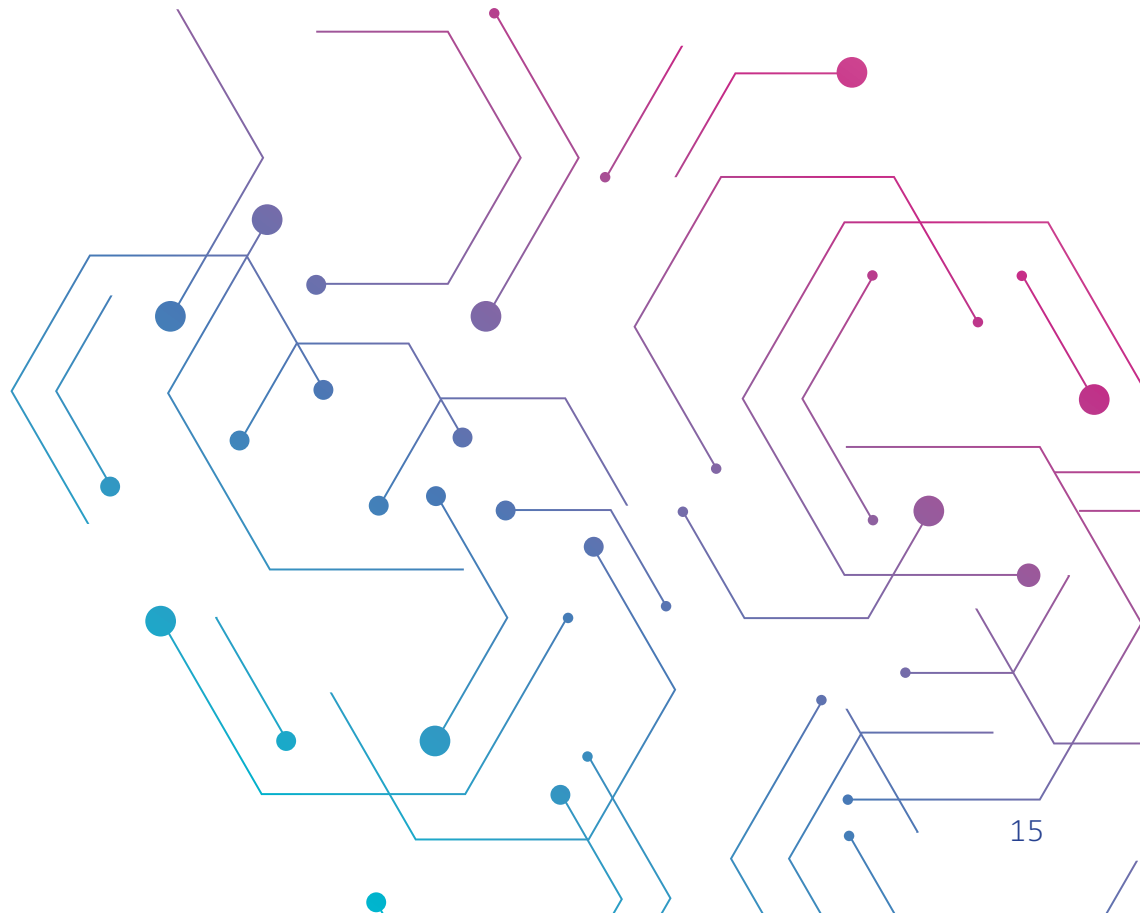
Dubai. Through this initiative, the public was encouraged to install photovoltaic systems at their premises and connect it to DEWA's grid. This promoted the use of renewable energy at these individual sites, with any surplus exported to DEWA and credit awarded to customers in their bills. The connection process consists of four stages (no objection certificate, design approval, inspection and connection, and generation) and the procedure can be found on DEWA website. As part of this initiative, over 7,300 sites have now connected solar power equipment to DEWA's grid, generating over 500 MW of electricity. DEWA made history in 2021 by opening the first solar-powered green hydrogen facility in the MENA region. The facility was designed not only to produce green hydrogen but also to serve as a testing ground for various potential applications, including industrial and mobility uses. DEWA is building expertise, experience and capabilities to contribute in shaping the clean hydrogen future of the United Arab Emirates. Moreover, DEWA is studying the feasibility of building a wind farm in the Hatta region of Dubai, with a total capacity of 28 MW, based on wind speed data collection measured over a full year at the suggested location. DEWA has also built the first virtual power plant (VPP) in the region, which is connected to its Smart Grid Station. DEWA's Smart Grid Station was developed in cooperation with the Korean Electricity Power Corporation (KEPCO), resulting from their joint MOU in 2014 to share information on the latest international standards for smart cities. The DEWA Smart Grid Station uses a variety of Smart Grid technologies to generate electricity through renewable resources such as solar power and wind energy, maximise energy efficiency through real-time monitoring and control, reduce peak load, peak shift, and reduce water consumption.

