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ANNEX 8

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Approval of the content of the draft Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275

Solar energy in buildings (Article 10)

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to the

Commission Notice providing guidance on new or substantially modified provisions of the recast Energy Performance of Buildings Directive (EU) 2024/1275

Solar energy in buildings (Article 10)

1. POLICY AND LEGAL CONTEXT

In line with the REPowerEU plan[1], the Commission put forward the legislative proposal for a solar mandate in the recast Energy Performance of Buildings Directive ('the recast EPBD')[2] on the basis of the EU solar energy strategy[3].

The solar mandate in the recast EPBD is closely linked to the revised Renewable Energy Directive (RED)[4], which aims to facilitate the transition to a decarbonised economy by increasing the share of renewable energy to at least 42.5% of final energy consumption in the EU by 2030, with a goal of 45% by 2040. It is also linked to RED Article 16d facilitating permitting for solar energy equipment (PV and solar thermal) and RED Article 15a on mainstreaming renewable energy in buildings.

The following guidance for the RED is relevant for Article 10 of the recast EPBD:

- Guidance on heating and cooling aspects in Articles 15a, 22a, 23 and 24 of Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources as amended by Directive (EU) 2023/2413, C(2024)5043 final

The following Recommendation and guidance on permitting procedures for renewable energy are also relevant for EPBD Article 10:

- Commission Recommendation (EU) 2024/1343 of 13 May 2024 on speeding up permit-granting procedures for renewable energy and related infrastructure projects[5]
- Accompanying guidance to the Member States on good practices to speed up permit-granting procedures for Renewable Energy Projects[6].

There are also close links between Article 10 of the recast EPBD and Article 15a on the right to energy sharing of Directive (EU) 2024/1711[7] on the electricity market design.

2. RELEVANT DEFINITIONS

The following definitions in Article 2 of the recast EPBD are relevant for the implementation of Article 10:

(1) 'building' means a roofed construction having walls, for which energy is used to condition the indoor environment;

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1 Commission communication of 18 May 2022 entitled 'REPowerEU Plan', COM/2022/230_final.
2 Directive (EU) 2024/1275
3 Commission communication of 18 May 2022 entitled 'EU Solar energy strategy', COM/2022/221 final.
4 Directive - EU - 2023/2413 - EN - Renewable Energy Directive - EUR-Lex.
5 https://eur-lex.europa.eu/eli/reco/2024/1343/oj.
6 SWD/2022/149.
7 Directive (EU) 2024/1711 of the European Parliament and of the Council of 13 June 2024 amending Directives (EU) 2018/2001 and (EU) 2019/944 as regards improving the Union's electricity market design.

(6) ‘technical building system’ means technical equipment of a building or building unit for space heating, space cooling, ventilation, domestic hot water, built-in lighting, building automation and control, on-site renewable energy generation and energy storage, or a combination thereof, including those systems using energy from renewable sources;

(14) ‘energy from renewable sources’ means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, osmotic energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas;

(18) ‘residential building or building unit’ means a room or suite of rooms in a permanent building or a structurally separated part of a building which is designed for all-year habitation by one private household;

(22) ‘major renovation’ means the renovation of a building where: (a) the total cost of the renovation relating to the building envelope or the technical building systems is higher than 25 % of the value of the building, excluding the value of the land upon which the building is situated; or (b) more than 25 % of the surface of the building envelope undergoes renovation. Member States may choose to apply point (a) or (b);

(35) ‘roofed car park’ means a roofed construction, with at least three car parking spaces, that does not use energy to condition the indoor environment;

(51) ‘useful floor area’ means the area of the floor of a building needed as parameter to quantify specific conditions of use that are expressed per unit of floor area and for the application of the simplifications and the zoning and allocation or re-allocation rules;

(56) ‘services related to the energy performance of buildings’ or ‘EPB services’ means the services, such as heating, cooling, ventilation, domestic hot water and lighting and others for which the energy use is taken into account in the calculation of the energy performance of buildings;

(60) ‘other on-site uses’ means on-site uses other than EPB services, including appliances, miscellaneous and ancillary loads, or electro-mobility recharging points;

(65) ‘car park physically adjacent to a building’ means a car park which is intended for the use of residents, visitors or workers of a building and which is located within the property area of the building or is in the direct vicinity of the building.

