Global quadrupling of cooling appliances to 14 billion by 2050

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Soaring global need for cooling by 2050 could see world energy consumption for cooling increase five times as the number of cooling appliances quadruples to 14 billion—according to a new report by the University of Birmingham, UK.

This new report sets out to provide, for the first time, an indication of the scale of the energy implications of 'Cooling for All'.

Effective cooling is essential to preserve food and medicine. It underpins industry and economic growth, is key to sustainable urbanisation as well as providing a ladder out of rural poverty. With significant areas of the world projected to experience temperature rises that place them beyond those which humans can survive, cooling will increasingly make much of the world bearable—or even safe—to live in. With populations increasing, expanding urbanisation and climate change impacts leading to more frequent heatwaves and temperature rises, the demand for more cooling will increase in the decades ahead.

There are currently 3.6 billion cooling appliances around the world today and the University of Birmingham report authors forecast that the 14 billion devices needed by 2050 will consume five times the amount of energy currently predicted for cooling usage.

The report—A Cool World—Defining the Energy Conundrum of 'Cooling for All' - states that, by 2050, if we are to meet our Paris Climate targets to hold temperature increases to 2'C, total energy

consumption for cooling must be limited to 6,300 TWh. Without action beyond current technology capabilities and efficiency gains, cooling could account for 19,600 TWh of energy consumption per year, against a current annual usage of 3,600 TWh. Even with new technologies coming on board, the annual energy requirement will be 15,500 TWh.

The report states that, along with aiming to reduce overall demand, if we are to meet our climate goals a whole new system approach to cooling is needed, recognising available free and waste cold and heat resources and incorporating new technologies, data connectivity, thermal energy storage to meet demand in the most efficient way.

Professor Toby Peters, 'A Cool World' report author from the University of Birmingham's Energy Institute, said: "Current projections do not consider a 'Cooling for All' scenario and it will be impossible to meet the UN's sustainable development goals as well as the Paris climate change targets. If we are to meet either of these, relying on technology efficiency and greening electricity won't be sufficient.

"The challenge now is how to start with a system-led approach, better harnessing a portfolio of energy resources and adopting novel technologies. In order to achieve this, we need to start by asking ourselves a new question—no longer 'how much electricity do we need to generate?' but rather 'what is the service we require, and how can we provide it in the least damaging way."

The report concludes that:

- Under the current scenario, over the next 30 years 19 cooling appliances will be sold every second; but this will not deliver 'Cooling for All'.
- By 2050, we would require a total of 14 billion cooling appliances globally to meet demand—an additional 4.5 billion

appliances compared to the baseline forecast of 9.5bn- or four times as many pieces of cooling equipment than are in use today.
- to "green" the volume of electricity required would consume more than 80% of the International Energy Agency's projected total renewables capacity for 2050 and more than 100% in the event we do not achieve accelerated technology progress.

According to the report, if we are to take cooling demand seriously, the key stages to move towards a solution for cooling demand are:

- Reducing the energy required for cooling: getting industry to adopt high efficiency cooling technologies and using maintenance to deliver optimum performance.
- Reducing the need for cooling through better building design
- Systems level thinking across built environment and transport
- Harnessing waste resources: 'wrong time' renewables; waste cold; and waste heat.
- Considering the strategies and skills required for installing appliances and maintaining them in order to maximise efficiency and reduce energy demand
- Creating a model for delivery of affordable cooling to those in rural and urban communities based on the energy needs of local requirements, rather than imposing a 'one size fits all' approach.

The report authors call for the creation of a series of real world 'Living Labs'. These labs will engage at community level, testing and demonstrating not only new technologies, but also the socio, business, governance, policy and funding models. This will ensure that new thinking on systems, new innovations and business models can be properly designed and tested.

Given the urgency and need to combine engineering and social sciences for an integrated approach that includes the behaviour of individuals,

technical solutions, and the business models to make those solutions viable, they also urge the creation of an international centre for excellence: its aim to deliver global collaboration on cooling—enhance awareness and understanding of the challenge of cooling; to build a roadmap and deliver the innovation pipeline; provide skills and education, and lead on trialling new technologies at scale.

The report builds on the University's research partnerships in India and Birmingham recently signed an agreement with the State Government of Haryana to advance the use of 'clean cold' technology in India and help meet rising demand for cooling sustainably.

This landmark agreement followed the world's first-ever Congress on Clean Cold held at the University of Birmingham last month and supported by the University's India Institute, which also sponsored the first Birmingham-Haryana clean cold workshop last year.

Provided by University of Birmingham