



SolarPower Europe Note

On-site solar mandates across Europe

European Commission's proposal for the EPBD
Article 9a: Solar energy in buildings

Article 9a foresees that all new buildings shall be designed to optimise their solar energy generation potential.

On top of this, member states shall ensure the deployment of suitable solar energy installations:

- a) by 31 December 2026, on all new public and commercial buildings with useful floor area larger than 250 square meters;
- b) by 31 December 2027, on all existing public and commercial buildings with useful floor area larger than 250 square meters; and
- c) by 31 December 2029, on all new residential buildings.

Criteria for the practical implementation, and for possible exemptions for specific types of buildings shall be defined at national level, in accordance with the assessed technical and economic potential of the solar energy installations and the characteristics of the buildings.

Main findings about solar mandates across Europe

1. **Belgium (Flanders), the Netherlands, and Switzerland have mandates on existing buildings in place. In 7 countries a mandate on renovated buildings applies, and in 9 countries on new buildings. Most mandates come into effect within the next two years.**
2. **Exemption criteria and required sizes of installations have a significant impact on the scope of the mandate. They vary widely, reflecting the diversity of Europe's building stock, solar irradiation, and regulatory frameworks.**
3. **For buildings that are not suitable for solar installations, an investment in renewables nearby is in some cases permitted as an alternative.**



Figure 1: solar mandates across Europe. Green: includes a mandate on existing buildings, light green: mandate on new and / or renovated buildings, orange: mandatory installation of RES technology, red: no mandate



Austria

Overview and lessons learned

Each of the 9 federal states in Austria has a different solar mandate. Currently, solar mandates are in effect in 3 federal states. Experience shows that the mandate accelerates solar deployment because PV installations become the standard. Due to the big PV boom and the high acceptance of roof-mounted PV systems, no backlash by society has been experienced.

Details of mandates that are already in effect

- In **Vienna**, new residential buildings, with at least two floors, or more than two apartments must have a solar capacity installed of at least 1 kWp per 300m² building surface area. New non-residential buildings must have installed at least 1 kWp per 100m² building surface area.
- In **Styria**, new residential buildings must be equipped with 3m² PV per 100m² building surface area and the water heating must work on renewables. New non-residential buildings with more than 250m² surface area must carry 6m² PV per 100m² building surface area.
- In **Lower Austria**, on all new buildings with more than 300m² surface area, 25% of the overbuild area must be covered with PV modules or 50% of the area must be PV-ready. If the building has an air conditioning system 2m² PV area must be installed per kW cooling capacity. This rule also applies to buildings that are retroactively equipped with an air conditioning system. If a new non-residential building includes a parking lot with more than 20 parking spots, several options are possible. One of them is to compensate for each additional parking spot with an 8m² PV area. Buildings are exempted from the obligation if they can't carry the PV system or the solar irradiation is too low. The defining criteria here is that the sun shines on the PV system for at least 9h on 20 March.

Implementation

While the federal states write the regulations, local building authorities are responsible for issuing the operating permits for the buildings. Following the construction or renovation of a building, they receive the protocol of the work. If no PV has been installed, they don't issue the operating permit.

Recommendations from Austria

- The Austrian PV industry mentions promising opportunities in coupling the mandate with renovations that change the energy consumption of a building, in particular for heating and cooling capacities.
- Multi-apartment buildings with several units and to buildings with high energy consumption should have more demanding obligations.
- Parking lots from a certain size on present a significant opportunity, including for synergies with EV charging infrastructure.
- Exception to the mandate should be kept limited and be very detailed, such as for places that are regularly shaded. If buildings are exempted from the mandate, this should be compensated by installing or contributing to a PV system nearby.
- PV installation deadlines should be 2 years after the construction for new and renovated buildings
- It should be the architect or the planner of the renovation who must inform the customers of their obligation to install a PV system.
- Permitting procedures must be overhauled with an increasing number of on-site installations

France

Lessons learned

The effect of the mandate from 2019 has remained limited for two reasons. The first is the limitation of the scope to new and heavily renovated buildings above 1000 m² floor area. The second is that lacking financial stimulus drove building owners to bypass the solar obligation by installing a green roof. In October 2021, new support schemes for rooftop PV created a strong push toward project development on large rooftops. The threshold lowering planned for July 2023 should also drive installations.



