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Recommendations for an ambitious EU-wide solar mandate

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This policy brief presents how an EU solar mandate can be designed to be as effective as possible, based on the suggestions made by the European Commission.

Five key recommendations

1. Start as early as possible (it takes time for the mandate to become effective)
2. Obligate Member States to create favourable conditions which enable the exploitation of the complete suitable European solar roof potential
3. Address all new buildings, buildings with roof renovation as well as parking lots once the directive enters into force.
4. Target the full suitable space of individual roofs to exploit potentials faster and more efficiently
5. Enable a ramp-up of the needed infrastructure by implementing a phased approach for the building stock

Introduction

A rapid and significant increase of renewable energies in Europe is necessary, both for decarbonising the energy system as well as for security of supply aspects. Rooftop solar installations have to be a substantial part of it, as they offer several advantages like avoiding additional land use, demand-side generation or opportunities for citizens to participate in the energy transition. Hence it should become standard that buildings are equipped with solar installations. An ambitious solar mandate is the most effective way to realize this and therefore the EU Commission's proposal to amend the Energy Performance of Buildings Directive (EPBD) with provisions for such a mandate is highly welcome. In the following we will discuss how the current suggestions should be adjusted and which additional elements should be considered.

Configuration of an EU-wide solar mandate

What to define at EU level and what to keep open for definition at MS level?

We recommend that the European solar obligation should be defined in as much detail as possible at EU level. In this context, some elements can be specified as mandatory requirements and others as guidelines. Member States should only be allowed to deviate from the mandatory elements through a stricter implementation. This is to ensure that the greatest possible impact is achieved by the obligation.

When should the obligation begin for which building categories?

The obligation should start as early as possible and include as many types of buildings and roofs as possible plus parking lots. At the same time, it should follow a phased approach differentiated by building types. The phased approach could enable an early start of the mandate while simultaneously the needed crafts persons could be trained and the necessary infrastructure for the material could be ramped up. Moreover, the goal should be to achieve a continuity of the workload and the material needs, so that peaks and insecurities for the solar industry can be avoided.

Suggested timeline in comparison to commissions proposal

Time	Commissions proposal of Article 9a of EPBD	Own suggestion
Mid 2023		Solar mandate adopted at EU level
By entry into force		Regulatory frameworks in MS enabling the exploitation of the EU solar roof potential All new buildings (public, residential and non-residential) and all buildings undergoing fundamental roof renovation. In the absence of such a definition, Member States shall use 'major renovation' which looks at the whole building envelope as an additional trigger point.[1] New parking lots
31 Dec. 2026	All new public and commercial buildings with useful floor area > 250 sqm	Existing non-residential (commercial, and public buildings) and bigger parking lots Expected remaining roof lifetime > 20 years Roof size > 500 (or 1000) sqm
31 Dec. 2027	All existing public and commercial buildings with useful floor area > 250 sqm	Existing non-residential (commercial, and public buildings) Expected remaining roof lifetime > 20 years All roof sizes (> 20 sqm usable roof space)
31 Dec. 2029	All new residential buildings	

In the EU's legal proposal amending the EPBD "Article 9a Solar energy in buildings" **buildings** are differentiated in the following **categories**: public, commercial and residential. Member states can introduce an additional category we recommend addressing commercially operated buildings where appropriate. Thereby the number of buildings that are addressed from the very beginning can be increased and commercially operated residential buildings do not have to be treated in the same way as privately owned buildings.

The second differentiation is whether a building is **newly built or part of the building stock**. For the building stock relevant criteria include the age of the roof and whether a fundamental renovation of the roof is carried out. The expected time until the roof needs to be substantially renovated should in any case exceed the payback time of the solar installation, as installation costs have become a large part of the total costs (in Germany approx. 50%[2]) and hence re-installation after a roof renovation should be avoided. For an adequate business case the payback time of a solar installation should not exceed 20 years.

[1] In accordance with the definition of 'major renovation' in Directive 2010/31/EU, renovation works shall cover the whole building envelope, and in light of the solar mandate, also (and especially) the roof. An adequate definition of fundamental renovation should be implemented. One possible definition could be at least 50% of the water-bearing layer (roof membrane) is renewed. (Based on the Berlin Solar mandate)

[2] See https://www.erneuerbare-energien.de/EE/Redaktion/DE/Downloads/bmwi_de/zsv-boschundpartner-vorbereitung-begleitung-eeg.pdf?__blob=publicationFile&v=7

We assume that the solar mandate could be adopted at EU level by mid-2023. The obligation could then start on 31 December 2024, so that Member States have 1.5 years to translate it into national law.