The following definition under the RED is also relevant:

(9b)“solar energy equipment” means equipment that converts energy from the sun into thermal or electrical energy, in particular solar thermal and solar photovoltaic equipment;’

3. IMPLEMENTATION OF OBLIGATIONS UNDER ARTICLE 10

3.1. Design of new buildings

According to Article 10(1), ‘Member States shall ensure that all new buildings are designed to optimise their solar energy generation potential on the basis of the solar irradiance of the site, enabling the subsequent cost-effective installation of solar technologies’.

This means that, when designing a building, architects and other construction professionals must consider its potential for generating solar energy alongside other design parameters.

For the purposes of Article 10, solar technologies include both photovoltaic (PV) and solar-thermal systems. Therefore, the design of new buildings should consider both PV and solar thermal technologies and combinations of the two.

Designing a building optimised for solar-energy generation requires a comprehensive approach. Key factors for such an approach include: (i) adequate **load-bearing capacity** for solar installations; (ii) proper **building orientation**; and (iii) **roof and façade design**. The objective is to ensure suitable solar installations can be added in the future without costly structural changes.

Tools to make it easier to identify suitable sites such as the Photovoltaic Geographical Information System (PVGIS)[8] can be used to assess the solar potential of a location. Many European cities and regions also offer local mapping tools (e.g. Aarhus[9], Flanders[10], North Rhine-Westphalia[11], Brussels)[12].

On building orientation, in addition to south-facing orientations, both east-facing orientations and west-facing orientations can be considered for new constructions. The south-facing orientation, which is typically used for rooftop installations, benefits from sunshine hours. Electricity tends to be injected into the grid .at peak times, which can exacerbate problems of grid congestion, curtailment and negative prices. A west-east orientation provides a different generation pattern, and electricity is not injected at peak times. This helps to alleviate grid congestion problems and makes investment more attractive as the price of this electricity could be higher.

The design of new buildings should consider the use of solar technologies throughout the entire structure, not just on the roof, but also on the façade, balconies and terraces and on roofed car parks and similar structures. Also here, solar installations with west and east orientations can be beneficial for the grid. Balconies and terraces can be designed for solar generation. Building-integrated technologies such as building-integrated photovoltaics (BIPV) and building-integrated solar thermal (BIST) should be considered during the design phase.

On roof design, a flat roof provides flexibility in placing solar panels at an optimum angle, while a pitched roof can be designed to face the sun in the best direction. The roof's angle should optimise the performance of the solar installation on the basis of the latitude of the building's location. The design should also take into account compatibility with other uses of the roof.

The choice of materials during the design phase should take account of solar installations, for instance in terms of fire safety.

The design of new buildings could also take into account the space required for storage systems such as batteries or hot water storage.

Consideration could also be given at the design stage to combining green roofs with solar installations, as this integration may offer benefits. Green roofs can help to reduce cooling loads and keep solar panels at a temperature closer to their optimal operating range.

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8 https://re.jrc.ec.europa.eu/pvg_tools/en/.

9 https://app.powerbi.com/view?r=eyJrIjoiOGFhMjUyZWQtYmI4MC00NzE1LTlmMTMtNzkzMzQ1ZWJhN2E0IiwidCI6Ijg5ZjA4NzM5LTkxYzAtNDdhZS1hNzMyLTI5MWI1ZGY3YTk0ZSIsImMiOjh9

10 https://apps.energiesparen.be/zonnekaart .

11 https://www.energieatlas.nrw.de/site/karte_solarkataster

12 https://geodata.environnement.brussels/client/solar/ .

3.2. Permit-granting procedure

Article 10(2) of the recast EPBD provides that 'the permit-granting procedure for the installation of solar energy equipment set out in Article 16d of Directive (EU) 2018/2001 [RED], and simple-notification procedure for grid connections set out in Article 17 of that Directive shall apply to the installation of solar energy equipment on buildings'.

