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# What if cities adjusted the energy mix in real time?

# **Dynamic Power**



Citywide autonomous systems adjust energy generation and transmission in real time, optimising usage and extending asset life.



#### UNCERTAINTIES

Systems, Technology

## **MEGATREND** (Most significant)

Energy Boundaries

#### TRENDS

Cross-Sectoral Partnerships Food–Water–Energy Nexus Government Agility Air Pollution Transforming Energy

#### TECHNOLOGIES

Artificial Intelligence Internet of Things (IoT) Real-Time Analytics

#### SECTORS IMPACTED

Communication Technologies & Systems Cyber & Information Security Energy, Oil & Gas, & Renewables Government Services Health & Healthcare Infrastructure & Construction Utilities

#### **KEYWORDS**

Energy Optimisation Greenhouse Gas Emissions Renewables Smart Grids Urbanisation



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75% of global energy consumption and

70% of global greenhouse gas emissions, values which are predicted to increase

# WHY IT MATTERS TODAY

Cities consume a lot of energy. Globally, they are responsible for approximately 75% of global energy consumption and 70% of global greenhouse gas emissions, values which are predicted to increase.<sup>1033</sup> Urbanisation accounts for around 10% of the increase in global emissions since 2015.<sup>1034</sup> Cities' need for diverse energy sources and smart grids will increase, and with renewables, they can reduce supply risks by up to 30%.<sup>1035</sup>

Population growth, and demand for energy, in cities is expected to increase. Globally, urban populations account for more than half of the 8 billion people on Earth today, a share that is increasing.<sup>1036</sup> The global urban population is expected to increase from approximately 56% today to around 70% by 2050.<sup>1037</sup> Cities already generate over 80% of global gross domestic product and are expected to continue to do so.<sup>1038</sup> Key to growth in artificial intelligence (AI), data centres will consume four (1,700 TWh) to nine (3,500 TWh) times more energy in 2050 compared with 2023 levels.<sup>1039</sup>

Renewable energy assets are a significant capital investment, and effectively managing them is critical for energy security. The costs of both solar photovoltaics (PV) and wind power technologies continue to decrease. Between 2010 and 2023, solar PV costs dropped 56% below fossil fuel and nuclear alternatives, reaching 4 cents per kWh,<sup>1040</sup> while wind turbine costs fell by an average of 53%.<sup>1041</sup> Driven by emission reduction targets, energy security, and strategic economic goals, demand will continue to increase. Subject to supply chain interruptions and financing, investment in energy are significant crossing \$3 trillion in 2024, two-thirds of which is allocated to clean energy.<sup>1042</sup>



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Between 2010 and 2023, solar PV costs dropped



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below fossil fuel and, nuclear alterantives, eaching 4 cents per KWh

The Global 50 (2025)

# THE OPPORTUNITY

Citywide, fully integrated and autonomous systems optimise the energy mix in real time. The focus is no longer solely on what the energy mix is but on how it adjusts in real time to optimise energy generation and transmission. While advanced machine intelligence contributes to future energy demand, it also offers solutions for energy management and optimisation. With the Improved grid efficiency; Internet of Things (IoT) and advanced computing these systems enhanced energy storage; reduce costs, enhance efficiency and extend asset life. extended life of energy assets. Beyond smart grids that optimise energy transmission, these systems adjust the energy mix to weather patterns, minimising conversion losses and reducing maintenance downtime. With

> quantum computing, it becomes possible to direct surplus renewable energy to storage or high-demand areas, ensuring a

sustainable, reliable and cost-effective energy supply.

BENEFITS

### RISKS

Cybersecurity vulnerabilities; increased system complexity; high initial costs; technological complexity.

With quantum computing, it becomes possible to direct surplus renewable energy to storage or high-demand areas, ensuring a sustainable, reliable, and cost-effective energy supply.