



## Solar Energy Made Regional

Work Package T3 - Regulation and economic opportunities for SMEs  
Task T3.3 - Analysis of legal and regulatory issues for PV integration in  
SMEs

### Deliverable T3.3.1

# Legal and regulatory support tool for solar PV integration for SMEs

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## 1 Introduction

In 2021, only 5.7% of the total electricity production in the European Union (EU) came from solar energy<sup>1</sup>. However, the increasing need for renewable energy sources (RES)<sup>2</sup> is changing the energy scenario. For example, in 2022, the EU solar photovoltaic (PV) sector realized its full potential for the first time and installed 32.8 gigawatts (GW) of connected capacity during the calendar year.<sup>3</sup>

To further support this growth, decentralisation of solar energy and innovative technologies are critical. According to the International Energy Agency (IEA), buildings integrated photovoltaics (BIPV) replace conventional building materials with PV cells in all kinds of buildings or infrastructures (including roads), covering different segments with various technologies.<sup>4</sup> Even though BIPV ranged from 300 to 400 megawatts (MW) in Europe (2021 data), it is still a niche market and difficult to assess.<sup>5</sup>

The EU legal framework has supported the mentioned increase of renewable energy sources (RES) in general and solar energy in particular. Incentives, facilitation of permitting procedures, and other legal measures could enable even faster deployment of solar PV and the development of BIPV technologies. These measures would also help the EU achieve its climate and energy goals as customised solar PV integrated into the built infrastructure has the potential to harmonise energy production, climate change mitigation, and nature protection by, among others, helping to achieve zero-carbon buildings and not competing with other land uses such as agriculture or nature-protected areas.

In this context, this Report analyses the regulatory and legal elements that could support the adoption, integration, and uptake of solar PV in the current EU legal framework. It identifies the relevant EU legislation for solar PV development and discusses potential legal and regulatory issues while identifying potential opportunities and bottlenecks. The research was conducted using literature review but mostly analysis to legal documents, as well as official reports from the European Commission. The Report also included a transnational perspective, when applicable, and national regulations for Belgium, Germany, and the Netherlands to exemplify jurisdictional transposition of EU Directives (under the boxes “Example”).

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<sup>1</sup> European Commission (2023) Solar energy. Available online [https://energy.ec.europa.eu/topics/renewable-energy/solar-energy\\_en](https://energy.ec.europa.eu/topics/renewable-energy/solar-energy_en).

<sup>2</sup> Cf. Article 2(1) to Directive (EU)2018/2021 “energy from renewable sources” or “renewable energy” means energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas”.

<sup>3</sup> EurObserv'ER (2023) Photovoltaic Barometer. Available online <https://www.eurobserv-er.org/photovoltaic-barometer-2023/>.

<sup>4</sup> Masson, Gaëtan; Kaizuka, Izumi (2021) Trends in Photovoltaic applications 2021: International Energy Agency (IEA) Photovoltaic Power Systems Programme.

<sup>5</sup> Masson, Gaëtan; Kaizuka, Izumi (2021)

## 2 EU legal framework for solar PV integration

This Section charts the legal and policy background surrounding solar PV integration in the EU. Moreover, it highlights specific governance issues of PV solar (for example, concerning subsidization, tariffs, and financial support) within the EU to appraise the role of national legislation and policy to support integrated solar PV. Last, it analyses the broader role of integrated solar PV within the evolving energy generation mix scenarios and the potential trade-offs of its application against conventional solar PV applications.

### 2.1 Contextual information on the support for solar PV in the EU

RES are pressing in the EU for two principal reasons. First, to achieve the EU climate objective of becoming climate-neutral by 2050 under the European Green Deal and second, to reduce dependency on gas and other fossil fuels, increasing energy security. As additional benefits, RES are essential to diminish pollution and lower energy prices.

