



EXCLUSIVE INTERVIEW

“WAPDA is currently executing several strategically important mega projects aligned with the Government of Pakistan’s vision to promote clean energy initiatives. Upon completion, these projects will increase the country’s hydropower potential by 11,369 MW, bringing the total to 20,000 MW, and will augment the current water storage capacity by 11.7 million acre-feet (MAF). These developments will play a crucial role in addressing the severe challenges posed by climate change, particularly in the wake of recent floods”

Lt Gen Sajjad Ghani (Retd)

Chairman, Water and Power Development Authority (WAPDA)

ICMA: What challenges do you face in maintaining Hydel Power’s share in the national grid?

Chairman WAPDA: WAPDA, being the largest supplier of hydropower, contributes over 95% to the country’s hydro-power through 22 hydropower projects and provides 37 billion units out of the total annual energy production of 121 billion units. The share of hydel generation in the energy mix is approximately 27%. WAPDA has identified a hydropower potential of more than 40,000 MW at the Indus cascade alone. If tapped as planned, this potential could transform the currently expensive consumer-end energy tariff into a more affordable one, thereby revolutionizing Pakistan’s economic landscape. However, the organization faces several challenges in maintaining its hydropower share in the national grid, despite its critical role in ensuring sustainable and affordable energy. These challenges can be categorized into technical, financial, environmental, and governance-related issues:

a) Seasonal Variability of River Flows: Hydropower production heavily depends on seasonal river flows (hydrology), which vary due to monsoons, glacier melt, and precipitation patterns. Reduced water availability during dry seasons significantly impacts generation capacity.

b) Hydropower as a By-product: Reservoirs are developed primarily for irrigation, with hydropower generation as a by-product. Reduced irrigation demand during certain seasons leads to decreased hydropower generation. However, during high-flow seasons, full generation capacity is realized while meeting irrigation requirements and releasing excess water into the river system.

c) Reservoir Sedimentation: Silt accumulation in major reservoirs, such as Tarbela and Mangla, reduces water storage capacity and hydropower generation. High costs and technical challenges limit dredging and desilting efforts.

d) Insufficient Funding and Investments: Budget constraints for hydropower development, due to competing national priorities, and reliance on external financing for large-scale projects often result in delays in both initiation and completion.

e) Delays in New Projects: Prolonged planning, approval, and construction timelines for new water and hydropower projects are caused by delays in decision-making and regulatory inefficiencies. Land acquisition issues and disputes with local communities further exacerbate these delays.

f) Transmission and Distribution Bottlenecks:

Inadequate transmission infrastructure to evacuate generated hydropower to the national grid, coupled with losses due to technical inefficiencies and aging equipment, hinder the enhancement of hydropower's share in the grid.

g) Dependence on Thermal Power: The national grid's reliance on thermal power sources reduces the focus on expanding and optimizing hydropower.

h) Environmental and Social Concerns: Hydropower projects often face opposition due to concerns over displacement, environmental degradation, and loss of biodiversity. Stricter environmental regulations and compliance requirements also contribute to project delays.

ICMA: Can you elaborate on plans to rehabilitate and refurbish old Hydel Power Stations?

Chairman WAPDA: WAPDA has initiated comprehensive plans to rehabilitate and upgrade aging hydropower stations to enhance their efficiency, capacity, and reliability. These upgrades aim to modernize machinery, improve energy output, and extend the lifespan of these critical assets.

The refurbishment of Mangla Power Station is currently underway, involving the replacement of 50-year-old and obsolete E&M equipment to take advantage of an increased water head (40 ft) and storage capacity (2.9 MAF). Units 3 to 6 have already been rehabilitated, and upon the project's complete rehabilitation, the installed capacity will increase from 1,000 MW to 1,310 MW. This initiative will also extend the power house's operational life by an additional 40 years.

Similarly, the rehabilitation of Warsak Power Station is progressing well and is expected to regain a capacity of 50 MW. WAPDA is also working on the capacity enhancement of Dargai Power Station from 18 MW to 22 MW and Chitral Power Station from 1 MW to 5 MW. Additionally, WAPDA has plans to rehabilitate its low-head, small hydropower stations, which have been operational for 60 to 99 years. Feasibility studies for the Renala and Rasul Hydropower Projects have been completed, while evaluations for Nandipur, Chichoki, Shadiwal, and Kurram Garhi are in the final stages.