According to the RED, the permit-granting procedure must not exceed one month for a solar installation with a capacity of up to 100kW. For solar installations in existing or future artificial structures, including building-integrated solar installations, it must not exceed three months.

Before solar installations up to 10.8 kW may be connected to the grid, the distribution system operator must be notified. If the distribution system operator gives a positive decision or fails to respond within one month, the connection can proceed. Member States may increase this threshold to up to 50 kW.

3.3. Timeline for deployment of solar installations

Article 10(3) provides that 'Member States shall ensure the deployment of suitable solar energy installations, if technically suitable and economically and functionally feasible' on different categories of buildings according to the timelines in the table below.

Table 1: Timeline for deployment of solar installations

Building type	**Article 10 requirement**	**Building size useful floor area**	**Deadline date**
New	New public and non-residential buildings	> 250m^2	31/12/2026
New	New residential buildings	All	31/12/2029
New	New roofed car parks physically adjacent to buildings	All	31/12/2029
Existing	Existing public buildings	>2 000m^2	31/12/2027
Existing	Existing public buildings	>750m^2	31/12/2028
Existing	Existing public buildings	>250m^2	31/12/2030
Existing	Existing non-residential buildings where the building undergoes a major renovation or an action that requires an administrative permit for building renovations, works on the roof or the installation of a technical building system	>500m^2	31/12/2027

For the deployment of solar energy installations on new buildings, Member States may choose to apply the requirements only to buildings for which building permit applications or equivalent applications are submitted after the deadline.

3.4. Interpretation of public buildings

For the purposes of Article 10, public buildings are a subset of non-residential buildings, namely those non-residential buildings that are owned by public bodies. In the case of

multiple owners, this refers to buildings where at least 50% of the non-residential building is owned by public bodies.

Public bodies are defined in the Energy Efficiency Directive Article 2(12) as 'national, regional or local authorities and entities directly financed and administered by those authorities but not having an industrial or commercial character'.

For example, social housing, even if owned by public bodies, does not fall under the obligations laid down for public buildings in Article 10. Instead, it is subject to the requirements applicable to residential buildings.

For mixed-use buildings that include both residential and non-residential units, Member States may choose to treat them as either residential or non-residential buildings and to apply the corresponding obligations. This is clarified in recital 34.

3.5. Interpretation of useful floor area

Useful floor area is used as a criterion for identifying buildings subject to the obligations in Article 10(3). As defined in Article 2(51), useful floor area means the total size of the building, including all floors, rather than the surface area of just one floor.

For public buildings, the requirement to install suitable solar energy systems is being applied gradually, on the basis of the useful floor area, starting with the largest buildings.

According to Article 10(4), Member States 'may use the measurement of buildings' ground floor area instead of buildings' useful floor area, provided that the Member State shows that this results in an equivalent amount of installed capacity of suitable solar energy installations on buildings'. If a Member State chooses to make use of this option, it must prove to the Commission that the impact is equivalent when notifying implementation.

One way to demonstrate equivalence is by showing that the same number of buildings are covered when the ground floor area is used as a criterion as when the useful floor area is used. The ratio of ground floor area to useful floor area for different categories of buildings can be used for this purpose.

For example, in an analysis conducted on 49 non-residential buildings in Germany, the thresholds specified in Article 10 were applied consistently to both the ground floor area and the useful floor area. Using the ground floor area resulted in a decrease of between 6% and 24% in the number of buildings subject to the EPBD obligations. In this example, the ratio between ground floor area and useful floor area was around 0.55. Therefore, instead of using a useful floor area threshold of 500m^2, a ground floor area threshold set at 500 m^2*0.55=275 m^2 could be applied. This is a methodology that can be used by Member States to prove the equivalence between ground floor and useful floor area.

3.6. Solar installations on existing non-residential buildings

As highlighted in the EU solar energy strategy and the European solar rooftops initiative, there is a large untapped potential for solar installations on existing structures such as the roofs of existing buildings[13]. In particular, certain categories of non-residential buildings such as warehouses, data centres and shopping malls typically have large roofs that could be suitable for solar installations. These buildings also have large electricity needs that could be met through self-consumption of locally produced renewable energy. Also, other existing non-residential buildings such as offices and shops are often suitable for solar installations.