#### Capability: **UTILITY SCALE STORAGE**

This capability is a set of assets and technologies that enable the storage of generated energy that exceeds the instantaneous load of the system for use at a later time. It allows DEWA to harness excess large scale renewable energy and put it to operational use. DEWA has implemented two pilot projects for energy storage systems, the first in the region, at the Mohammed bin Rashid Al Maktoum Solar Park; the largest single-site solar park in the world based on the Independent Power Producer (IPP) model. It has a planned production capacity of 5,000 MW by 2030, with investments totalling AED 50 billion. When completed, it will save over 6.5 million tonnes of carbon emissions annually. The first energy storage project within the solar park used sodium sulphur battery technology, with a power capacity of 1.2MW and an energy capacity of 7.2MWh. The second pilot project used lithium-ion battery technology, with a power capacity of 1.25MW and an energy capacity of 9.35MWh. These pilots, with a combined power capacity of 2.45MW, are contained in outdoor solutions with minimal degradation of the battery capacities due to the weather conditions of Dubai with potential for full-scale implementation to meet the operational requirements of the Mohammed Bin Rashid Solar Park. These solutions not only reduce the thermal generation spinning reserve emissions but also provide support to the solar generation plant with several operation modes and ancillary services. Moreover, DEWA is developing a pumped-storage hydroelectric power plant in the Hatta region of Dubai, with a production capacity of 250 MW and a storage of 1,500 MWh. The station, which is the first of its kind in the GCC, will have a life span of up to 80 years. The hydropower plant mechanism includes the use of advanced turbines that run on clean energy generated at the Mohammed bin Rashid Al Maktoum Solar Park, to pump water from the dam to the upper reservoir. DEWA has also installed the tallest concentrated solar power (CSP) tower in the world. The 700 MW CSP plant utilises molten salt, has a thermal storage capacity of 15 hours and has an energy capacity of 10,500 MWh.

