



## **JOINT NEWS RELEASE**

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### **Singapore and Denmark pioneer sustainable cooling for megacities, supported by US\$9.4 million from Grundfos Foundation**

As climate change accelerates, the world is experiencing more frequent extreme weather events and rising temperatures.

This is driving up the demand for cooling to make cities liveable, especially in fast-growing megacities with populations exceeding 10 million.

While cooling is essential, it also creates a challenge, as conventional cooling systems consume vast amounts of energy and contribute to carbon emissions, creating a vicious cycle that worsens global warming.

To break this cycle, **Nanyang Technological University, Singapore (NTU Singapore), Aalborg University and Aarhus University** in Denmark have embarked on a new five-year research initiative, supported by US\$9.4 million (DKK 60 million or S\$12 million) in funding from the **Grundfos Foundation**.

This is the foundation's largest individual research grant to date and the first to include a university outside Denmark.

Titled *Sustainable Water-based cooling in Megacities (SWiM)*, the three universities will develop intelligent and sustainable cooling systems that can reduce energy consumption in large cities by up to 30 per cent, lowering both costs and carbon emissions.

### **Building on Denmark and Singapore's expertise**

Denmark is a world leader in district heating, where hot water generated from a central plant is distributed through pipelines to homes and industries.

Notable projects include the Avedøre Power Station near Copenhagen, one of the world's most efficient combined heat and power plants, and Amager Bakke, a waste-to-energy facility that supplies heat to the city while also serving as a public ski slope.

Singapore has adapted the concept for tropical conditions by developing district cooling systems, where chilled water from central plants is distributed to buildings through underground pipes.

The Marina Bay financial district is home to the world's largest underground district cooling network, which serves major developments such as Marina Bay Sands and Asia Square, cutting annual carbon emissions by nearly 20,000 tonnes – the equivalent of removing 17,000 cars from the road.

District cooling is also being adapted for residential estates, with Tengah estate being the country's first public housing town to adopt the system, serving up to 22,000 homes.

While these systems have proven effective, they still have challenges to overcome, as they typically cover only limited areas such as a business district or housing estate.

The SWiM project aims to address these technical challenges by developing new tools, algorithms and demonstration platforms to make sustainable cooling practical at a city-wide scale.

**Mr Kim Nøhr Skibsted, CEO of Grundfos Foundation**, said: "Cooling is on its way to becoming the single largest user of electricity, contributing significantly to climate change. Due to rapid demographic development in tropical and subtropical megacities, particularly among the growing middle-income population, the need for innovative cooling systems that enhance liveability while minimising environmental impact is further increased."

**Professor Madhavi Srinivasan, Executive Director of the Energy Research Institute @ NTU Singapore**, said: "NTU is pleased to receive funding support from the Grundfos Foundation, marking a significant milestone in international collaboration for sustainable urban innovation. This joint effort brings together NTU's research strengths in sustainability, engineering and artificial intelligence, with the expertise of Denmark's universities and Grundfos, to develop advanced sustainable urban cooling solutions. This partnership is a testament to our shared commitment to support urban sustainability goals through science, technology, and international cooperation."

**Professor Rafael Wisniewski, Department of Electronic Systems, Aalborg University, who is coordinating the SWiM project**, said: "It is extremely important that the systems we develop are autonomous and can be installed and operated without requiring a top-level expert. This large-scale initiative is a starting point for something bigger, paving the way for concrete solutions that will apply theory and methods in practice over the next five years."

A key element is the intelligent control of the cooling systems, both during deployment and operation. The systems must be able to operate despite human installation errors, cyber-attacks, equipment failures, and a constantly changing environment. This

aspect is ensured by the Department of Electrical and Computer Engineering at Aarhus University.

**Professor Peter Gorm Larsen, who leads the initiative at Aarhus University, explains:** “Autonomy will be enhanced by the use of digital twins supporting Building Information Models and include monitors that will be able to support transition between different states controlling the cooling in an optimal manner.”

### **Developing innovations for real-world impact**

Through SWiM, NTU Singapore, Aalborg University and Aarhus University will pioneer new models and control systems for sustainable cooling.

The project aims to create technologies that not only optimise energy consumption in the lab but also function reliably in real-world settings, even under conditions such as installation errors, cyberattacks, equipment failures, or shifting urban environments.