[13] For further background: https://publications.jrc.ec.europa.eu/repository/handle/JRC135456

Against this background, Article 10(3)(c) of the recast EPBD requires Member States to ensure the deployment of suitable solar installations 'on existing non-residential buildings with useful floor area larger than 500 m^2, where the building undergoes a **major renovation** or an action that requires **an administrative permit for building renovations, works on the roof or the installation of a technical building system**'.

Major renovation is defined in Article 2(22). In addition to the criterion of major renovation, a second criterion for the deployment of suitable solar installations is 'an action that requires an administrative permit for building renovations, works on the roof or the installation of a technical building system'.

This second criterion refers to interventions that are not considered major renovations but still involve some interaction with a public authority to obtain a permit for the work.

An example would be a renovation that is smaller than a major renovation but for which local regulations require a permit. Other examples include work on the roof or the installation of technical building systems for which permits are required.

Linking the solar obligation to cases where a permit is required makes it easier to identify buildings subject to the requirement and facilitates follow-up, as there is already some interaction with a local authority for other purposes. This is not in any way linked to whether the solar installation as such requires a permit or not; it is simply a way to identify buildings that are subject to the solar installation requirement.

However, there may be cases where a permit is required for a purpose which is not considered relevant at all in relation to solar installations, such as changing the colour of a façade. In such cases, Member States may choose not to consider this a relevant criterion.

As there are differences between Member States as to which actions require an administrative permit, the application of this requirement will vary across Member States.

3.7. Roofed car parks

According to Article 10(3)(e), Member States must ensure the deployment of suitable solar installations on all new roofed car parks physically adjacent to buildings by 31 December 2029.

A roofed car park, as defined in Article 2(35), is a 'a roofed construction, with at least three car parking spaces, that does not use energy to condition the indoor environment'.

If a roofed car park has walls and uses energy for heating or cooling, it should be considered a building (in line with the definition of 'building' in Article 2(1)), and the obligations for non-residential buildings apply.

The threshold of three parking spaces is intended to exclude roofed car parks on driveways of single-family houses.

The obligation applies to roofed car parks that are adjacent to buildings (similar to the obligations on recharging infrastructure in Article 14, which applies to car parks that are adjacent to buildings). Article 2(65) of the recast EPBD defines a 'car park physically adjacent to a building' as 'a car park which is intended for the use of residents, visitors or workers of a building and which is located within the property area of the building or is in the direct vicinity of the building'.

3.8. What is a suitable solar installation?

According to Article 10(3), 'Member States shall ensure the deployment of suitable solar energy installations, if technically suitable and economically and functionally feasible', in accordance with the timetable set out in Section 3.3 above.

3.8.1. Interpretation of suitable solar installations

While there is no definition of what constitutes 'suitable' solar installations, Article 10(4) requires Member States to establish, and make publicly available, criteria at national level for the practical implementation of the obligations under Article 10. These national criteria should be used to define, at national or regional level, what constitutes suitable solar energy installations for different categories of buildings.

The bulleted paragraphs below provide guidance on interpreting what qualifies as suitable solar energy installations:

- The guidance does not specify a number of square metres, share of roof area or installed power of solar installations per building. However, Member States have the possibility of determining such parameters at Member State level in the national criteria. Some Member States that have existing solar standards have chosen to express the solar mandate in terms of a percentage of building area covered by solar installations or minimum installed power per building surface area.
- According to Article 10(4), and as also explained in recital 32, the national criteria must be in accordance with the assessed technical and economic potential of the solar energy installations and the characteristics of the buildings covered by the obligation. A suitable solar installation would therefore be one that is efficient, i.e. it makes efficient use of the available space on the roof, façade, balconies, etc., and thus efficiently exploits the potential for solar energy production. Depending on local building conditions, the exact number of square metres or installed power of solar panels may vary. In most cases, the installation of a single panel on a large roof will not be sufficient to be considered 'suitable'.
- Article 10(4) provides that the criteria 'shall also take into account structural integrity, green roofs, and attic and roof insulation, where appropriate'. For existing buildings, this means that Member States should take into account the need for roof renovations and, if necessary, allow more time for the solar installation to avoid lock-in effects.
- The potential for self-consumption and energy sharing should be taken into account when determining what constitutes a suitable solar installation. In particular, the energy needs of the building should be considered. For the purposes of Article 10, this includes not only the energy required for EPB services (heating, cooling, ventilation, domestic hot water etc.) but also the energy needs for other on-site uses such as IT services, electric vehicle charging, and appliances.
- The energy needs that should be taken into account when determining the size of suitable solar installations under Article 10 are therefore typically larger than those used to calculate cost-optimal levels of energy performance, as these are limited to the EPB services.
- Combining solar electricity production and electric vehicle charging can offer benefits both to the user and to the energy system/grid. The availability of storage (batteries or hot water storage) should also be taken into account.

- Buildings have different energy requirements. Some buildings require more electricity, while others more thermal energy. The energy needs for hot water should be taken into account when determining whether a solar installation is suitable and when deciding between PV and solar thermal energy or combinations of the two. As solar thermal energy differs from PV in terms of space requirements, the available roof area should also be factored in.
- If a solar installation produces more energy than the building needs at a given point in time, the excess electricity can be fed into the grid, also for the purpose of energy sharing[14].
- Member States should also take into account that solar installations under Article 10 will contribute to the goal of achieving at least 49% renewable energy consumption in buildings in the EU by 2030, as laid down in Article 15a of the RED. This goal includes renewable energy produced on-site or nearby, as well as renewable energy sourced from the grid, and therefore has a broader focus than Article 10. However, the table in Annex C to the RED guidance (C(2024) 5043), which shows shares per Member State and for the EU in 2020 based on proxy data reported to Eurostat, might support the calculation for the implementation of Article 10.
- Also, the policies and measures for deploying suitable solar energy installations on all buildings, along with the numerical targets for the deployment of solar energy in buildings, must be included in the national building renovation plans, as required by Article 3.

3.8.2. Technical suitability, economic feasibility and financial feasibility

The following table shows how each type of suitability and feasibility can be interpreted and gives examples.

Table 2: Interpretation of technical suitability, economic feasibility and functional feasibility

Type	Meaning	Examples
Technical suitability	Technical suitability refers to the compatibility between the technical characteristics of the solar installation and those of the roof or façade of the building ensuring that installation is possible. There is no technical suitability if it is technically impossible to install a solar system.	Technical suitability is a problem if a building does not support a solar installation (either on the roof or on the façade or balconies) required to fulfil the requirements to be considered suitable under the legislation, e.g. if: • the orientation of the roof on an existing building is not suitable. As roofs facing east and west can also be productive, these should not generally be exempted; • the angle of the roof on an existing building is not suitable; • the structural integrity of the existing building (e.g. construction of the roof) does not support solar installations; • there is a lack of space on the roof, and the façade is not suitable for solar installations; • shading from adjacent buildings

[14] Energy sharing as covered in Directive 2024/1711 on electricity market design.

		cannot be mitigated; • the roof material (thatch, straw, wood) is unsuitable for solar installation. For all points above, also consider installing elsewhere than the roof, i.e. facade, balcony
Economic feasibility	Economic feasibility refers to the cost of the solar system and whether the expected benefits outweigh the costs, taking into account the expected lifetime of the solar installation.	Economic feasibility can be calculated, for example, on the basis of: • a maximum payback period, taking into account monetary benefits of the solar system in relation to the expected lifetime of the solar installation; • a maximum ratio between the cost of the solar installation and the cost of the planned intervention (installation of the system) plus any follow-up costs, e.g. costs related to fire safety and structural safety.
Functional feasibility	It is functionally not feasible to deploy solar installations if these would result in changes that affect the building's intended use, taking into account any specific constraints (e.g. regulations) that may apply to the building.	The application of solar installation requirements may not be functionally feasible if, for example • applicable regulations (e.g. on fire safety, the strength and stability of the structure) conflict with the installation requirements.