## Capability: **SMART CHARGING AND INFRASTRUCTURE**

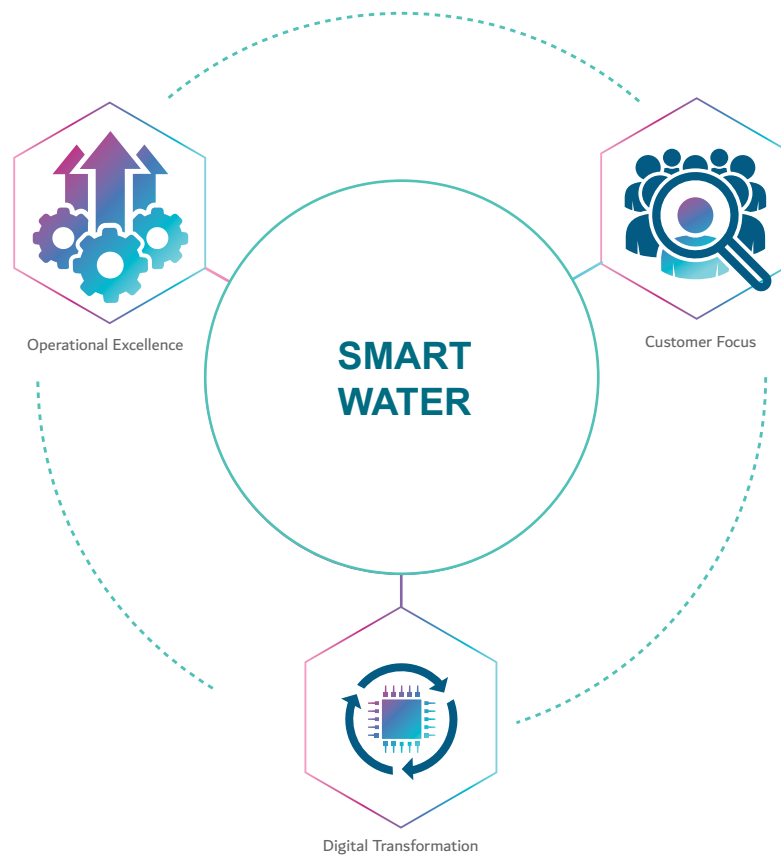
This capability provides a fit for purpose network of public charging spots supported by smart charging services that enables DEWA customers to charge their electric vehicles. The Electric Vehicle Green Charger Initiative was launched to support HH Sheikh Mohammed bin Rashid Al Maktoum's vision to make Dubai the smartest and happiest city in the world and to promote green transportation. This initiative was the first public charging infrastructure for electric vehicles in the region. In 2015, DEWA installed 100 electric vehicle charging stations in highly frequented areas across the city, to encourage electric vehicle adoption in Dubai. Since then, the network has expanded to 351 chargers across Dubai by end of 2022 and DEWA previously launched a series of free-charging incentives on its network to further encourage green mobility within the city. DEWA's EV Green Chargers are smart units which are connected through a Charge Point Management System (CPMS) with status and locations of chargers available via the DEWA app. DEWA has also launched a QR code service for its registered electric vehicle customers to allow them to start and end their charge cycles via a card-less customer experience. Moreover, Customer Care Center staff facilitating remote support to EV customer on EV charging which empower the agent and elevate customer experience. DEWA has achieved an impressive milestone by ensuring the prompt delivery of 99.25% of EV Green charger cards within just three working days when customers have been registered at the service. This remarkable efficiency has been extended to over 3900 cards. by the end of 2022. As member of Dubai Green Mobility Committee, DEWA supports the 10% annual government procurement target for electric and hybrid vehicles by utilising 131 electric and hybrid vehicles in its own fleet. This target will increase to 20% starting from 2025, with a further increase to 30% in 2030. DEWA is also researching and testing emerging technologies in mobility such as V2G technology, autonomous mobility, ultra-fast charging, mobile charging, and inductive charging.



## THEME

# SMART WATER

Adopting a data-driven approach to enhance operations and optimise asset management practices is foundational to realising a smart water network. Data management enables DEWA to monitor operations, improve system performance, and enable data driven decision making across the system for an efficient, reliable, secure and autonomous water network remotely and continuously. The continuous flow of data also provides insights into the status of the assets in the network, thus enabling smart maintenance practices leveraging AI-analytics that prolong the lifetime of the water network assets, provide additional security and reliability, reduce field operation costs and overall optimise asset repair and replacement planning.



### Capability: **OPERATIONAL EXCELLENCE**

This capability focuses on optimising the maintenance and planning of water assets by leveraging asset optimisation initiatives and improving leak detection. It aims to expand the existing capabilities to the entire suite of DEWA's assets and operations and enable the use of integrated data-driven insights for informed decision-making. This allows DEWA to maximise operational efficiency, maximise asset value and extend their lifetime, reduce maintenance costs, improve system reliability, and enhance customer happiness. DEWA, as a leading utility, utilises a number of leading leak detection technologies within its water network.

