

SOCIAL INFRASTRUCTURE

Empowering urban communities

Our cities are increasingly challenged to accommodate rapid urbanisation and its impacts on land, resource use, city design and infrastructure quality. District energy systems are helping to solve these modern infrastructure problems, writes InstarAGF's **Gregory Smith**

More than ever before, populations are concentrating in geographically smaller areas. The world is increasingly interconnected and inherently more complex. Continued and rapid urbanisation demands that our cities become more resilient if they are to grow and thrive: more adaptive to disruptions of all kinds, more environmentally sustainable and more economically diverse. This urban resilience is fundamentally about infrastructure, and our ability to turn challenges into innovation. In our fast-changing world, as much as 75 percent of the urban infrastructure we will require globally by 2050 has yet to be built, and in some cases, even imagined.

In both developed and developing economies, it is increasingly clear that the most successful cities of the future will be those that take a holistic approach to building, financing and managing their economic and social infrastructure. And it is imperative that cities rise to this considerable challenge.

Cities generate more than 80 percent of global gross domestic product, meaning that urbanisation can contribute to sustainable growth if managed well, including allowing new ideas to emerge. Urbanisation is also closely correlated with energy consumption: according to the United Nations, cities use 75 percent of global primary energy and are responsible for 70 percent of carbon dioxide emissions, making them vital to mitigating climate change. The traditional demarcation between energy, transportation and other forms of infrastructure – including social infrastructure – has been shifting for years as a result of evolving technologies and changing patterns of infrastructure use. This increased

connectivity profoundly influences the quality, resilience and potential of our cities, and is emerging as a catalyst for more integrated infrastructure planning and investment decisions.

Cities are made up of a diverse and interdependent mix of institutions, assets and systems. Modern infrastructure solutions must be cost effective and extend across multiple urban ecosystems. District energy is an example of such “super-infrastructure”: it is economic infrastructure that meets energy needs and spurs new opportunities for prosperity while supporting other forms of critical community development and social infrastructure. It serves an immediate purpose yet is also a means to an end, enabling new approaches that can improve citizens' well-being and ultimately help a city to flourish.

CREATING A CLOSER CONNECTION BETWEEN ENERGY AND COMMUNITY

While district energy is not a new concept, dating back to ancient Rome, it is being embraced in new and creative ways in the 21st century. Our 100-year-old model of large-scale, centralised, remote and costly electricity production and distribution is slowly collapsing as municipalities and vital social institutions turn in greater numbers to microgrids, distributed energy systems and district energy. These institutions, which can include universities, schools and hospitals (together with municipalities, the “MUSH” sector), can use district energy to take control of energy costs, improve reliability and meet environmental goals. An attractive local solution, district energy systems grow incrementally over time as a neighborhood develops, avoiding the need for large

capital investments while helping communities to manage the changing nature of risk in energy generation and delivery.

Such community energy systems have a massive economic and social impact. By offering the prospect of stable, long-term energy costs, district energy systems help to attract new businesses and development to a given area. Sharing infrastructure provides numerous benefits to the connected buildings and institutions as well as the communities where they are located. They enable the penetration of renewable energy technologies, helping to green the environment, and can even use municipal waste products or wood waste.



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They also lessen demand on the overall grid and, importantly, retain capital, or energy dollars, and long-term wealth within the community.

Further, a study by the Canadian Urban Institute suggests that investing in community energy systems generates high-quality jobs: every \$1 million invested in building energy efficiency retrofits creates more than nine person-years of permanent employment.

In Toronto, the Regent Park Revitalization Plan demonstrates how energy modernisation can promote social inclusiveness and community empowerment. This 20-year endeavour, a large multi-phase redevelopment plan that began in 2005, is transforming an urban community with ageing infrastructure into a mixed-income, mixed-use neighbourhood powered by a district energy system that will eventually be connected to all buildings in the redevelopment. In addition to lowering the neighbourhood's greenhouse gas emissions, the

project is expected to cut energy costs by 15 percent – savings that are effectively reinvested into supporting more affordable housing. This revitalisation in Canada's oldest and largest social housing project has already created more than 465 jobs for local residents and won numerous awards for innovative neighbourhood renewal that extends well beyond energy.

