Automated solar shading, a key solution to reach 2050's decarbonisation goals for the European building stock.

Climate change, causing higher temperatures, longer and more intense heatwaves, will significantly increase energy demand and associated GHG emissions for space cooling in buildings for the next decades. The International Energy Agency 2018 report "The Future of Cooling" warned policymakers of air-conditioners (ACs) as the fastest growing energy users in buildings in Europe and worldwide. The IEA is very clear about it, AC is becoming one of the top drivers of global electricity demand. The need for more sustainable, passive and low-energy cooling solutions is eminent.

A recent Guidehouse study[1] in comparing AC to Solar Shading as solutions to reduce overheating in buildings shows that automated solar shading can significantly reduce the energy use of buildings, up to 60 % by 2050. Solar shading can also drastically mitigate GHG emissions, up to 100Mt accumulated savings can be achieved between now and 2050, while at the same time adapting the European building stock to climate change effects. Finally, a shift from AC to more solar shading would come at a lower total cost whereby a massive 14,6 billion €/year could be saved in investment and energy consumption for space cooling by 2050.

ES-SO RECOMMENDATIONS

The Guidehouse study findings provide additional data proving that automated solar shading is an energy-efficient and cost-effective solution to the overheating problem in a changing climate. The evidence is clear that solar shading is a key solution to reach 2050's decarbonisation goals for the European building stock. As a result, ES-SO recommends that:

Priority 1

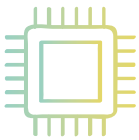
"Solar shading" becomes mandatory and is defined as a passive measure for energy efficiency in the EPBD. For new and renovated buildings **solar shading must always be applied first, by respecting the energy efficiency first principle.** Only at a second step active air conditioning could be considered, if there is still a need to tackle overheating.

Priority 2

"Solar shading" should be included in article 2, point 3 of the EPBD as a **technical building system,** similar to how cooling and heating systems are included. See our paper with eu.bac

Priority 3

As a result of priority 2, **automated solar shading will be fully recognised as a mandatory Building Automation and Control System** in article 8 of the EPBD. The control system enables the optimised operation of automated solar shading devices and will guarantee reductions in space cooling and heating demand.



[1] "Solar shading – Synergising mitigation of GHG emissions and adaptation to climate change. The potential to disrupt rising cooling demand and overheating in European buildings", Guidehouse Germany GmbH, 5 November 2021

Today, less than 50% of EU´s buildings are equipped with solar shading devices, of which a large share is non-automated. The potential contribution of solar shading to the European Green deal is huge, according to the Guidehouse research.

Next to combatting overheating with far less energy consumption than AC and mitigating GHG emissions at a lower total cost, automated solar shading also increases comfort, convenience, productivity, health and well-being, even more when automated, as reflected in the smart readiness indicator (SRI)[2] of buildings and the European standard EN15232[3].

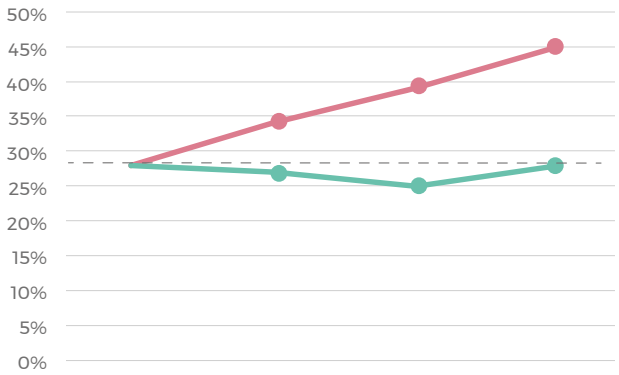
This ES-SO Position Paper highlights the most important outcomes of the Guidehouse Research and makes recommendations to the European Energy Performance of Buildings Directive (EPBD) to help reach EU's ambitious climate neutral ambitions.

GUIDEHOUSE RESEARCH SCENARIOS

The Guidehouse study analysed the potential of automated solar shading to reduce the need for space cooling in new and existing buildings by 2050 with comparing two scenarios:

1. **Business as Usual (BAU)** = No change in the implementation of shading devices between 2020 and 2050.
2. **Preferred scenario** = All buildings in BAU by 2050 that need air conditioning, will be equipped with automated solar shading.