3.9. National criteria for practical implementation and possible exemptions

Article 10(4) provides that 'Member States shall establish, and make publicly available, criteria at national level for the practical implementation of the obligations set out in this Article, and for possible exemptions from those obligations for specific types of building'.

Member States are required to communicate the national criteria to the Commission when notifying their transposition and implementation of Article 10. Any changes to these criteria after they have been notified must be communicated to the Commission and made publicly available in the Member State.

The conditions, under which suitability and feasibility should be assessed (e.g. climate conditions) should be determined at Member State level or, where regional conditions affect only part of a Member State's territory, at regional level. In the latter case, the regional conditions should be outlined in the national transposition measures.

In Member States with regional jurisdictions, these requirements must be transposed at regional level. In all cases, these conditions should be documented (e.g. as part of technical guidelines) and should be applied uniformly across the national or, where applicable, regional territory. In addition, any exemptions from these requirements should be assessed using clear procedures set and supervised by public authorities. These procedures may vary between different types of buildings, in particular to take account of specific types for which technical suitability, economic feasibility or functional feasibility is an issue.

3.9.1. Technology neutrality within the context of Article 10

Article 10(4) requires Member States to take account of the principle of **technological neutrality with regard to technologies not producing any on-site emissions** when laying down the national criteria for the practical implementation of the requirements set out in Article 10 and any possible exemptions.

Article 10 operates on the basis that the decarbonisation of electricity, heating and cooling is equally important. Therefore, one aspect of technology neutrality is that Article 10 applies to all solar technologies: PV, solar thermal and combinations of these.

Furthermore, Article 10 is not limited to solar installations on roofs, but also covers: (i) installations on façades, balconies, terraces, roofed car parks, similar structures; and (ii) building-integrated technologies such as BIPV and BIST.

In summary, Article 10 covers solar installations 'on' buildings but does not extend to ground-mounted solar installations on open land. However, solar installations with a clear link to the building, such as those on patios, terraces, pergolas, winter gardens, canopies, pavilions are included. Technological neutrality in the context of Article 10 also refers to technologies that do not generate on-site emissions. In certain instances, although not mentioned in Article 10, renewable energy systems other than solar, such as wind turbines, may also be considered. There are various wind turbine innovations that are suitable for rooftops, particularly for large and high-rise buildings.

Installations that use renewable energies (e.g. biomass boilers) and the purchase of solar energy through contractual arrangements (e.g. green electricity contracts or energy communities) do not qualify under Article 10.

If a building owner wishes to allow a third party to deploy a solar installation on the building under a contractual agreement, this would be considered in line with Article 10 and could be part of the criteria set by the Member States.

3.9.2. Guidance on principles for possible exemptions

Generally, the solar obligation applies to all buildings. However, exemptions may be granted, for example, for the following four cases.

- The first case is when there is ongoing construction: if a building is under construction at the time of the deadline in the article, an exemption may be granted.
- The second case is when a solar installation would be challenging for reasons of technical suitability, economic feasibility and functional feasibility (see Section 3.8 above): this includes safety reasons and concerns relating to the structural integrity of the building.
- The third case is when the roof is being renovated: if a roof renovation has been planned, the building may be temporarily exempted.
- The fourth case is when a solar installation could be replaced with another technology according to the principle of technology neutrality: an exemption may be granted, for example, if an equivalent amount of energy can be produced by another renewable source, such as small rooftop wind turbines. However, the use of a biomass boiler or a (possible) connection to a renewable-energy district-heating system would not qualify, as this is not considered renewable energy production on the building.

Exemptions should not be automatically granted in the following two cases.

- The first case it when there are any grid-related concerns. In this case, alternative solutions should be considered first, e.g. self-consumption, a higher share of solar thermal installations, energy storage, and energy sharing. If these are still not feasible due to grid concerns, a deferral could be considered.
- The second case is when a new construction or a building undergoing major renovation already has a green roof. While green roofs must be taken into account in the national criteria under Article 10(4), green roofs and solar installations are not mutually exclusive. In fact, solar green roofs can offer a synergistic benefit for the urban climate, contributing to the sustainable use and structural preservation of flat roofs, and to decentralised energy production for buildings ([15]). In addition, installing the solar equipment on the facade, balcony, etc could also be a possibility.