More specifically, EU law supporting solar PV shows increasing and successive instruments targeting bottlenecks. First, Directive 2009/28 (Renewable Energy Directive – RED) introduced mandatory national targets for RES shares in Member States, which set support schemes and incentives based on RES's high upfront installation costs (as opposed to low operational costs). Second, the Clean Energy for All Europeans legislative package revised RED, introducing Recast Directive (EU) 2018/2001 or Renewable Energy Directive (REDII) and Regulation (EU) 2019/943 or Electricity Market Regulation to modify support schemes for RES, applicable as of 2021. Third, the most recent phases in EU law on promoting RES and solar PV result from the urge to reduce greenhouse gas (GHG) emissions<sup>6</sup>, as 75% of total GHG emissions in the EU are from the energy sector<sup>7</sup>. This new phase started with the EU Green Deal, which aims to reduce GHG emissions by at least 55% by 2030 (compared to 1990 levels) and achieve climate neutrality by 2050, as legally required in Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality (European Climate Law). Finally, another boost to the implementation of solar energy took place with the REPowerEU Plan, adopted after Russia invaded Ukraine in 2022. The REPowerEU sets measures that include faster permitting issues and increased public financing through the Recovery and Resilience Facility (RRF).

### 2.2 Binding target for RES in the EU

REDII sets a binding target for the EU to reach a share of at least 32% of energy from RES in its final gross energy consumption by 2030 (Article 3(1)). A proposal to amend REDII adopted

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<sup>6</sup> Cf. Article 3 (b) and (c) to Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, “emissions” mean “the release of greenhouse gases into the atmosphere from sources in an installation” and “greenhouse gases” mean the gases listed in Annex II, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF<sub>6</sub>).

<sup>7</sup> European Commission (2023) Renewable energy targets. Available online [https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets\\_en](https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en).

on 23 February 2017 planned a more ambitious target of 40%<sup>8</sup>. Another proposal adopted on 14 July 2021 aimed to increase the EU gross final energy consumption in 2030 to at least 40%<sup>9</sup>. On 18 May 2022, following the REPowerEU plan, the Commission proposed to increase the target to 45% by 2030 through Proposal for a Directive of the European Parliament and of the Council amending Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources, Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency<sup>10</sup> (hereafter REDIII proposal). On 30 March 2023, a provisional agreement<sup>11</sup> on this proposal was reached to raise the share of RES in the EU's overall energy consumption to 42.5% by 2030 with an additional 2.5% indicative top-up that would allow reaching 45%.

### 2.3 REPowerEU

Despite the context and regulations supporting the increase in solar energy in the EU for climate purposes, Russia's aggression against Ukraine in February 2022, as mentioned, accelerated this need. The EU is facing an energy crisis from the weaponization of the gas supply and the increase in energy prices, threatening the EU energy security and supply. As a result, on 19 May 2022, the European Commission published the REPowerEU<sup>12</sup> Plan with a roadmap to respond to the energy crisis, including accelerating RES.

Specifically concerning solar PV, the REPowerEU adopted the EU Solar Strategy<sup>13</sup>, which also aims to support BIPV for new buildings and renovations.

**Reference:** According to the EU Solar Strategy, "The opportunities that buildings provide to install solar energy extend well beyond rooftops and parking spaces. Building-integrated PV (BIPV) represents a novel form of solar deployment: they constitute a construction product, while at the same time allowing solar electricity generation

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<sup>8</sup> European Commission (2017) Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast). Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0767R%2801%29>.

<sup>9</sup> European Commission (2021) Proposal for a Directive of the European Parliament and of the Council amending Directive (EU) 2018/2001 of the European Parliament and of the Council, Regulation (EU) 2018/1999 of the European Parliament and of the Council and Directive 98/70/EC of the European Parliament and of the Council as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652. Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0557>.

<sup>10</sup> European Commission (2022) Proposal for a Directive of the European Parliament and of the Council amending Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources, Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A222%3AFIN&qid=1653033811900>.

<sup>11</sup> European Council (2023) Council and Parliament reach provisional deal on renewable energy directive. Available online <https://www.consilium.europa.eu/en/press/press-releases/2023/03/30/council-and-parliament-reach-provisional-deal-on-renewable-energy-directive/>.

<sup>12</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: REPowerEU Plan. Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A230%3AFIN&qid=1653033742483>.