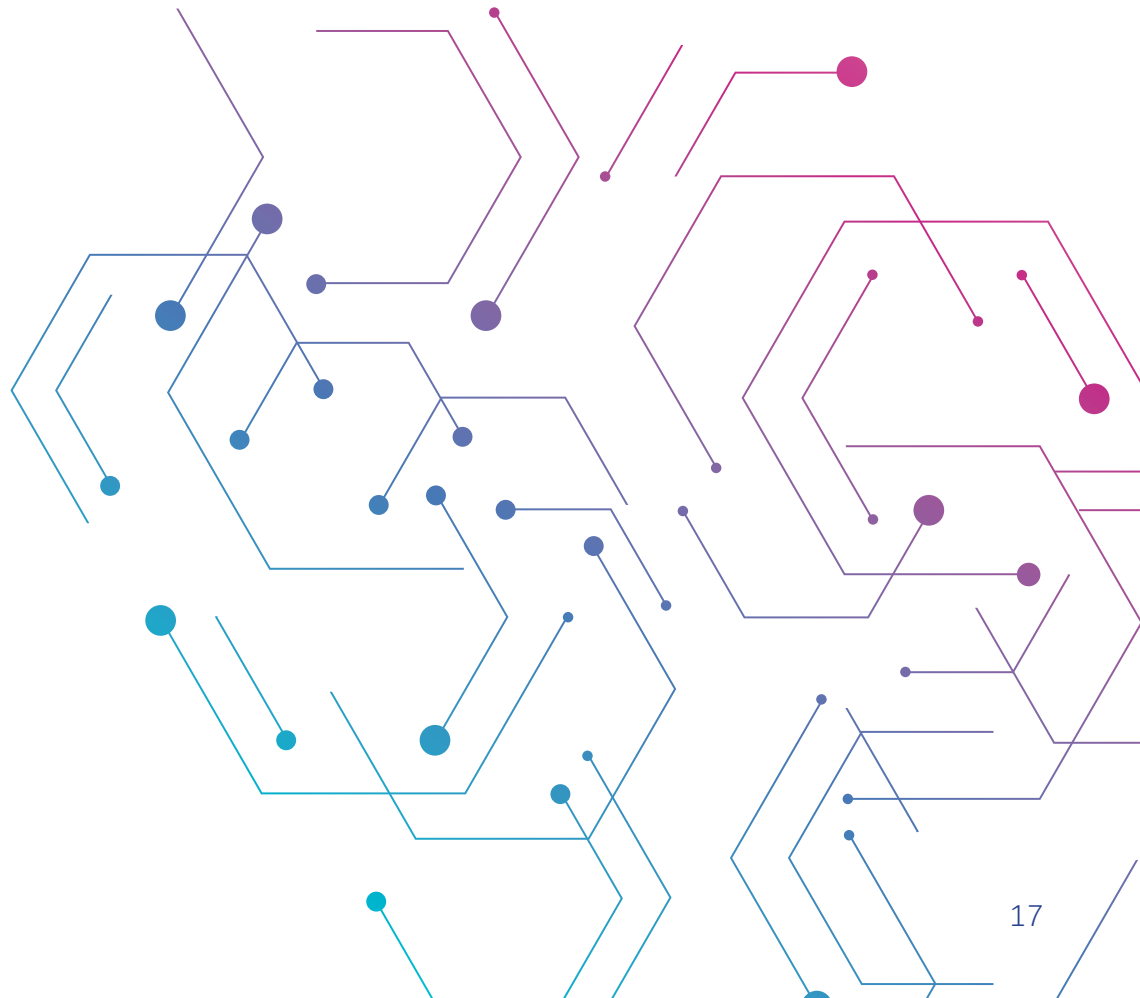


Capability: **CUSTOMER FOCUS**

This capability focuses on ensuring that DEWA sustains its position as a utility that champions customer happiness and enhances the customer experience by utilising actionable data insights, through smart water applications. DEWA has a unified approach to building awareness about its services and programs that cuts across a variety of channels. By utilising smart grid artificial intelligence, DEWA is able to deliver mass-customised messages and campaigns to its customers based on their profile and their interactions with DEWA. This improves customer engagement and happiness, while supporting Dubai's clean water targets.