3.9.3. Protected buildings

In general, Article 10 applies to all buildings, including historical and other protected buildings. Unlike other articles of the recast EPBD, Article 10 does not explicitly mention the possibility of exempting protected buildings from solar obligations. Nevertheless, Member States have sufficient flexibility to lay down specific rules for protected buildings in their national criteria.

As historical and other protected buildings need to be preserved and renovated, it makes sense to use innovative approaches to achieve carbon neutrality in this building stock too. Many solutions are available to integrate solar energy 'invisibly' into historical buildings that come close to the original materials in terms of shape, colour and surface texture (e.g. coloured modules (BIPV/BIST) or solar tiles). In addition, traditional, more 'visible' solar energy can also be integrated into historical buildings in innovative ways, bringing not only energy but also aesthetic benefits to the building [16]. For instance, in Amsterdam, visible solar installations will be allowed on monuments and heritage buildings in some cases from 2025[17].

There are many examples of successful integration of solar energy in historical buildings. including:

- the 16th century Renaissance palace in the historic centre of Valladolid in Spain ([18]); and

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15 Literature and examples:

- Xiang et al. 2023: Green roofs and facades with integrated photovoltaic system for zero energy eco-friendly building – A review. Sustainable Energy Technologies and Assessments 60(2023)103426
- Fleck et al. 2022: Bio-solar green roofs increase solar energy output: The sunny side of integrating sustainable technologies. Building and Environment. Volume 226, December 2022, 109703
- University of Technology Sydney 2021: Green Roof & Solar Array – Comparative Research Project. Final Report July 2021. 2020/037855/EPI R3 2021920005, https://opus.lib.uts.edu.au/bitstream/10453/150142/2/City%20of%20Sydney%20Final%20Report%20EPI%20R3%20201920005.pdf

Examples of use:

- https://www.sempergreen.com/en/references#page=2
- https://livingroofs.org/green-roofs-solar-power/
- https://zinco-greenroof.com/systems/solar-energy
- https://urbanstrong.com/blog/integrated-solar-green-roofs-are-for-the-greedy.

16 See, for example, the Valetta Design Cluster in Malta: https://onyxsolar.com/valletta-design-cluster.

17 https://www.pv-magazine.com/2024/06/18/amsterdam-to-allow-solar-panels-on-monuments/.

18 https://positive-energy-buildings.eu/demo-cases/spain

- the decision tool for the energy retrofitting of historic buildings, including solar energy installations, developed as part of the HiBERtool project ([19]).

Buildings officially protected as part of a designated environment or because of their special architectural or historical merit, or other heritage buildings, can be granted exemptions for specific reasons, including in the following case (in line with Article 5(2)):

- The installation of solar energy systems would unacceptably alter their character or appearance. Such an exemption should be based on well-founded case-by-case decision in close coordination with the local government.

Another case is when a protected building is part of a building complex and other buildings within the complex are more suitable for solar energy installations.

3.10. Administrative, technical and financial support measures

According to Article 10(5), 'Member States shall put in place a framework providing the necessary administrative, technical and financial measures to support the deployment of solar energy in buildings, including in combination with technical building systems or efficient district heating systems'.

On financial measures, the provisions on solar energy in buildings do not qualify as a 'Union standard' within the meaning of State aid rules. This is clarified in recital 32. Therefore, the existence of Article 10 does not mean that Member States can no longer grant State aid for solar installations.

Below is a selection of existing practices in three different categories of support that are relevant for the implementation of Article 10(5). These three categories are one-stop-shops, support for vulnerable households, and financial incentives. However, the obligation in Article 10(5) is not limited to these three categories of administrative, technical and financial support.

3.10.1. One-stop-shops

One-stop-shops are important tools to support the deployment of solar energy in buildings. Some examples are given below. More general guidance on one-stop-shops is also available in connection with Article 22[2021], of the Energy Efficiency Directive (EED) and Article 18 of the recast EPBD[22] as well as in relation to the Renewable Energy Directive.