Details of the solar mandate

In France, all commercial or industrial buildings, warehouses and parking lots covering over 1000m² that are newly built or heavily renovated must carry either solar technology or green roofs. At least 30 % of the rooftop surface must be covered. The law is in place since 10 November 2019. Starting 1 July 2023, the mandate will also cover office buildings and the threshold will be lowered to 500m². It is required to respect the mandate to obtain the construction permit for the new building or building extension.

Recommendations from France

- The mandate should be coupled with measures to tackle barriers to individual & collective self-consumption, such as facilitated grid access, facilitated coupling with storage & e-mobility
- A mandate should be coupled with the development of smart grids to facilitate system integration
- Should be coupled with a mandate to ensure buildings are solar-ready, in the short-term.

The Netherlands

Details of the solar mandate

The Dutch government is currently planning to mandate solar on all new buildings except residential buildings with less than 250m² building surface area from 2025 onwards. Furthermore, municipal governments will be able to mandate solar PV installations on existing commercial roofs if this is necessary to reach their regional climate objectives. Mandates on existing buildings may only prescribe that the electricity demand of a commercial building is covered with self-generated electricity, they may not oblige buildings to become net generators.¹ If a roof reinforcement is necessary, building owners will be eligible for subsidies to cover it.

Recommendations from the Netherlands

- Clear provisions on solar readiness should be set in place.
- Provision should be set in place for situations where investors and beneficiaries are different parties, “split-incentives”, such as in the case of multi-apartment buildings and social housing.
- Provisions for business case killers, such as the availability of a grid connection, insurability of the building, etc., should be inserted.
- The mandate should require to use the full rooftop area for the PV installation.
- If a building owner doesn't want to invest him / herself, he / she should make the rooftop available to any market party wishing to install solar panels for a proportionate fee.

Switzerland

Details of the solar mandate

The canton Basel-Stadt provides an interesting case because obligations have been introduced to install solar PV with building renovations and by 2035 all suitable roofs must be equipped. An extra subsidy is planned if the installation is coupled with roof insulation. The cantons are discussing introducing such an obligation in all the cantons.

Beyond this, 23 out of 26 Swiss cantons have (or will soon introduce) an obligation to produce their own electricity on new buildings, which is in most cases a solar obligation. The installation must generate at least 10 Watt per m² energy reference area of a building and a maximum of 30 kW. These mandatory installations get the same national subsidy covering around 20% of the costs. There is no coupling with energy efficiency measures. A solar obligation for new buildings is also being discussed on a national level.

Recommendations from Switzerland

- In the Canton of Basel-City they plan on coupling subsidies for building renovations with PV installations. This will guarantee that solar mandates don't delay building skin renovations.
- Exceptions for should be included for listed buildings.

¹ On top of this, the municipal government may mandate energy efficiency measures if they have a payback time of less than 5 years.



- Multi-apartment buildings: Tenants or owners are “self-consumption consortiums” (ZEV in German, RCP in French). They can use their solar power within the building and are together one customer vis-à-vis the energy supplier. This makes a PV system attractive.

Greece

Details of the solar mandate

As of January 1, 2023, all new buildings with at least 50% non-residential use with a useful floor area greater than 500 m² will include the obligation to install PV or solar thermal systems covering at least 30% of their useful area. The PV systems can be installed retroactively. Excluded from this obligation are tourist accommodation and churches. Buildings with a useful area greater than 5.000 m² can be excluded for reasons related to building morphology or aesthetics.

