



ENERGY TRANSITION

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Powering Urban Energy Transition Through Innovation and Industry Expertise



The energy transition must be handled in a phased approach that guarantees grid stability, resilience, and efficiency.
Image: Emel Green Power

As cities face mounting pressure to fast-track their energy transition, the quest for novel solutions has never been more critical. What can governments do to steer innovation and industry participation to create an enabling environment for sustainable and resilient urban energy landscapes?

Imperative for Novel Energy Solutions in Cities

Cities are dynamic hubs where diverse sectors and systems converge and interconnect. This interconnectedness, combined with the increasing electrification of these sectors and the rapidly growing energy demands of urban populations, makes cities major electricity consumers.

To meet this demand, cities must accelerate their energy transition by adopting innovative solutions. Traditional energy systems, while prevalent in most major global cities, often fall short in managing contemporary urban environments' flexibility and high-density requirements. There is a need to adopt novel solutions that facilitate the *Decarbonisation* of electricity through *Decentralisation* and *Digitalisation*. Such solutions include photovoltaics, urban wind turbines, energy-efficient buildings, clean mobility technologies, and sophisticated digital platforms for real-time energy management.

But Innovating and Implementing Novel Solutions Isn't Easy

The widespread adoption of novel solutions in urban areas remains elusive. Two primary challenges toward accelerated energy transition in cities are the significant innovation gaps across sectors and the lack of synchronisation across industries toward cost-effective deployment of such solutions.

Innovation Challenges

Growth trajectories in innovation within sectors such as power and transport have seen stronger progress as compared to building and industrial sectors. This is despite the latter having significantly higher carbon mitigation costs (International Renewable Energy Agency, 2017). Furthermore, corporate innovation tends to occur in silos, slowing progress and hindering the adoption of innovations from adjacent sectors (World Economic Forum, 2024). Compounding these issues is the cautious financing environment for innovative small companies, as investors avoid riskier bets on new technologies amid rising interest rates.



Carbon dioxide emissions from fossil fuels are at an all-time high.
Image: Jose A. Bernat Bacete / Getty Images



Daqo's polysilicon plant in Shihezi, Xinjiang.
Image: Daqo New Energy



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Implementation Challenges

There are three big implementation challenges. The first is infrastructure installation, which is hampered by limited private sector investment. Energy storage projects often struggle without contracted revenue or long-term agreements, deterring investors.

The second is renewable energy deployment, specifically the installation of more renewable capacity, which is hindered by slow and complex permitting procedures, grid congestion, and inadequate policy support. This has resulted in long grid queues in some European countries.

The final barrier is the lack of resilient and reliable supply chains, which delays project deliveries and drives up costs. Scaling novel solutions like solar panels, wind turbines, energy storage systems,

and other clean energy technologies requires cost-competitive access to an unprecedented volume of raw materials such as cobalt, nickel, graphite, copper, and lithium. In 2023, the IEA projected that demand for these critical minerals would increase four-fold by 2040. However, access to these high volumes remain restricted due to limited mining capacity and processing facilities. Furthermore, supply chain constraints exist for critical materials for solar panel production as production is predominantly centred in China.

Creating an Enabling Environment Through Innovation and Industry Collaboration

A strategic and coordinated effort from governments and the industry is needed to create an enabling environment for the development and scaling of novel solutions. Collaboration can take place in three ways:

#1 – Strengthening Public-Private Collaboration

Public-private sector collaboration is a powerful mechanism for driving innovation and deploying market-relevant solutions at scale. Such collaborations open doors to cutting-edge technologies, facilitating cost-effective and distinguished innovations. Features of such collaborations include:

- Accelerated innovation with the right price signals due to improved information flow between industry and innovators (e.g., national labs and universities)
- Alignment of public and private sector innovation efforts with market requirements spotlighting projects with high commercial viability
- Market access for public sector innovators
- Promotion of commercial mindsets necessary to scale innovations rapidly

Public-private collaboration is also pivotal in developing the infrastructure necessary for energy transition. As urban projects grow more complex and costly, relying solely on public finances creates investment gaps. Involving the private sector in infrastructure



Toyota tests their new EV pickup truck, which is slated to begin manufacturing in Thailand from 2025.
Image: Reuters / Arton Pookasook

development fosters the adoption of innovative models throughout the project lifecycle, ensuring efficient and timely completion of energy-related infrastructure projects.

London is one city where public-private collaboration has proven effective. In view of the rising number of EVs on its roads, the city came up with the 2030 EV Infrastructure Strategy to eliminate barriers to EV infrastructure implementation and to actively engage the private sector to deploy charging points across the city (Mayor of London, 2021). As a result, London successfully increased its rapid charge points from just over 300 in 2020 to 1,140 in mid-2024.