ICMA: What major hydroelectric projects are under planning or construction?

Chairman WAPDA: WAPDA is currently executing several strategically important mega projects aligned with the Government of Pakistan's vision to promote clean energy initiatives. Upon completion, these projects will increase the country's hydropower potential by 11,369 MW, bringing the total to 20,000 MW, and will

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augment the current water storage capacity by 11.7 million acre-feet (MAF). These developments will play a crucial role in addressing the severe challenges posed by climate change, particularly in the wake of recent floods. The major projects include:

- Diamer Basha Dam (4,500 MW)
- Mohmand Dam (800 MW)
- Dasu Hydropower Project (4,320 MW)
- Tarbela 5th Extension Hydropower Project (1,530 MW)
- Floating Solar at Ghazi & Barotha (300 MW)
- Keyal Khwar Hydropower Project (128 MW)
- Attabad Hydropower Project (54 MW)
- Harpo Hydropower Project (34.5 MW)
- Kurram Tangi Dam (Stage-I) (18.9 MW)
- Nai Gaj Dam (4.2 MW)
- Naulong Dam (4.4 MW)

ICMA: What are the most pressing challenges faced by Pakistan's power sector?

Chairman WAPDA: The Power Generation Policies have encouraged private sector investment through Independent Power Producers (IPPs), which currently account for more than 70% of total electricity generation, primarily in the thermal power sector. However, this continued reliance on thermal power generation over the past three decades has disrupted the Hydel-to-Thermal mix ratio. As a result, the power sector now faces several persistent challenges, including high electricity costs, increasing capacity payments, over-reliance on imported fuel, escalating circular debt, transmission constraints, operational inefficiencies, and poor governance.

ICMA: How does WAPDA work with NTDCL and CPPA-G to ensure seamless electricity delivery and billing?

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critical for ensuring the smooth delivery of power from WAPDA's hydropower plants to end consumers. While WAPDA generates electricity, NTDCL ensures its transmission at the correct voltage through real-time monitoring, transformers, reactive power management, and other tools. This collaboration helps maintain grid stability, minimize voltage fluctuations, and ensure a reliable electricity supply nationwide.

WAPDA's meticulous tracking and maintenance of electricity production data are vital for CPPA-G to cross-check and verify the production and billing process. This partnership ensures that electricity generation, procurement, and billing are accurate, transparent, and aligned with regulatory requirements. By utilizing WAPDA's production data, CPPA-G can effectively manage power purchases, calculate adjustments, and ensure accurate billing for distribution companies. This collaborative approach ultimately benefits both power producers and consumers across Pakistan.

ICMA: What role does WAPDA play in tariff determination with NEPRA?

Chairman WAPDA: WAPDA provides detailed project cost breakdowns, operational expenses, and expected output data to NEPRA for tariff determination. We ensure transparency and adherence to regulatory frameworks, advocating for tariffs that balance consumer affordability with the financial sustainability of our projects.

WAPDA's low-cost electricity generation plays a pivotal role in Pakistan's power pricing system. By producing a significant portion of the country's electricity at a low cost, WAPDA effectively subsidizes the overall energy basket price. Its cost structure serves as a benchmark for determining tariffs for other power plants, helping to keep electricity prices fair and affordable for consumers while covering the legitimate costs of power producers. NEPRA's oversight ensures that all tariff adjustments reflect reasonable and prudent costs, preventing unnecessary price increases for consumers.

ICMA: How does WAPDA manage hydropower generation while addressing environmental impacts?

Chairman WAPDA: WAPDA aims to balance the need for clean energy with environmental protection, ensuring the sustainable development of hydropower resources in Pakistan. WAPDA manages hydropower generation while addressing environmental impacts through a multi-faceted approach, which includes:

- Environmental Impact Assessments (EIAs) for all hydropower projects are conducted to identify and mitigate potential impacts on water quality, aquatic ecosystems, and biodiversity, incorporating findings into project designs and operations.
- River flows are managed to mimic natural patterns, ensuring ecological balance, sustaining aquatic life, and supporting downstream agriculture by maintaining minimum flow levels.
- Communities affected by hydropower projects receive support through compensation, resettlement plans, and social welfare programs, with local stakeholders consulted to address their concerns.
- Monitoring of water quality, biodiversity, and ecosystems is conducted to ensure compliance with environmental standards, overseen by regulatory bodies.