The **first building category** that should **be addressed** are newly constructed buildings (public, commercial, and residential) and buildings where the roof is getting substantially renovated, as it should become the standard that on every newly constructed or renovated suitable roof solar energy systems are installed. If this opportunity is missed a later installation would cause higher costs due to missed economic synergies. Commercial, public, and residential buildings should be both obligated in this first phase as in combination with a sufficient financing mechanism equipping a new roof with a solar energy system is a no-regret measure even for the building owner.

Newly constructed **parking areas** should also be covered by solar power roofs to use this sealed area for both parking and energy generation. There are several examples for mandates and thresholds for example in Germany: in Baden-Wuerttemberg with an obligation for parking areas with at least 4 side by side parking lots, in Rhineland Palatinate with at least 50 parking lots or Schleswig-Holstein with at least 100 parking lots. In France, all parking lots above 1000 sqm that are newly built or substantially renovated must be covered by solar installations or green roofs.[3] We suggest following the strictest example from Baden-Wuerttemberg and suggest an obligation for all parking areas with at least 4 side by side parking lots that are newly built or substantially renovated. It must be discussed whether this mandate for parking areas should also be introduced in the first phase (31.12.2024) to thus reinforce the impact of the solar mandate, or at a later stage to achieve a broader phasing approach to ramp up the solar infrastructure.

Addressing newly constructed buildings and roof renovations enables an incremental steady growth, but it takes time until high shares of the building stock are equipped with solar installations.[4] Therefore we recommend to also address the building stock without renovations. This is also part of the EU Commissions proposal: “by 31 December 2027, on all existing public and commercial buildings with useful floor area larger than 250 square meters”. Other examples include the Swiss canton Basel[5] and the Netherlands[6]. To implement such an obligation for the **building and parking stock** we suggest the following specifications:

1. The obligation for existing buildings should address commercial buildings, commercial properties and public buildings.
2. Existing residential buildings that are not currently undergoing roof renovation should not be obligated to install a solar system, but Member States are required to create the conditions to ensure that all building owners are incentivised to equip their roofs with a solar installation.

[3] With a typical parking lot size of 10 to 17 sqm this would correspond to between 60 and 100 parking lots.
[4] In Germany approx. 2.5% of the building stock’s roofs are renovated per year. With this rate it would take 32 years to equip 80% of the building stock.
[5] All suitable roofs must be equipped by 2035.
[6] Municipal governments can mandate solar PV installations on existing commercial roofs if their regional energy goals are not reached otherwise.

3. The mandate should only involve roofs with an expected lifetime[7] of at least 20 years, so that the roof outlasts a maximum payback time of the solar installation.
4. A staggered approach where first bigger roofs are addressed, so that progress can be achieved faster with fewer installations. For example, roofs with a size[8] above 500 or 1000 sqm (equal to app. 50 – 100 kWp resp. 100 to 200 kWp) could be mandated as of 31.12.2026 and the rest one year later.
5. To provide additional benefit from already sealed areas, existing parking spaces with more than 50 side by side parking lots should be obligated for a retrofitting with a solar installation until 31.12.2026.

Besides accompanying measures that are in general needed for a successful ramp up of solar installation (see section below) we recommend a European solar roof register to access the roof potentials of the privately owned residential building stock. Such a central register would allow property owners to make their rooftops available for third parties. There are already various examples for this approach. For example, roof areas can either be recorded centrally through geodata, or through self-reporting[9]. Ideally, there would be a mixed entry, with centrally collected data (aerial photographs) being supplemented individually (e.g., age of the roof). Thereby an overview as complete as possible combined with the impulse for building owners to check their solar potential and maybe decide to equip their roofs themselves could be achieved. Several European member states already use central geodata-based solar registers for cities, regions or country wide to identify suitable areas for solar systems. However, a Europe-wide platform can promote the PV market and thus increase effectiveness and efficiency.

What is a suitable roof?

Whether a roof is suitable for solar installation depends mainly on the size, the orientation and competing usage of a roof (like roof terrace, glass roof or green roof)From our point of view, it makes sense to formulate guidelines for this question but leave it up to the member states to decide based on country-specific circumstances and regulations. Due to the significant **differences in solar irradiation within the European Union** more roofs in southern Europe are suitable for solar installations than in northern areas. The JRC ENSPRESO dataset shows that full load hours of PV systems in the south of Europe are up to 1,500 h and hence more than twice as high as in the northern regions with 700 h. Also, within countries full load hours can differ significantly, like in Finland from 734 to 910 h.