Capability: **DIGITAL TRANSFORMATION**

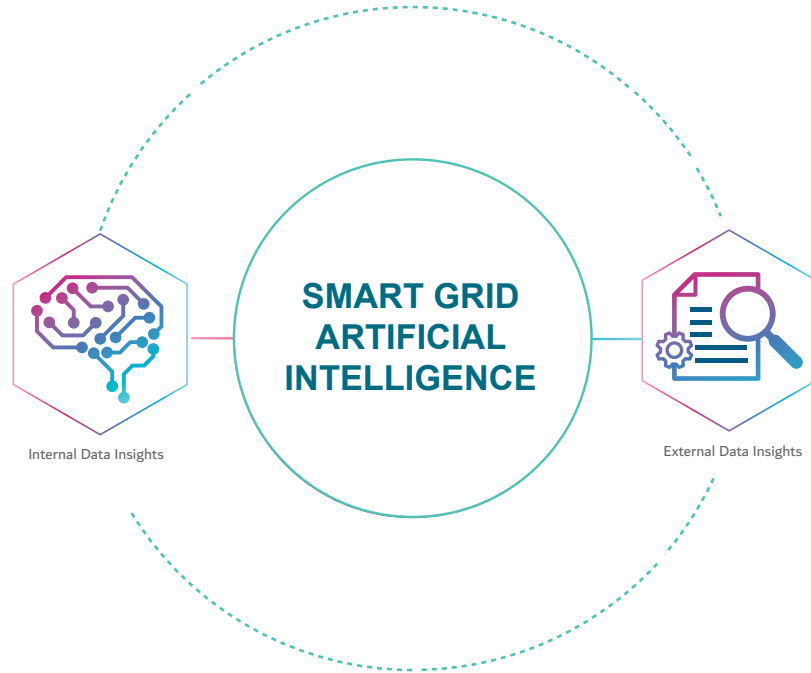
This capability focuses on the implementation of digital platforms, alongside the highest cyber security requirements, to enhance the reliability and the resiliency of DEWA's water network, as well as maintain the water quality at the highest possible standard. Such digital platforms can enable near-real time data flow coupled with advanced analytics where Smart Adoption Result was 99.26% for 2022. It provides DEWA with a holistic overview of operational data streams and analytics, thus unlocking remote monitoring and control capabilities, enhancing the ability to make data-driven decisions, increasing the network's automation and improving leak detection, isolation and service restoration processes. Furthermore, this capability is in line with Dubai's 10X vision, positioning DEWA as 10 years ahead of globally leading utilities and as a pioneer of disruptive initiatives and services that enhance customer experience and service provision.



## THEME

# SMART GRID ARTIFICIAL INTELLIGENCE

By utilising internal and external data insights, derived from artificial intelligence implementations by Moro Hub, DEWA is able to unlock additional value for wider commercial application and potentially increased customer happiness.



### Capability: **INTERNAL DATA INSIGHTS**

This capability enables a set of data driven services that builds the needed intelligence to operate and improve DEWA's business and internal processes by leveraging the data streams generated by its smart grid assets and services. Unlike traditional siloed uses of operational data, Internal Data Insights applies technologies such as Big Data & Analytics and artificial intelligence to improve DEWA's internal processes and business performance, which can unlock additional value. Through the Big Data & Analytics platform, DEWA expanded its analytic systems to improve both operations and customer experience by leveraging the large volumes of data from smart meters and the grid, as well as incorporate artificial intelligence and advance analytics. It provides insights into hidden patterns, correlations, customer sentiments, and other useful business information based on the real-time streaming of data, data ingestion, predictive modelling, and using big data. Moreover, a comprehensive data management environment was established, based on a Smart Grid data governance framework, which includes data quality and metadata management, lifecycle management, and change management. Moreover, utilising artificial intelligence as part of DEWA's customer experience allows DEWA to better understand the experience across multiple channels over time and thus provide insights for continuous improvement. DEWA utilises interactive virtual assistants to answer customer quickly and consistently. They address issues and handle a high volume of requests and direct customers to live agents if more complex issues arise. Verbal interactions can be optimised to enrich customer happiness.