<sup>13</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy. Available online [https://eur-lex.europa.eu/resource.html?uri=cellar:516a902d-d7a0-11ec-a95f-01aa75ed71a1.0001.02/DOC\\_1&format=PDF](https://eur-lex.europa.eu/resource.html?uri=cellar:516a902d-d7a0-11ec-a95f-01aa75ed71a1.0001.02/DOC_1&format=PDF).

from additional surfaces. Despite recent cost reductions, the potential of this sector remains to be unlocked through uptake by the construction sector and the related economies of scale. EU-wide deployment would require homogeneous certification for the affected products, as well as customised professional training and university programmes. National governments can also provide guidance to local authorities on how to deal with BIPV in their permitting decisions. Some Member States have introduced specific opportunities for BIPV in their renewable energy support frameworks. Attaching such support to the construction permit stage can further facilitate the uptake of these products by actors in the construction sector.”

The EU Solar Strategy will bring over 320 GW of solar PV online by 2025 (more than doubling compared to 2020) and install 600 GW by 2030, increasing solar by 43%. Among the four initiatives within the EU Solar Strategy, three are relevant for the purposes of this Report<sup>14</sup> as well as the related recommendation and proposal:

1. EU Solar Rooftop Initiative: phased-in legal obligation to install solar panels on new public, commercial, and residential buildings<sup>15</sup>;
2. Commissions’ permitting package: legislative proposal, recommendation, and guidance to accelerate the deployment of solar energy:
  - a. Commission Recommendation of 18.5.2022 on speeding up permit-granting procedures for renewable energy projects and facilitating Power Purchase Agreements<sup>16</sup>;
  - b. REDIII proposal; and
3. EU Solar PV Industry Alliance: aims to facilitate innovation-led expansion of a resilient industrial solar value chain in the EU, particularly in the PV manufacturing sector.

Furthermore, on 14 March 2023, the Commission proposed to reform the EU electricity market to increase support for RES, phase out gas, protect consumers from volatile fossil fuel prices, and make the EU industry more competitive<sup>17</sup>. The proposal reforms, among others, Regulation EU 2019/947 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (Electricity Regulation), Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (Electricity Directive), and

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<sup>14</sup> The fourth initiative concerns the EU large-scale skills partnership for onshore renewable energy, including solar.

<sup>15</sup> For the EU Solar Rooftop Initiative, see section 4 of this Report.

<sup>16</sup> European Commission (2022) Commission Recommendation of 18.5.2022 on speeding up permit-granting procedures for renewable energy projects and facilitating Power Purchase Agreements. Available online [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI\\_COM%3AC%282022%293219&qid=1653033569832](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM%3AC%282022%293219&qid=1653033569832)

<sup>17</sup> Cf. European Commission (2023) Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union’s electricity market design. Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0148&qid=1679410882233>; European Commission (2023) Proposal for a Regulation of the European Parliament and of the Council amending Regulations (EU) No 1227/2011 and (EU) 2019/942 to improve the Union’s protection against market manipulation in the wholesale energy market. Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023PC0147&qid=1679411047615>.

Regulation (EU) 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency (REMIT Regulation).<sup>18</sup>

**Transnational perspective:** Regulation (EU) 2022/869 was adopted in 2022 following the EGD and the increasing need for renewable energy and energy security and sets guidelines for trans-European energy infrastructure (TEN-E). Together with Regulation (EU) 2021/1153 establishing the Connecting Europe Facility, these regulations can further support cross-border cooperation on solar energy according to the EU Solar Energy Strategy, which has as one dimension the international cooperation in the field of solar energy and increasing the integration of solar electricity generated across the EU. This could further support the development of integrated solar PV, such as in noise barriers among border highways. For example, Regulation (EU) 2021/1153 mentions that cross-border projects “contribute to the strategic uptake of innovative technologies concerning renewable energy” such as solar energy.

## 2.4 Support for solar PV

Article 194(1)(c) of the Treaty on the Functioning of the European Union (TFEU) requires Union policy on energy to aim, among others, to promote new and renewable forms of energy. The European Commission sees public intervention to support RES as essential due to market and regulatory failures, including unfair competition with other fuels, such as fossil and nuclear subsidies.<sup>19</sup> For the REPowerEU, the Commission assessed the need for additional investments of 210 billion euros until 2027 to phase out Russian fossil fuel imports.<sup>20</sup> These would include 86 billion euros for renewables, financed by the RRF.

### 2.4.1 Support schemes

Member State’s support for solar PV is not new. As mentioned, Directive 2009/28/EC set mandatory national targets for RES, which boasted national support schemes. Support schemes help accelerate RES, especially innovative technologies such as integrated solar PV.

