As global warming accelerates, solar shading should be the first solution in the fight against overheating of buildings.

SCOPE

Europe is getting hotter. According to the Intergovernmental Panel on Climate Change (IPCC), between now and 2050 the average number of days per year our continent will require A/C will increase by around 30 % . This will significantly increase energy demand and associated GHG emissions for space cooling in buildings for the next decades.

A recent study of Guidehouse, a leading global provider of consulting services to the public and commercial markets, shows powerful results proving that automated solar shading can minimize energy use, largely mitigates GHG emissions and at the same time adapt the European building stock to climate change effects such as the growing issue of overheating.

Automated operation of solar shading enables optimal reduction of the need for active cooling in mid-summer and summer, being the focus of this study, and the optimal use of solar gains during wintertime to minimise the need for heating.

Today, less than 50 % of EU´s buildings are equipped with solar shading devices, whereas a very large share of those does not reach the optimum performance due to manual control.

METHODOLOGY

The Guidehouse study takes established baseline data and makes projections for future emissions from A/C across Europe, defined as “Business As Usual” (BAU), and compares it with potential emissions in a scenario where 70% of the buildings which require A/C are equipped with automated solar shading, defined as “preferred implementation”.

By calculating the difference between BAU and the alternative scenarios, two effects of solar shading uptake are considered:

- Reducing cooling loads for existing space cooling systems.
- Avoiding additional ACs, or reducing AC’s power, as they will not be needed to enable comfortable indoor climate in new and existing buildings by 2050.

Planet: a CO_2 emission reduction strategy

Dynamic solar shading can cost- effectively stop the predicted trend of rising needs for AC. It is a key technology to support GHG mitigation and adaptation targets. In the “BAU” scenario, 45% of buildings in Europe will require A/C by 2050, compared with 28% today. In the “Preferred” scenario where dynamic façade shading is implemented effectively, that number would remain static (illustration 2), resulting in a 58% decrease of greenhouse gas emissions. (illustration 1)

	2020	2030	2040	2050
BAU	23,6	17,2	9,5	7,8
Preferred	81	13,5	5,7	3,3

Illustration 1: reduction of greenhouse gas emissions with dynamic solar shading

Up to approximately 100 Mt of cumulated CO2,eq-emissions could be avoided in the “Preferred” shading scenario compared to the “BAU” scenario between now and 2050.

Reducing 100 Mt CO2,eq emissions is equivalent to reducing the annual CO2-emission of 22 million cars .

Up to 100 Mt of cumulated CO_2,eq-emissions[2] could be avoided in the “Preferred” solar shading scenario.

[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

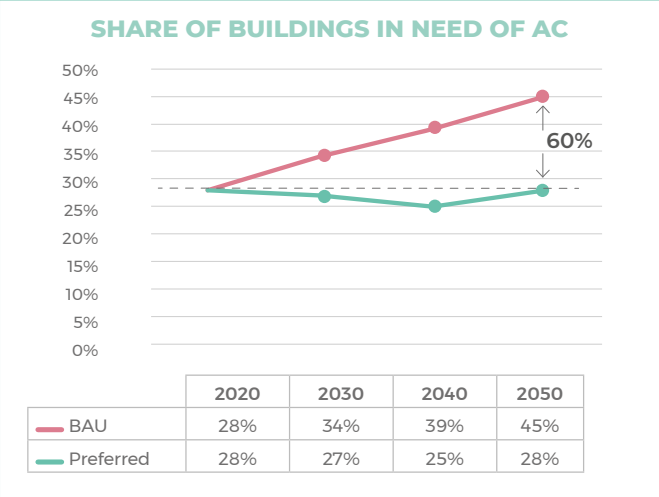
[2] CO2-factors are aligned with the 2021 EPBD Impact Assessment and are based on the Climate Target Plan 2030 from the European Commission.

Society : an energy efficiency strategy

In terms of energy consumption, an uptake of dynamic solar shading can save up to approximately 60% of electricity for space cooling by 2050 or approx. 870 TWhel of saved final energy accumulated from 2020 to 2050. A saving that will be made by the end users paying their energy bill.

Automated solar shading also optimises energy performance in winter. Compared to fixed shading or manually operated dynamic shading, automated dynamic solar shading can also maximise the utilisation of solar gains.

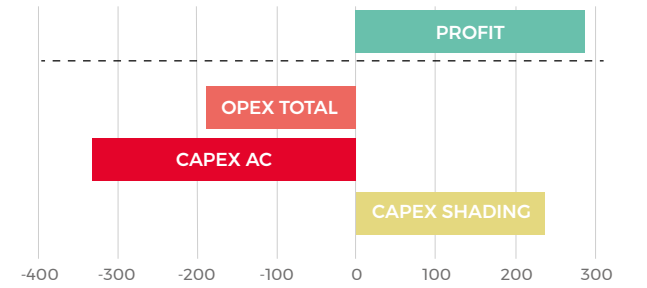
This 870 TWhel is roughly equivalent to the final energy consumption of Spain[4], with its 47 million inhabitants in 2020.



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

Illustration 2: dynamic solar shading can stop the predicted trend of rising needs of AC's

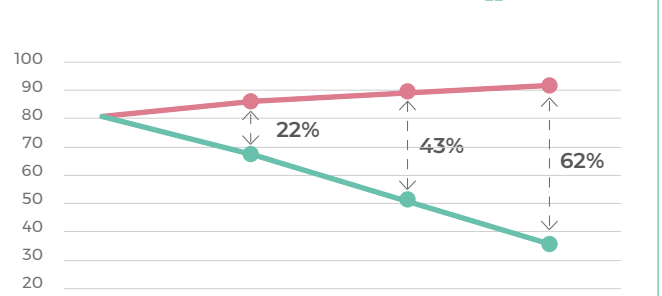
870 TWh_{el} can be saved by 2050 = Final energy consumption of Spain in 2020



ACCUMULATED BENEFIT	285
OPEX Preferred -BAU, Shade+AC	-190
CAPEX Preferred -BAU, AC	-330
CAPEX Preferred -BAU, Shading	235

AVOIDED cost ⟷ ADDED cost

Illustration 3: Investment in dynamic shading is clearly over-compensated by avoided expenses in air-conditioners and their electricity use.



	2020	2030	2040	2050
BAU	81	86	89	91
Preferred	81	67	51	35

Illustration 4: final energy savings with solar shading

People: a cost-effective strategy

The study shows further that dynamic solar shading enables to reach climate neutrality by mid-century at significantly lower total costs. The costs of the required transformation are far over-shadowed by the costs of inaction or delayed action.

What will it cost to make this change? The study explored the cost of implementing more dynamic solar shading and found that up front capital expenditure (CAPEX) is broadly cost-neutral when compared with the equivalent requirement for A/C installation. On top of this, very significant savings will be made from ongoing operational costs (OPEX).

The conclusion is that switching from more A/C to dynamic solar shading systems could reach some € 285 billion accumulated savings from 2020 till 2050, this amount can be compared with the GDP[5] of countries like Luxemburg (€64bn[5]) and Finland (€237 bn[5]) together in 2020.

€285 billion potential savings = 2020 GDP of countries like Finland plus Luxemburg

[3] https://energyfactor.exxonmobil.com/reducing-emissions/carbon-capture-and-storage/putting-houstons-carbon-capture-and-storage-potential-in-to-perspective/

[4] Source: Eurostat data for 2020

[5] Gross domestic product (GDP) is the market value of all final goods and services from a nation in a given year