Recommendations from Greece

- Any application for a building permit that cannot comply with the above, should prove that there are serious technical reasons for not compliance.
- PV or solar thermal installations should cover at least 30% of the useful building area. If a storage system is included, the minimum obligation falls to 25%.
- Minimum deployed capacity should increase with the number of parties in the building. For residential buildings with 2 apartments, the minimum mandatory PV capacity should be 2 kWp, with 3-5 apartments 3 kWp, with 6 or more apartments 6 kWp. In case of a storage system, the minimum capacity shall be 6 kWh for buildings with 2 apartments, 12 kWh for buildings with 3-5 apartments, and 18 kWh for buildings with 6 or more apartments.
- As of January 1, 2023, all new buildings should be ‘solar ready’ and be designed to easily install batteries, EV chargers and heat pumps.
- As of January 1, 2023, PV should be also compulsory for all open parking spaces with at least 35 parking lots. In this case, the minimum PV coverage will be 60% of the appropriate parking space.

Germany

Details of the solar mandate and the implementation

9 / 16 federal states have on-site solar mandates, which are partially already in effect. On top of this, some communities have implemented solar mandates. The earliest solar mandate came into effect on 1 January 2022. Therefore, no experiences can be drawn from the German example, yet.

- **Baden-Württemberg** is the first state to pass a comprehensive solar obligation. It is in effect for new non-residential buildings and carports with a minimum of 35 parking spots from January 1, 2022. A new climate protection law from fall 2021 now stipulates an obligation to install PV systems on roofs of new residential buildings as early as May 1, 2022, and on residential buildings that undergo fundamental roof renovation from January 1, 2023. The developers of the newly constructed building or the renovation are obliged to proof the PV installation within 12 months after completing the works.
- In **Schleswig-Holstein**, a new version of the Energy Transition and Climate Protection Act (EWKG) is in force since January 1, 2022. It includes obligations to install solar PV or solar thermal systems on all new non-residential buildings with suitable roof surfaces and when a renovation covers more than 10 % of the roof surface. The PV system may be installed in the immediate vicinity of the building to fulfil the obligation. The roof space may also be leased to third parties. In addition, the installation of PV systems is mandatory for the new construction of parking lots with more than 100 parking spots. The building control authority may request proof of the completed installation. The ministry responsible for energy and climate protection is empowered to define minimum requirements for a) the PV system, b) what qualifies as an “open parking space”, c) the minimum use of parking space for the PV installation, d) conditions for economic proportionality, e) suitable roof surfaces, including size, form and inclination, f) suitable exterior surfaces, g) orientation of the surfaces and shading, h) minimum use of the roof surface.
- In **Berlin**, from January 1, 2023, new and existing buildings that undergo a fundamental roof renovation and are in private use must be equipped with solar PV on their building roof.



Alternatively, the system can be installed on the building façade or a solar thermal system. New buildings must cover at least 30 % of their gross roof area, existing buildings must cover at least 30 % of their net roof area with photovoltaic systems. For existing buildings alternatively to the percentage share of the roof surface, the following capacities may be installed: For residential buildings with a maximum of two flats: 2 kW, for residential buildings with at least three and a maximum of five flats: 3 kW, for residential buildings with at least six and a maximum of ten dwellings: 6 kW. Owners of the buildings must prove the PV installation to the construction supervision authority. If no PV system has been installed, the authority may ask the owners to retroactively fulfil their duties within one year. The Berlin Solar Act provides for exceptions if the obligation to install and operate would contradict other regulations under public law, e.g. the law on the protection of historical monuments, or it is technically impossible in individual cases, or it is not justifiable, because the gross roof area of a new building can be oriented exclusively to the north for compelling reasons or the gross roof area of an existing building is oriented exclusively to the north.

- In **Hamburg**, roofs of new buildings must be equipped with PV systems from 2023 on. Existing buildings that undergo a complete renewal of the roof cladding must be equipped from 2025 on.
- In **Rhineland-Palatinate**, a solar obligation will take effect from 2023. 60 % of suitable roof surfaces of all new commercial buildings and new covered parking lots with 50 or more parking spots must be equipped with PV systems. Unlike in other federal states, a solar thermal system for heat generation can be installed as an alternative to a PV system.
- In **Lower Saxony**, at least 50 % of new commercial buildings with a roof area of 75 square meters or more must be equipped with PV systems. New residential buildings will have to be solar-ready according to the amended state building code.