Asia, too, has made waves for its public-private efforts. At COP29 in Baku, the Monetary Authority of Singapore (MAS) and BlackRock signed a Statement of Intent to unleash regional decarbonisation investment opportunities through a blended finance debt initiative. This Industrial Transformation infrastructure debt programme was first launched by MAS in COP28, under the FAST-P initiative to mobilise up to US\$5 billion from public, private, and philanthropic partners to finance transition opportunities in Southeast Asia.

Likewise, Thailand's "30@30 Policy", which aims to make EVs 30% of domestic automotive production by 2030, has resulted in a new public-

private partnership to introduce standardised swappable batteries in small electric cars. This partnership increases efficiency and supports domestic EV manufacturers and operators of EV battery charging/swapping stations nationwide.

Another advantage of partnering with the private sector is the potential for innovative market designs and long-term contracts that provide stability and assurance to investors. In the UK, such contracts have successfully facilitated the development of large-scale, long-duration storage solutions.

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#2 – Embracing the Industrial Cluster Model

The complex value chains required for energy transition cannot be developed solely through the efforts of energy companies. Private players from diverse sectors—such as mobility, mining, and manufacturing—must join forces to deliver an equitable, competitive, and clean energy transition.

One effective approach is the industrial cluster model, in which private sector participants adopt a unified and systematic approach to optimise innovation of solutions and facilitate deployment. Companies within these hubs share technology, investments, and risks in large infrastructure projects.

One example of this is Europe's largest integrated chemical cluster at the Port of Antwerp-Bruges. The port hosts cooperative infrastructure for cross-border carbon transport and storage, and is focused on expanding the low-carbon hydrogen value chain (World Economic Forum, 2024).

Beyond the industrial clusters, industry players are also forging partnerships with cities to support energy transition in cities. One such initiative is the London Business Climate Leaders initiative, where 11 leading businesses are working closely with representatives from the city to focus on thematic areas such as sustainable buildings, renewable energy, and circular economy and waste (CDP City-Business Climate Alliances, 2019).



Port of Antwerp-Bruges.
Image: Port of Antwerp-Bruges



Located in the Groningen region of the Netherlands, HyNetherlands is one of Europe's largest hydrogen plant projects.
Image: Engie Group



Breakthrough Energy Fellows – Southeast Asia is a three-year joint funding commitment announced in 2024.
Image: Breakthrough Energy

More can be done towards innovating and deploying novel solutions for cities to meet their energy transition imperatives. Collaboration between the government and industry counterparts will be essential.



#3 – Creating an Ecosystem for Innovation

By combining existing technical knowhow and technologies from different sectors and companies with various policy instruments such as incentives and smart policies, governments can help to catalyse innovation.

Netherlands is a good illustration of this with its success in building a strong network of internationally renowned centres of excellence, including the Top Consortium for Knowledge and Innovation Offshore Wind (TKI Wind op Zee), the Energy Research Center of the Netherlands (ECN), and Delft University of Technology. Steered by the Dutch 2019 Climate Agreement, favourable governmental policies and incentives have helped the Dutch innovation ecosystem to attract both domestic and foreign companies to collaborate in these research institutes.

As a result, the Netherlands has emerged as Europe's second-largest producer of hydrogen and Europe's first 'hydrogen hub', with a capacity of 9 million m³. It also has one

of the highest densities of solar panels in the world and a significant presence in offshore wind power.

Beyond the power sector, it is crucial for innovation efforts to also encompass end-use sectors, such as buildings and industry. Additionally, there should be a focus on developing infrastructure and business models in tandem to support the deployment of these novel solutions.

One effective strategy is to nurture an ecosystem that supports early-stage start-ups innovating in sectors like mining and minerals. Connecting these start-ups with established companies not only amplifies the impact of innovation but also facilitates the rapid scaling of new technologies.

In Singapore, this is seen in the partnership involving Breakthrough Energy, a climate organisation founded by Bill Gates, Enterprise Singapore, and Temasek to nurture deep-tech climate start-ups in the renewable energy and carbon footprint space in Southeast Asia.

A Concerted Effort is Required

The irreversible energy transition is underway in cities globally. While governments are already driving this shift, more can be done towards innovating and deploying novel solutions for cities to meet their energy transition imperatives. Collaboration between the government and industry counterparts will be essential for all stakeholders to effectively leverage innovation and private expertise for truly energy-efficient urban spaces.