ICMA: What measures are taken to tackle sedimentation issues in hydel power stations?

Chairman WAPDA: WAPDA addresses sedimentation issues using a combination of engineering, operational, and environmental management strategies. Lost storage capacity in water reservoirs due to sedimentation can be restored through techniques such as dredging, sluicing, flushing, watershed management, and dam raising. However, the effectiveness of specific techniques depends on various factors, including the reservoir's location, hydrological conditions, sediment composition, local land use practices, design provisions, and available resources for implementation, etc.

In this regard, strenuous efforts have been made by WAPDA to address sedimentation issues in major reservoirs. For example, to tackle the sedimentation issues at Tarbela, WAPDA engaged several renowned experts of the world on reservoir sedimentology from time to time during the last 50 years, and comprehensive studies on sediment management were conducted in 1998, 2005, and 2013. The experts recommended that the only viable option to protect the installations and structures from sediment intrusion is to raise the Minimum Operating Level of the reservoir, and raising

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the intakes of low-level inlets was also recommended. The options such as dredging, sluicing, flushing, and watershed management techniques were not considered technically feasible or economically viable.

It is worth mentioning that the construction of Diamer Basha Dam will reduce the sediment load in the Tarbela reservoir, eventually enhancing its life by 35 years. To restore/regain the lost storage capacity of Mangla Dam, the raising of the dam was decided in the year 2000, as dredging of the reservoir was uneconomical and not feasible. After the completion of Mangla Dam Raising, the capacity increased from 5.88 MAF to 7.4 MAF. Moreover, the Mangla Watershed Management Project, which includes check dams, retaining walls, tree plantations, etc., is playing a key role in reducing sediment inflow into the reservoir.

ICMA: How does WAPDA use automation and digital tools in hydel power operations?

Chairman WAPDA: WAPDA is adopting automation and digital tools to enhance operational efficiency. Supervisory Control and Data Acquisition (SCADA) systems, DCS, predictive maintenance software, and real-time monitoring platforms are being deployed across our hydropower stations. These technologies enable proactive decision-making and help reduce downtime.

ICMA: How does WAPDA ensure the financial viability of hydel power projects?

Chairman WAPDA: WAPDA is an important growth point of the economy, and its business model has an important role to play in the development of a more sustainable and lower-carbon economy in Pakistan, both through the current investment portfolio and future investments.

While capitalizing on WAPDA's institutional strengths and sound balance sheet footing, raise and mobilize financing from DFIs for multi-purpose mega hydel projects through an integrated financing framework. Major multilaterals, including the World Bank, Saudi

Fund for Development, Islamic Development Bank, Kuwait Fund for Development, OPEC Fund, AIIB, ADB, etc., have been WAPDA's trusted partners in financing all mega multi-purpose projects.

WAPDA's credit rating has been aligned with that of the GOP by all three international rating agencies: S&P, Moody's, and Fitch. It is the only parastatal organization of Pakistan that has accessed the international bond market on its own credentials without any financial obligation on the government. It has raised capital through the issuance of a \$500 million Green Eurobond, which was listed on the London Stock Exchange. There was a tremendous appetite for WAPDA's Green Bond, with the order book six times oversubscribed, reaching close to \$ 3.0 billion. This included very credible and top companies, including Goldman Sachs, Blackrock, Bluebay, Fidelity, Ashmore, Amundi, and UBS.

ICMA: Is WAPDA collaborating with international experts to improve hydropower management?

Chairman WAPDA: The technical challenges at mega projects are being overcome with the multidisciplinary team of the world's top-notch experts in the relevant field to advise and handle these challenges, along with state-of-the-art technological interfaces. Large consulting firms like Stantec, Dolsar, SMEC, AFRY, Mott MacDonald Ltd, Nippon Koei, Tractabel, and many others, with the help of large local firms, are on board for this historic development.

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WAPDA has the continuous support of a world-renowned International Panel of Experts on all mega under-construction projects. These experts bring a wealth of experience and knowledge in the latest technologies, construction techniques, and best practices in hydropower development.

The Editorial Board thanks Lt Gen Sajjad Ghani (Retd), Chairman of the Water and Power Development Authority (WAPDA), for sparing his precious time to give an exclusive interview for the Chartered Management Accountant Journal.