Furthermore, the following Federal States have concrete plans to introduce a mandate

- **Bremen**
- **Saxony**
- **Bavaria**

Recommendations from Germany

- Solar mandate should be combined with the requirement for member states to introduce a digital roof area cadastre. Whenever a building permit is being issued, the roof area is entered into the system. When a building owner does not want to or cannot install a solar system, the available roof space should be equally accessible to third party developers, in a transparent manner.
- There should be exceptions for hardship cases in the area of redevelopment, where profitable operation of a photovoltaic system is unlikely, or not feasible.

Bulgaria

Details on the mandate

In Bulgaria, the National plan for nearly zero-energy buildings from 2015 to 2020 included targets for renovations of public buildings to increase energy efficiency and on-site RES generation. However, the main KPI was energy savings and it did not include a specific measure for RES generation. Therefore, the obligation was commonly fulfilled by increasing a building's energy efficiency.

Recommendations from Bulgaria

- A mandate could include storage to maximise self-consumption
- A mandate should include a clear, quantifiable KPIs to measure compliance.

Belgium / Flanders

Details on the mandate

- For new and extensively renovated buildings, 15 kWh/m² (vertical floor projection) must be generated from renewables. It applies to residential and non-residential buildings. In 2023 and 2025, the requirements will increase.



- Within 5 years after an ownership change of a small non-residential building, a “minimum share of renewable energy of 5% of the building’s energy demand must be generated from renewable sources. The law applies from 2023 on. If the measured energy consumption increases, the necessary production increases. Buildings that will be demolished within 5 years or protected monuments are exempted.
- For grid-connected buildings with more than 1 GWh yearly electricity consumption, 12,5 Wp/m² (actual rooftop surface, not the vertical projection) must be generated from renewables in 2025. The thresholds will increase in 2030 to 18,75 Wp and in 2035 to 25 Wp. It is thus recommended to install the required capacity in the 2035 target from the beginning. On top of this, the required maximum of installed renewables is limited to 35% of the electricity consumption. If a building owner cannot get the necessary grid connection, he / she only needs to install the inverter capacity allowed by the DSO, but with a higher solar panel capacity (0,7 kVA/kWp or approximately 1,429 kWp/kVA). If more than 25% of the roof is glass, the glass surface is exempted (not the whole building). For government buildings, the threshold is 500 MWh consumption (and will reduce to 250 MWh by 2029). A similar increase in the requirements for industrial buildings is likely but not announced, yet. Instead of acquiring an on-site installation, an investment in another renewables project in Flanders is permitted.

Italy

Details of the mandate

Since 2011, Italian legislation provides that all new buildings and buildings with more than 1000 m² of useful area undergoing an integral renovation of elements constituting the envelope or demolition and reconstruction must integrate on-site renewables (on top, inside or in proximity to the building). The renewable energy generated must cover heat, electricity and cooling consumptions, based on deadlines and minimum integration criteria. An exemption is made for energy demand for heating and cooling if a building is connected to a district heating/cooling network. These RES projects that go beyond the obligations in this decree could still benefit from national incentives for RES and have access to guarantee and revolving funds.

With the implementation of RED II, these rules were refined. Now all new non-public buildings and buildings undergoing major refurbishment after June 2022 should use on-site renewables to cover 60% of energy consumption for water heaters and 60% of total energy consumption. These percentages are increased to 65% for public buildings. These obligations will be reviewed every 5 years, starting from 2024. By June 2022, local authorities (regions and municipalities) should update their legislation to make these provisions enforceable. Differently from the previous decree, only existing buildings can access national incentives schemes as well as guarantee funds and revolving funds for subsidized loans.

Recommendations from Italy

- Existing buildings should be included with feasible deadlines.
- The permitting procedures must be streamlined in the building and RES sectors. Bureaucracy in Italy could represent a major stumbling block and overly-complex permitting procedure could be a hurdle to solar deployment on buildings.