

Sustainable Practices in DEWA Network

Reema Alzarooni^{1*}, Maryam AlMajidi², Jawaher Alshamsi³, Amal Alhammadi³

¹Manager, Transmission Engineering, Dubai Electricity and Water Authority (PJSC), Dubai, UAE

²Assistant Manager, Transmission Equipment Maintenance & Commissioning, Dubai Electricity and Water Authority (PJSC), Dubai, UAE

³Sr. Engineer, Transmission Engineering, Dubai Electricity and Water Authority (PJSC), Dubai, UAE

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*Corresponding author: Reema Alzarooni

Manager, Transmission Engineering, Dubai Electricity and Water Authority (PJSC), Dubai, UAE

Abstract

Dubai Electricity and Water Authority (DEWA) is considered as a benchmark for other utilities due to its sustainable initiatives, where it addresses Dubai's increasing energy and water demands through innovative and environmentally-oriented practices. This paper discusses DEWA's advancements in renewable energy integration, smart grid technologies, and sustainable infrastructure, highlighting the Mohammed bin Rashid Al Maktoum Solar Park and the Hatta Hydroelectric Power Plant as its major initiatives. Furthermore, DEWA's efforts in water management, green building design, and community engagement also serve as examples to its commitment to sustainability. With notable achievements in energy production efficiency, significant reductions in carbon emissions, and enhanced energy management systems, DEWA greatly contributes to Dubai's Clean Energy Strategy 2050.

Keywords: Utility, sustainability, smart grid, net-zero, solar park, hydroelectric, renewable, community engagement.

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1. INTRODUCTION

DEWA is dedicated to being a sustainable utility that plays a crucial role in Dubai's infrastructure. The utility pledges to meet the constantly increasing demands for electricity and water across Dubai with the highest standards of reliability and quality of generation, transmission, and distribution of these essential services. DEWA aligns itself with global sustainability goals and Dubai's Clean Energy Strategy 2050 through innovative initiatives such as Mohammed bin Rashid Al Maktoum Solar Park, which exemplifies the authority's commitment to renewable energy integration. In addition, DEWA incorporates cutting-edge technologies, the environmental positive impact of which will be discussed throughout the paper.

2. DEWA Network Overview

DEWA's infrastructure is designed to ensure the generation, transmission, and distribution of highly reliable and continuously available electricity and water across the city of Dubai.

Generation: DEWA generates electricity using a mix of traditional and renewable energy sources. The

Jebel Ali Power and Desalination Complex, the largest in the UAE, is vital to this effort, employing gas turbines and steam turbines. Additionally, the Mohammed bin Rashid Al Maktoum Solar Park is set to generate 5,000 MW by 2030 using photovoltaic and concentrated solar power technologies (DEWA (PJSC) & Sustainability and Innovation Centre, 2024).

Transmission: The transmission network is designed to carry high-voltage electricity from generation sites to distribution areas. DEWA operates high-voltage substations at 400 kV and 132 kV, which are essential for stepping down the voltage for further transmission. This network includes both overhead lines and underground cables, ensuring strong connectivity and minimal disruption.

Distribution: The distribution network manages the final delivery of electricity to consumers, consisting of medium and low voltage substations that reduce the voltage to 33 kV and below, making it suitable for residential and commercial use. DEWA has integrated smart grid technology, automated distribution management systems, and demand response strategies

into its distribution system to enhance efficiency and reliability.

Through these interconnected components—generation, transmission, and distribution—DEWA ensures a continuous and reliable supply of electricity and water to meet Dubai's growing needs.

3. Sustainable Design of DEWA Distribution Network

DEWA operates one of the most advanced and sustainable utility networks globally, incorporating innovative technologies and strategic initiatives to ensure social responsibility. Below is an overview of how DEWA's network embodies sustainability across its operations:

- a) **Renewable Energy Integration:** DEWA has significantly advanced the integration of renewable energy within its network. The Mohammed bin Rashid Al Maktoum Solar Park, one of the largest in the world, exemplifies this effort. By utilizing solar energy, DEWA reduces carbon emissions and dependence on non-renewable resources, contributing to a cleaner, more sustainable energy mix. 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 tons of carbon emissions annually (DEWA (PJSC) & Sustainability and Innovation Centre, 2024)
- b) **Energy Efficiency Measures:** DEWA emphasizes energy efficiency across its network. Technologies like smart grids, smart meters, and automated systems enhance the optimization of energy distribution and consumption. These measures minimize energy losses and promote efficient usage, improving resource utilization and reducing environmental impact (DEWA (PJSC), 2024).
- c) **Water Management Practices:** DEWA implements sustainable water management practices to ensure responsible use of water resources. In fact, DEWA reduces water wastage and promotes conservation, contributing to the preservation of precious water resources in the region (DEWA (PJSC), 2024)
- d) **Smart Grid Technologies:** Smart grid technologies are crucial to DEWA's sustainability efforts. These technologies allow real-time monitoring, control, and optimization of the electricity grid, enhancing reliability and resilience. By minimizing energy losses, improving system efficiency, and empowering consumers to make informed decisions about their energy usage, DEWA significantly advances its sustainability goals.
- e) **Environmental Impact Reduction:** DEWA is dedicated to reducing its environmental