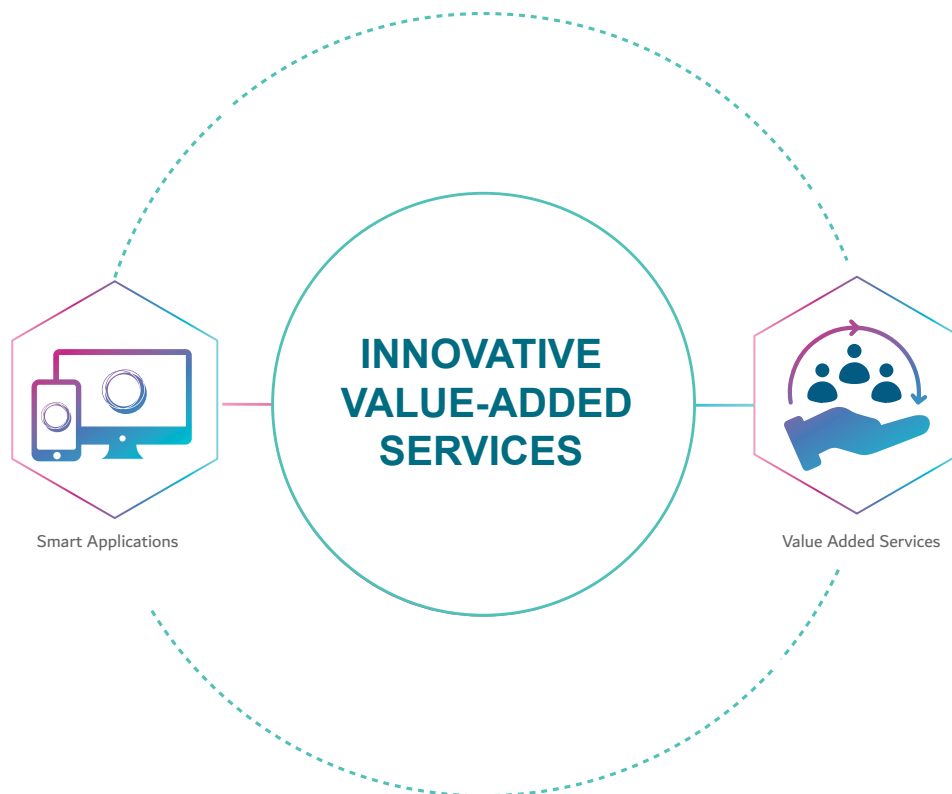
### Capability: **EXTERNAL DATA INSIGHTS**

This capability allows DEWA to leverage data streams generated by its smart grid and value-added services. that will benefit DEWA to generate new revenue streams, enhance services and performance.

## THEME

# INNOVATIVE VALUE-ADDED SERVICES

DEWA is able to unlock the value behind its current and future smart grid investments by putting the customer into focus and enabling new products and services, while enhancing current ones.



### Capability: **SMART APPLICATIONS**

This capability provides a set of organisational capabilities and technologies that ensures consistent and smooth interfacing with customers across all service channels, built on data driven insights from customer interactions. Which resulted in to achieving 98% from 666K customers votes in the Dubai Government Instant Customer Happiness Score end of 2022. It provides a personalised experience that makes customers feel recognised and valued. This strengthens the relationship between DEWA and its customers and enables DEWA to engage them in new ways. DEWA has launched the Smart Living initiative, which utilises smart meter data insights, to support its customers to conserve and manage their electricity and water consumption by providing them with digital consumption dashboards, as well as access to five years of historical consumption data. DEWA also allows them to compare their consumption with similar homes in the area.

Capability: **VALUE-ADDED SERVICES**

This capability focuses on non-core premium smart services that enhance the customer experience while generating additional revenue. It leverages smart grid artificial intelligence to identify the needs of each individual customer and create tailor-made offerings for them that extend far beyond the traditional utility portfolio. This allows DEWA to create new revenue streams and increase customer happiness. Such services would include virtual energy audit services for customers, customer water quality assurance services, and smart certificates for suppliers.

For example the High Water Usage Alert initiative aligns with DEWA's core strategy of minimizing our environmental footprint and promoting conservation awareness and social responsibility. To that extent, smart meters were leveraged to efficiently identify unusual water consumption, significantly reducing the time needed to detect leaks, which previously took around 29 days. Advanced algorithms now swiftly identify high usage and notify customers within 48 hours, entirely without manual intervention