Regarding the **size** we recommend a de-minimis regulation excluding small roofs (e.g. below 20 sqm usable space[10]) from the obligation. Roof areas with an **orientation** within a range reaching from the east via the south to the west plus flat roofs, where

[7] The determination of age or durability is characterized according to the different types of roofs.
[8] We suggest not to use the useful floor area to define thresholds for solar installation. A very rough estimation of what 250 sqm useful floor area could mean regarding solar capacity leads to a broad range of 7 to 50 kWp (lower value 5 floors plus gable roof north/south orientation; upper value 1 floor flat roof 5 sqm/kWp)
[9] The UBA proposal suggests entry of relevant data, such as dimensions and age, as well as market rate per year and square meter, by the owners.
[10] Based on the mandate in Baden-Wuerttemberg Germany

the orientation and angle of the solar installation can be chosen, typically capture sufficient solar irradiation.

It needs to be defined what size of solar installation is needed to **fulfil the obligation**. Therefore, a coverage rate can be defined. Existing solar mandates show a broad range of provisions from 30%[11] to 75%[12] of the useful roof space. To achieve a fast and cheaper energy transition, solar installations should cover the complete suitable part of the roof.

Green roofs should be no exclusion criterion but could reduce the available space of the roof for a solar installation. However, there are several examples of combined solutions for green roofs and solar power showing that with low-growing plants there are only minor restraints for the solar modules which could be adjusted by installing higher mounting brackets. On the positive side (beside other environmental advantages of green roofs) the cooling effect of the plants could halve the maximal roof temperature and thereby increase the amount of electricity produced.[13]

Exempt from the obligation should be special types of buildings like temporal structures, tents, small sheds with less than 20sqm usable space, underground structures and greenhouses. Additionally, if the shading rate is too high, an appropriate economic evaluation must be performed.

Photovoltaic and solar thermal systems

The European solar mandate should also allow solar thermal systems to fulfil the obligation, rather than just photovoltaic systems. Solar thermal systems typically occupy only smaller parts of the roof[14]. With a solar mandate that targets the full use of roof capacities solar thermal systems could be a supplement to photovoltaic systems (also in combination as a photovoltaic thermal hybrid solar collector). Photovoltaic systems have the significant advantage that energy that is not needed in the house can be used to decarbonise the European electricity system while surplus energy from solar thermal systems is wasted.

Accompanying measures for a successful implementation

Several accompanying measures are needed to enable a successful implementation of an EU-wide solar obligation. These measures are relevant for a solar uptake in general but become more urgent if this uptake is accelerated through the obligation. In the national implementation phase of the solar mandate MS should evaluate these measures and develop solutions for identified barriers. The EU should support MS in this process, for example with guidelines and best practice examples. These measures are not only necessary to make an EU solar mandate effective but also to stimulate solar installation on buildings that are not addressed by the obligation (esp. the private-owned residential building stock).

MS should have a strong **regulatory framework** for adequate payback times, like 10 years as mentioned in the EU Commissions proposal. Regulatory instruments that

[11] Bavaria (Germany) and Greece
[12] Baden-Wuerttemberg (Germany)
[13] See https://www.regenwasseragentur.berlin/gruendach-solar/
[14] Typically, 1 sqm solar collector per 10 sqm heated floor space is calculated.

enable more and deeper holistic energy renovations of buildings (i.e. Minimum Energy Performance Standards) will also ensure that the right combination of (demand/supply-side driven) measures is carried out, at the right time, to unlock multiple benefits for consumers (i.e. cleaner energy; lower energy bills; comfort etc.), all in respect of the EU short-term and long-term energy and climate commitments. Regulation needs to be coupled with the right financing framework and technical assistance. Without sufficient financing a solar mandate; and any other actions to improve our buildings, would have to include much more exemptions, undermining the achievement of its core objectives; as only financially strong building owners could be addressed. The financing could be achieved with different approaches like support schemes, market access for renewables or enabling self-consumption. For self-consumption energy sharing, collective self-consumption and energy communities need to be enabled. But such approaches should not be a core issue for a solar mandate so as not to overload it.