footprint across all operations. From eco-friendly infrastructure designs to sustainable procurement practices, DEWA prioritizes environmental conservation. Efforts to minimize land use, preserve natural habitats, and reduce emissions help DEWA mitigate environmental impact and promote ecosystem health (DEWA (PJSC), 2023).

- f) **Community Engagement and Education:** DEWA actively engages with communities to raise awareness about sustainability and encourage responsible energy and water usage. Through educational programs, workshops, and outreach initiatives, DEWA empowers individuals and organizations to adopt sustainable practices, fostering a culture of sustainability and inspiring collective action towards a greener future.
- g) **Resilience and Adaptability:** DEWA's network is designed to withstand and adapt to evolving environmental challenges and operational disruptions. Redundancy measures and emergency response protocols ensure the continuity of essential services, even in adverse conditions. By prioritizing resilience, DEWA ensures the well-being and prosperity of its customers and stakeholders.

4. Sustainable Practices Reema

DEWA maintains a robust environmental management system and programs that comply with local, federal, and international standards. The organization fosters a culture that prioritizes sustainability and environmental stewardship, leading to continuous enhancements in its environmental and sustainability practices. DEWA is committed to adhering to various ISO standards and undergoes regular internal, external, and third-party audits to ensure ongoing operational and business improvements. The organization's Integrated Management System (IMS) policy clearly defines its goals and principles, reflecting strong strategic leadership. DEWA invests in resources to support its environmental and sustainability initiatives, aligning them with its mission, objectives, and strategic plans (DEWA (PJSC), 2023).

- a) **Installed Capacity:** In response to Dubai's growing population and increasing energy demands, DEWA continues to deliver high-quality electricity and water services. DEWA aims to transform Dubai into a global clean energy hub, targeting 100% of the city's power capacity from clean energy sources by 2050. Since 1992, DEWA has expanded its capabilities to an installed capacity of 14,517 MW, including 2,027 MW from renewable sources, predominantly solar energy, and 490 million imperial gallons per day (MIGD) for electricity generation and water production, respectively. Clean energy constitutes about 14% of Dubai's total installed capacity (DEWA (PJSC), 2023).

- b) **Mohammed Bin Rashid Al Maktoum Solar Park:** The Mohammed bin Rashid Al Maktoum Solar Park is the world's largest single-site solar park. It supports the Dubai Clean Energy Strategy 2050 and the Dubai Net Zero Emission Strategy 2050. Scheduled for completion by 2030, the park will have a total capacity of 5,000 MW and will reduce CO2 emissions by 6.5 million tons annually. In 2022, DEWA adopted advanced solar photovoltaic bifacial technologies with Single Axis Tracking in Phase 5, boosting the first project's capacity from 300 MW to 330 MW. The ongoing 900 MW fifth phase, with an investment of AED 2.06 billion, is 60% complete and has achieved 4.225 million safe working hours without injuries (DEWA (PJSC), 2023).
- c) **Hydroelectric Power Plant In Hatta:** DEWA's hydroelectric power plant in Hatta is the first of its kind in the region, with an investment of up to AED 1.421 billion. Expected to generate 250 MW, the plant will utilize water from Hatta Dam and an upper reservoir being constructed in the mountains. During off-peak hours, turbines will use clean energy to pump water to the upper reservoir, and turbines will then generate electricity through a 1.2-kilometer subterranean water canal. The plant boasts a high efficiency of up to 78.9% in power generation and a rapid 90-second response to electricity demand. The project is 59.29% complete and is projected to begin operations by the end of 2024. Additionally, DEWA

plans to enhance Hatta's development, create innovative job opportunities, and promote community well-being through projects like the Hatta Sustainable Waterfalls, which aims to develop the area into a recreational and tourist destination (DEWA (PJSC), 2023).