SWiM will combine interdisciplinary expertise in several tracks, for instance: developing urban planning tools to project and manage future cooling demand in megacities; using artificial intelligence to monitor efficiency, detecting faults and guiding predictive maintenance; and designing smart algorithms that balance cooling needs with energy efficiency and grid stability.

By addressing both new districts and the retrofit of district cooling for older buildings, the solutions will be adaptable to suit different urban scenarios.

To prove these innovations will work at scale, the project will build physical testbeds in Singapore at the room, floor and building level, complemented by digital twins – virtual recreations of physical spaces that mirror real infrastructure – to simulate large-scale deployments.

Close collaboration with industry partners, including Grundfos, will ensure that the innovations developed are practical, scalable and readily deployable, supporting cities in reducing cooling energy use and carbon emissions.

These efforts are aligned with the national climate goals of both countries, with Singapore targeting net-zero emissions by 2050 and Denmark committing to climate neutrality by 2045.

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### ***About Grundfos Foundation***

The Grundfos Foundation (Poul Due Jensen Foundation) is a Danish commercial foundation. Grundfos' founder, Poul Due Jensen, created the Foundation on 19 May 1975. The Foundation supports philanthropic purposes within three strategic areas: [Water & Development](#), [Research & Innovation](#) and [Inclusion & Community Engagement](#).

With 88% of the shares, the Foundation is the majority shareholder in [Grundfos](#), a world leader in pumps, water solutions and services.

[Find out more about the Grundfos Foundation.](#)

### ***About Nanyang Technological University, Singapore***

A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 35,000 undergraduate and postgraduate students in the Business, Computing & Data Science, Engineering, Humanities, Arts, & Social Sciences, Medicine, Science, and Graduate colleges.

NTU is also home to world-renowned autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies and Singapore Centre for Environmental Life Sciences Engineering – and various leading research centres such as the Earth Observatory of Singapore, Nanyang Environment & Water Research Institute and Energy Research Institute @ NTU (ERI@N).

Under the NTU Smart Campus vision, the University harnesses the power of digital technology and tech-enabled solutions to support better learning and living experiences, the discovery of new knowledge, and the sustainability of resources. Ranked amongst the world's top universities, the University's main campus is also frequently listed among the world's most beautiful. Known for its sustainability, NTU has achieved 100% Green Mark Platinum certification for all its eligible building

projects. Apart from its main campus, NTU also has a medical campus in Novena, Singapore's healthcare district.

For more information, visit [www.ntu.edu.sg](http://www.ntu.edu.sg)

### ***About Aalborg University***

Aalborg University (AAU) is an international public university with campuses in Aalborg, Esbjerg, and Copenhagen, Denmark. More than 18,000 students are enrolled at AAU, the vast majority in Aalborg, and over 7 percent are international students. The university offers bachelor's, master's, and PhD degrees in a wide range of subjects, including humanities, social sciences, information technology, design, engineering, natural sciences, and medicine.

AAU's research and study programmes are multidisciplinary and built on close collaboration with business and industry. This approach is further strengthened by AAU's renowned teaching model, Problem-Based Learning (PBL), which is centred on real-world problems in all their complexity. Through interdisciplinarity, industry partnerships, and world-class research, AAU contributes new insights, solutions to societal challenges, and knowledge that helps transform the world.

In 2024, AAU advanced from a position in the global Top 10 to a place in the global Top 5 for sustainability. Additionally, in the internationally recognized Times Higher Education Impact Rankings, AAU was ranked fourth among nearly 1,600 universities worldwide. This ranking assesses universities' contributions to achieving the UN Sustainable Development Goals.

For more information, visit [www.en.aau.dk](http://www.en.aau.dk)

### **About Aarhus University**

Aarhus University (AU) was founded in 1928 and is today one of Northern Europe's leading universities with approximately 37,000 students and around 8,700 employees. The university has an international focus and works closely with the business community and public institutions to generate knowledge, educate future graduates and find solutions to society's greatest challenges.

AU has its main campus in Aarhus, but present throughout the country with campuses in Herning, Foulum, Silkeborg, Roskilde, Flakkebjerg, Emdrup (Copenhagen) and research and field stations in both Denmark and Greenland.

AU Engineering has over 5,000 engineering students and more than 1,000 researchers working on everything from green transition, digitalisation, health technology, drones and robots.

[Read more about AU](#)