SHARE OF BUILDINGS IN NEED OF AC



	2020	2030	2040	2050
BAU	28%	34%	39%	45%
Preferred	28%	27%	25%	28%

ADAPT TO CLIMATE CHANGE

In a business-as-usual scenario (1) , 45% of European buildings will need AC in 2050 versus only 28% in a preferred scenario (2). Automated solar shading can significantly stop/slow down the increase of additional AC in the future.

Automated solar shading devices are a key technology to make the European building stock resilient to climate change and overheating. By blocking 90% of the heat outside, automated solar shadings prevent overheating and can therefore significantly reduce the growing need of AC. Automated solar shading limits additional energy use and associated GHG emissions for space cooling.

Buildings equipped with solar shading devices are also more resilient to hotter climates in the future. Also very important is that urban heat island effects due to waste heat from air conditioners will be reduced.

Finally, automated solar shading is an essential element to reach nZEB and ZEB by optimising their energy performance.

[2] SRI see page 405 of the Final report on the technical support to the development of a smart readiness indicator for buildings

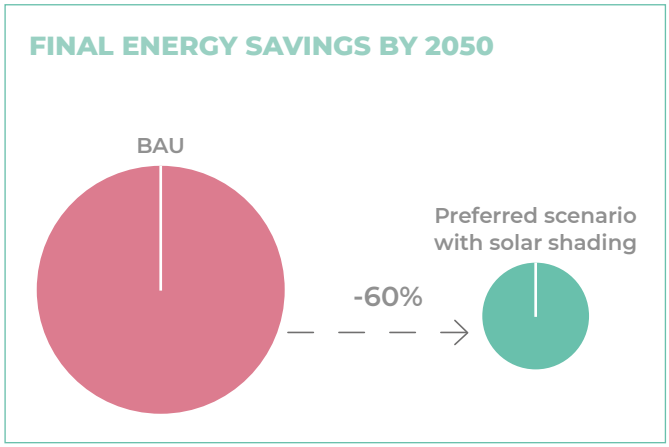
[3] EN 15232 Energy Performance of Buildings - Energy performance of buildings - Part 1: Impact of Building Automation, Controls and Building Management – Modules M10-4,5,6,7,8,9,10

MITIGATE GHG EMISSIONS

1. DECREASE COOLING ENERGY CONSUMPTION

Electricity savings for AC from automated solar shading also leads to a significant mitigation of GHG emissions.

When applying the preferred scenario (2) automated solar shading can save up to 60% of the electricity used for space cooling by 2050.



Energy efficiency is the first fuel which must be the priority to mitigate emissions and reverse rising electricity needs for space cooling to reach climate neutrality by 2050. The energy efficiency first principle must be the mandatory guiding principle for setting up minimum energy performance requirements.

Automated solar shading is an essential element of a strategy following the energy efficiency first principle, which is key for the energy transition:

Today 81 TWh/year of electricity is needed for space cooling in European buildings. This will further increase to 91 TWh/year by 2050 assuming a continuous energy efficiency improvement of air-conditioning units. However, with the preferred shading scenario (2) a reduction towards 35 TWh/year can be achieved, which is 62% final energy savings for space cooling in 2050.

Up to approximately 100 Mt of cumulated CO2-eq emissions could be avoided in the Preferred shading scenario (2) compared to the BAU scenario (1) between now and 2050.

2. DECREASE HEATING ENERGY CONSUMPTION

Automated solar shading maximises the utilization of solar gains, and as a result it also decreases the heating consumption. On the contrary, the use of a fixed solar shading (films, glazing, large overhangs...) permanently reduces solar gains, not just in summer but also in winter. This needs to be compensated by 8-20% additional energy use for space heating.[4]

3. COST EFFECTIVE

The Guidehouse study shows that automated solar shading enables climate neutrality by mid-century at significantly lower total costs.

With the preferred shading scenario (2) an **impressive 14,6 billion €/year can be saved as avoided cost in investment and energy consumption for space cooling in 2050.** Both investors and users will profit from this.

As a result, the total cost of the preferred scenario (2) is significantly lower than the business as usual one. Additional expenditure for automated shading is clearly overcompensated by avoided expenses in air-conditioners, electricity use as well as operation costs.

[4] Exact potential savings have not been calculated in this study. According to simulations for prISO 52016-3 Energy performance of buildings - Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads - Part 3: Calculation procedures regarding adaptive building envelope elements, based on EQUA IDA – ICE, a range of 8-20% additional space heating caused by fixed solar shading has been estimated.