- d) **Energy Management Of Dewa Premises And Assets:** DEWA is committed to creating a sustainable built environment that is energy, water, and material resource efficient by applying national and international standards for green buildings at all its assets. DEWA's sustainable efficient buildings are in line with the UAE's efforts to create a green and sustainable economy, the Nationally Determined Contributions for the UAE against Climate Change, and the Dubai Digital Authority initiative. DEWA applies an Energy Management System on its buildings which have been recently expanded to cover generations, plants its Substations, administration buildings, and fleet. The Energy Management system allows DEWA to keep track of its energy performance and identify energy conservation opportunities which would also reflect a cost benefit for the organisation.

Table 1 below demonstrates the total auxiliary energy consumption from power generation and water production facilities located at Jabel Ali, Al Aweer, and MBR Solar Park Phase 1 of the Jebel Ali facility:

Table 1: Total auxiliary energy consumption from different services facilities

Year	Efficiency Improvement	Auxiliary Power Consumption Reduction	Carbon Reduction Million Tons of CO2 due to efficiency improvement	Fuel saving due to efficiency improvement
	compared to 2006 (%)	(MWh) compared to 2006	compared to 2006	compared to 2006 - MMBTU
2018	29.68	413,745	6.65	124,713,523
2019	31.40	408,148	7.06	132,295,018
2020	33.41	293,385	7.11	133,309,503
2021	37.63	314,781	8.04	150,786,454
2022	37.78	225,873	9.22	172,973,272

DEWA has been continuously achieving progress in improving the energy production efficiency, Auxiliary Power Consumption Reduction, carbon emission reduction, and fuel savings. Since 2006, DEWA has achieved the following in 2022:

- a. 37.78% of efficiency improvement
- b. 25,873 MWh of Auxiliary Power Consumption Reduction
- c. 9.22 Million tons of Carbon emission reduction

- d. Fuel savings of 172,973,272 Metric Million British Thermal Uni (MMBTu) due to efficiency improvement (DEWA (PJSC), 2023).

- e) **Net Zero Carbon Emissions:** DEWA is working towards achieving net-zero carbon emissions by 2050. This ambitious goal involves eliminating or offsetting CO2 emissions. DEWA's strategy includes increasing the use of renewable energy and promoting energy efficiency through various projects. The organization's Research and Development Centre is exploring carbon

capture, utilization, and storage technologies to reduce overall emissions from power (DEWA (PJSC), 2023).

5. RESULTS AND DISCUSSION

DEWA's efforts in shaping a sustainable future for Dubai in the utility sector have been on the rise in line with Dubai's leadership's instructions, which is enabling it to meet the growing demands for electricity and water. DEWA's accomplishments in renewable energy generation, such as the Mohammed bin Rashid Al Maktoum Solar Park, serve as a global benchmark in clean energy adoption. This initiative, with generating 5,000 MW by 2030 will significantly reduce carbon emissions, showcasing DEWA's commitment to sustainable energy solutions. That and in addition to the Hatta Hydroelectric Power Plant, which proves DEWA's innovative approach to clean energy generation through the utilization of pumped-storage technology to enhance power supply reliability. Nevertheless, community engagement remains essential to DEWA's strategy, wherein many initiatives are designed to raise awareness and foster a culture of sustainability, such as educational programs, workshops, and outreach campaigns that empower individuals and organizations to adopt sustainable practices.

Despite its achievements, DEWA challenges in balancing Dubai's rapid urbanization with its sustainability goals will continue to rise due to the continual increase in Dubai's population. Accordingly, continued investments in research and development, especially in carbon capture, utilization, and storage technologies, will be essential to maintaining its status and progress towards achieving net-zero carbon emissions by 2050.

Through these concerted efforts, DEWA is contributing significantly to Dubai's Clean Energy Strategy 2050 and global sustainability objectives, setting a high standard for utility providers worldwide.

6. CONCLUSION

To sum up, DEWA can be considered as a live example for the integration of sustainability, innovation,

and resilience in utility management. Through its strategic initiatives, such as the Mohammed bin Rashid Al Maktoum Solar Park and the Hatta Hydroelectric Power Plant, DEWA has demonstrated its commitment to advancing renewable energy and reducing environmental impact. The adoption of cutting-edge technologies, including smart grids, energy management systems, and sustainable building practices, highlights DEWA's focus on efficiency and resource optimization.

By aligning with Dubai's Clean Energy Strategy 2050 and Net Zero Emission Strategy 2050, DEWA is supporting the city of Dubai in shaping a clean energy future and setting a benchmark for utilities worldwide. The significant achievements in carbon emission reductions, fuel savings, and water management reflect a DEWA's determination to mitigating environmental challenges.

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