The Climate Protection Agency Hanover in Germany offers free e.coBizz checks for small and medium-sized companies in various sectors in the Hanover region. Companies with suitable roof surfaces can receive a free solar audit. Building-specific, technical and financial aspects are taken into account during this free solar audit. Depending on the building's specific energy requirements, the consultants from the Climate Protection Agency will assess whether solar thermal or photovoltaic systems are suitable. After a two-hour consultation, companies receive a brief report showing whether and how solar energy is worthwhile.

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19 https://www.tool.hiberatlas.com/en/welcome-1.html

20 Article 22 of the EED requires Member States to ensure one-stop shops or similar mechanisms are set up to provide technical, administrative and financial advice on – and assistance with – energy-efficiency improvements to final customers and final users, with a specific focus on households and small non-household users, including SMEs and microenterprises.

21 Commission recommendation (EU) 2024/2481 of 13 September 2024 setting out guidelines for the interpretation of Articles 21, 22 and 24 of Directive (EU) 2023/1791 of the European Parliament and of the Council as regards the consumer related provisions.

22 Guidance on financial incentives, skills and market barriers, and one-stop shops in Annex 2

The Sustainable Energy Authority of Ireland (SEAI) coordinates and subsidises a group of one-stop-shops that provide advice and installation for individual consumers, communities, and businesses. The House2Home one-stop-shop, for example, covers the whole process of installing a solar system, including free solar PV consultations, assistance with applying for grants to purchase solar panels and batteries, and support with the installation of the system.

3.10.2. Financial incentives

In 2021 **Sweden** introduced a tax reduction for green technology, covering the installation of solar systems, batteries and charging boxes. The amount is deducted directly from the invoice of the installing company. The tax reduction is available only to private individuals. In 2023, over 200 000 Swedish homeowners received a tax reduction for installing green technologies.

The Mój Prąd scheme in **Poland** is a large solar rebate scheme open to residential rooftop PV projects ranging in size from 2 kW to 10 kW. 'Prosumers' (people who both produce and consume electricity) can submit applications under an agreement that regulates the feed-in of electricity generated by micro-installations into the Polish grid. Since the programme was launched in 2019, it has allocated about EUR 400 million to 411 494 PV projects.

In **Germany**, financial incentives are mostly provided at regional and local level. Several federal states, including North Rhine-Westphalia, Bavaria and Baden-Württemberg, currently have subsidy programmes for PV systems and battery storage systems. These are often municipal subsidy programmes, i.e. they provide grants from cities and municipalities. At state level, only the federal state of Berlin subsidises electricity storage systems and special PV systems.

The **reduction or abolition of VAT** in Austria (0% VAT for PV up to 35 KW), Germany and the UK (0% VAT), Belgium (6% VAT), the Netherlands (7% VAT) and Poland (8% VAT) is an efficient, transparent and simple way to subsidise solar systems.

3.10.3. Vulnerable households

Member States are encouraged to ensure that vulnerable households can also benefit from the installation of solar systems. Some examples of existing practices are given below.

In Germany, favourable conditions for balcony power plants make it possible for many people, including tenants and lower-income groups, to participate in the energy transition. Plug-in balcony power plants are available for just a few hundred euro and are subsidised by many federal states, cities and energy supply companies, with subsidies of up to EUR 500. The offer is open to everyone, but vulnerable households usually receive higher subsidies. More than 400 000 plug-in solar power systems are now in operation.

The main objective of the Horizon 2020 project Sun4All is to improve access to renewable energy for vulnerable households. To this end, Sun4All is adapting New York's Solar for All scheme to the European context. Sun4All is thus a concerted effort to help vulnerable households to switch to renewable energy and thereby reduce their energy bills. As part of the project, a financing system based on a collective self-consumption model is being tested, which would finance the purchase and installation of solar panels for vulnerable households. It is expected to make a significant contribution to combating energy poverty. The scheme is being tested in the cities of Almada (Portugal), Barcelona (Spain), and Rome (Italy) and in the community of municipalities Cœur de Savoie (France).