DESIGNING AND FINANCING CITIES THAT WORK

Building cities that work requires intensive policy coordination and smart, long-term investment choices that maximise returns to the community.

As one of the lowest-cost and highest-efficiency sources of energy, district energy systems meet these criteria and in some cities are actually mandated. In Denmark, about 60 percent of buildings are supplied by district energy: Copenhagen is expected to become the world's first carbon-neutral city by 2025. Conversely, while district energy is used in many major North American cities and by institutions such as university campuses, hospitals and military bases, its potential remains largely unexplored primarily due to the unregulated market environment in which it tends to operate. In Canada, communities make up about 60 percent of the country's total greenhouse gas emissions. In the US, buildings consume around 40 percent of all energy and 70 percent of grid electricity. Reducing the loads of our urban centres is critical for carbon reduction. It will contribute to economic productivity and overall competitiveness as businesses reduce costs and residential users save money.

A number of North American cities increasingly recognise the role of district energy in creating new economic capacity and supporting the innovation industries of tomorrow. In Canada, the federal government operates one of the continent's largest public sector district energy systems in Ottawa with six central heating and cooling plants and five distribution networks servicing about 80 federal buildings and three



Urban centres: increasingly interconnected



Smith: district energy can help revitalise social housing projects

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privately owned buildings. With the assets reaching the end of their useful lives and using outdated technologies, the government is now exploring how to partner with the private sector to finance the modernisation and expansion of this critical district energy system while reducing energy consumption and greenhouse gas emissions. This Energy Services Acquisition Program will help the government to meet its goal of reducing greenhouse gas emissions in its own operations by 40 percent by 2030.

Mandating environmental and resilience goals drives greater adoption of district energy and reduces the potential for interruption or loss of energy supply, which could have serious repercussions for critical services and infrastructure such as hospitals, water pumping stations and transit providers, among others. Accelerating the application of district energy, however, depends on integration with overall urban and social infrastructure planning and a new approach to how community energy projects are financed.

This shift is starting to occur as municipalities and MUSH institutions are increasingly tasked to do more with less government funding. Municipalities typically bear most of the responsibility for public infrastructure assets but collect less than 10 percent of every tax dollar, leaving them bereft of the resources to modernise and build critical infrastructure. At many higher educational institutions, for example, heating and cooling systems along with lighting represent a major operating cost: with millions of dollars in deferred maintenance in many cases, these universities and colleges need long-term solutions that do not rely on government funding or tuition increases.

For such institutions, partnering with the private sector through long-term, fixed-price concessions for the financing and operation of non-core assets such as energy systems creates a new source of revenue and enables re-investment in the institution's core purpose, whether that is

providing education, healthcare or other community services to a growing population. By renewing existing assets, these vital social institutions realise sustainability improvements, elevate stakeholder service levels, reduce future infrastructure expansion costs, increase reliability and benefit from advanced technologies to modernise and strengthen systems that in some cases have been neglected for decades.

INFRASTRUCTURE AT A TIPPING POINT

Taking a more integrated approach to resource and land use, energy and transportation planning, and fostering social inclusiveness can create a more complete understanding of community infrastructure needs, leading to better resilience. With increasing pressure on our urban infrastructure and rising population densities, existing financing and development models are moving closer to a tipping point and new solutions are required.

To draw a lesson from Socrates, the secret of change is not to focus all of your energy on fighting the old, but on building the new.

Overall, access to energy is fundamental to improving quality of life and is a key imperative for economic development and the liveability of our cities. District energy in particular can be a significant component of stronger social infrastructure and institutions, empowering cities to reach their full economic potential. Broadening the application of district energy requires innovation, investment and perhaps most importantly, collaboration. How well investors, the private sector and governments work together – and how aligned they are with citizens' goals and interests – will determine how effectively we can adapt and transform to build a better city of the future. ■

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