A special focus should be on **low-income and vulnerable households**. Solar installations require relatively high investments. Loans to spread the payment are often only available if a sufficient income exists. We recommend to include low-income households in the solar mandate by any means as an exclusion would also deprive them from the benefits of a solar system (return on investment / hedging against rising energy costs, participation in the energy transition…) and would lower the effect of the obligation. Tenants cannot hedge against increasing electricity prices in contrast to self-consuming homeowners and are therefore disadvantaged. They should be given special consideration within the mandate. MS need to develop adequate support schemes to enable low-income households and tenants to install a solar system. One option could be low-interest solar loans with interest rates that can be covered through the remuneration or savings, and which would not depend on the income of households. MS could also provide support to the investment (e.g. financed through Social Climate Fund or Recovery and Resilience Fund), either by giving the solar installation for free to vulnerable groups[15] or in combination with low interest loans for the resulting investment needs. Another option to avoid high investment needs are contract models where a contractor rents the roof and installs a solar system on it. A best practice example can be found in Brussels where building owners get the self-consumed electricity from the photovoltaic system on their roof for free, while the surplus electricity is sold by the contractor. With this concept also hedging against rising energy costs is possible for the households. This concept may also be suitable for households where the owners/tenants are elderly people who may not want to make investments in their property anymore.

Two crucial bottlenecks for the expansion of solar installations in Europe are currently the availability of **skilled workers** and sufficient **installation materials**. In a first step it should be evaluated how big the regional gaps are. In a second step additional workers should be won for and qualified for the needed tasks. Therefore, attractive conditions should be enabled (e.g. in cooperation with labour unions). Additionally clear policy signals towards a shift from the fossil to the renewable industry are needed, these could incentivise changes in working priorities of companies and career decisions. To build and increase supply chains that enable a reliable availability of materials like modules, inverters and others, enough time for the ramp-up and clear

[15] One example where vulnerable households receive a complete compensation of refurbishment costs is “Sauber Heizen für alle” in Austria, where sustainable heating systems can be installed for free.

perspectives for continuity are needed. Therefore, we argue for a staggered approach that avoids bottlenecks but also demand peaks[16].

To integrate high shares of photovoltaic electricity into the system the **electricity grid** (esp. distribution level) needs to be sufficiently equipped. Therefore distribution grid planning and expansion must be aligned with the PV expansion, also considering the upcoming significant growth of electricity demand for heat pumps and electric vehicles. The higher electricity demand is on the one hand an additional burden for the grid but also an opportunity to finance grid expansion. Moreover, if the flexibility of this additional demand is exploited, it can help to integrate renewables into the grid and thereby reduce grid expansion needs.[17] As there are more than 2,500 distribution system operators in Europe common solutions and guidelines are very important.

The effort, and the information collection for the obligated parties should be kept as minimal as possible. Therefore we recommend reducing bureaucratic burdens as much as possible (e.g. de-minimis rules for smaller installations, standardisation and digitalisation of processes). All information, forms and allowances required should be available from one contact point (**one-stop shop**) and for all relevant processes maximum durations should be defined. This should cover all measures related to the improvement of the envelope (i.e. roof renovation and beyond) and the replacement of fossil-fuel-based technical building systems (i.e. the installation of heat pumps). Incentivising holistic energy renovation of buildings, which encompass the measures mentioned above will help deliver more energy savings while **moving away from fossil heating**.[18]

In the current formulation of European **state aid law**, an incentive effect emanating from the support is required for the approval of support mechanisms. In order to avoid legal uncertainties in the interaction of a European solar obligation and national support mechanisms, it should be clarified in Art 9a of the EBPD draft that the introduction of the EU solar roof obligation does not have a negative effect on the approval of solar support schemes of Member States under state aid law.

The national implementation and achievements of the solar mandate should be **monitored on a regular and open-access basis** so that obstacles can be removed, and improvements implemented. The following core indicators are suggested and could be considered for example in the NECP reporting[19]:

- Effect of obligation and fulfilment rate: rooftop solar power installed, cover rate of new buildings and building stock
- Number of solar installers
- Average realisation time differentiated by capacity categories

[16] The photovoltaic demand collapse in Germany after the peak 2010-2012 which the German PV industry still has not completely overcome is a negative example.
[17] New solutions like flexibility markets as foreseen in the Clean Energy Package are needed here.
[18] The Swiss canton Basel-Stadt plans to offer extra subsidies if the solar installation is coupled with roof insulation.
[19] This additional monitoring should be considered in the current discussions of the Building Renovation Plans.

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