Tomorrow's Affairs
Analysis of today
Assessment of tomorrow

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Digital Energy Grid—a key ingredient in today's electricity revolution

Around the world, energy systems are undergoing profound, rapid transformations that will leave them looking dramatically different a decade from now.

A major driver is the increasing electrification of the global economy. Not only are more people adopting electric vehicles, heat pumps, and smart (digitally interconnected) appliances; we are also witnessing explosive growth in the construction of electricity-hungry data centers, many of them powering AI.

Owing to these trends, the International Energy Agency has projected that electricity demand will grow six times faster than overall energy demand by 2035.

The supply side of the energy sector is also evolving rapidly. Renewable energy sources, especially solar, are set to play increasingly significant roles in power systems globally.

These trends and technologies could deliver greater energy independence and lower emissions if the right policies and infrastructure are in place.

But they also add a layer of complexity to grid management, because operators must account for variable flows of electricity while ensuring reliability and affordability for consumers.

Grids also need to power more places and things. By 2030, homes and businesses will have more than 30 billion digitally connected devices, twice as many as today.

To keep pace, energy systems' flexibility – their ability to respond in a timely manner to fluctuations in electricity supply and demand – must increase much faster than is currently expected.

Digitalization can improve efficiency

Digitalization could be the key to closing the gap, even as it introduces new hurdles.

Digital tools for optimizing power systems can improve efficiency, enhance affordability, and strengthen energy security.

And AI, especially, has huge potential to strengthen and streamline electricity systems.

As recent case studies make clear, models and tools that are already available can better predict the output of weather-sensitive sources of generation, assist with aligning supply and demand throughout the day, and help detect and correct infrastructure anomalies as they arise.

But to make the most of these opportunities, certain challenges need to be managed.

> It is not enough for our energy systems merely to be furnished with digital capabilities

Even when the lion's share of new demand- and supply-side technologies are digitally enabled – implying the potential to be connected to other digital systems – they tend to operate in isolation.

Often, they feature proprietary designs, lack standardized interfaces, and do not have the necessary functionality to interact dynamically with the grid.

Such fragmentation creates unnecessary inefficiencies, raises costs, stifles innovation, and makes it harder to realize the benefits of digitalization on a broader scale.

That is why it is not enough for our energy systems merely to be furnished with digital capabilities.

Interoperability between digital technologies

They also must become interoperable so that new technologies can be introduced and integrated seamlessly.

When every node on the network can communicate effectively, those managing the system can achieve desired outcomes faster.

If well implemented, greater interoperability between digital technologies on both the demand and supply sides of the energy sector can deliver real dividends.

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Modern thermostats and appliances could respond to price signals in real time, helping to reduce peak electricity consumption.

Rooftop solar systems could be aggregated to provide power to grids when needed.

With the right frameworks, these resources can work together, driving progress toward the energy goals that countries and communities have set.

Digital Energy Grid

Unless we do more to ensure interoperability, we risk a future of squandered potential, missed opportunities, stranded investments, and rising energy-security threats.

Cyberattacks on energy utilities have already more than tripled in frequency over the past four years, and now AI is making the attacks more sophisticated. Yet we know that interoperable systems built on common standards can be more resilient to such threats.

Cyberattacks on energy utilities have already more than tripled in frequency over the past four years - Blackout in Spain

That is why we are calling for governments and industry to collaborate and work toward strong, secure digitalized energy systems. More than ever, we need a shared vision and long-term planning.

Recent proposals for a Digital Energy Grid aim to create a unified digital backbone for the energy ecosystem by introducing universal identity, machine readability, and verifiability.

Since these features would enable transparent, reliable, and interoperable energy transactions, they should be taken up in earnest.

Building on these ideas, India is already taking a calibrated step forward with the launch of the India Energy Stack.

The IES aims to build a digital public infrastructure that enables identification and value exchange across a multitude of actors and assets through uniform specifications and standards.

Energy systems will continue to be transformed one way or another. We must act now to ensure that the systems that emerge reflect thoughtful design choices.

That means fostering global cooperation and creating shared forms of infrastructure that will work for everyone.

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