As “public interventions need to be well designed and proportionate to avoid additional market distortions”<sup>21</sup>, the support schemes applied by Member States have increased the share of renewables but have not controlled its effects fully. For example, Member States passed high costs to consumers through surcharges, consequently reversing the guarantees previously granted to beneficiaries.<sup>22</sup>

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<sup>18</sup> European Commission (2023) Commission proposes reform of the EU electricity market design to boost renewables, better protect consumers and enhance industrial competitiveness. Available online [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_23\\_1591](https://ec.europa.eu/commission/presscorner/detail/en/ip_23_1591).

<sup>19</sup> European Commission (2013) Commission Staff Working Document. European Commission guidance for the design of renewables support schemes accompanying the document Communication from the Commission Delivering the internal market in electricity and making the most of public intervention. Available online [https://energy.ec.europa.eu/system/files/2014-10/com\\_2013\\_public\\_intervention\\_swd04\\_en\\_2.pdf](https://energy.ec.europa.eu/system/files/2014-10/com_2013_public_intervention_swd04_en_2.pdf).

<sup>20</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: REPowerEU Plan, p. 12.

<sup>21</sup> European Commission (2013) Commission Staff Working Document. European Commission guidance for the design of renewables support schemes accompanying the document Communication from the Commission Delivering the internal market in electricity and making the most of public intervention, p. 3.

<sup>22</sup> Iliopoulos, T. G. (2022) Support schemes for renewable energy sources in the EU. EU Law Live, 89:12, p. 5.



The need to reform support schemes came with REDII. It repealed Directive 2009/28/EC and set the legal framework for promoting RES across all sectors in the EU. Between 2018 and 2019, four main types of support schemes were adopted in Europe<sup>23</sup>:

- a) Feed-in tariffs (FiTs): Government-fixed guaranteed price per electricity unit fed into the grid that is paid to RES producers;
- b) Feed-in premiums (FiPs): Fixed or sliding premium paid on top of the market price to RES producers;
- c) Green Certificates (GCs): Official records that can be traded and represent the added environmental value of RES, proving a specified amount of green electricity has been generated. It has limited use in the EU<sup>24</sup>;
- d) Investment grants: Public money directly paid to support investments that generate RES. Not so common in the EU<sup>25</sup>.

The need for changes in support schemes and integration of State aid guidelines (see next section) revised REDII in 2018 to regulate support-scheme-specific provisions as of 2021. The current reading of REDII predicts financial instruments to reduce costs, support infrastructure (for example, transmission and distribution grids), integration, and cooperation between EU countries.<sup>26</sup>

**Definition:** According to current reading of Article 2(5) of REDII, a support scheme is “[...] any instrument, scheme or mechanism applied by a Member State, or a group of Member States, that promotes the use of energy from renewable sources by reducing the cost of that energy, increasing the price at which it can be sold, or increasing, by means of a renewable energy obligation or otherwise, the volume of such energy purchased, including but not restricted to, investment aid, tax exemptions or reductions, tax refunds, renewable energy obligation support schemes including those using green certificates, and direct price support schemes including feed-in tariffs and sliding or fixed premium payments”.

As before, REDII allows Member States to apply support schemes. These provide incentives for the integration of RES under Article 4 as long as it follows some principles, such as avoiding market distortions and considering integration costs and grid stability.

Member States can grant direct price support schemes as a sliding or fixed market premium. Direct price instruments and quantity instruments are “[t]he most widespread, so-called primary, support schemes [...] that assist in the generation of renewable energy over many years.”<sup>27</sup> Producers receiving financial support from a support scheme have the market value of the guarantee of origin for the same production appropriately considered in the relevant support scheme under Article 19(2). In addition, Article 4(5) of REDII allows Member States

<sup>23</sup> Council of European Energy Regulators (CEER) (2021) Status Review of Renewable Support Schemes in Europe for 2018 and 2019: CEER report. Available online <https://www.ceer.eu/documents/104400/-/-/ffe624d4-8fbb-ff3b-7b4b-1f637f42070a>.

<sup>24</sup> European Commission (2013) Commission Staff Working Document. European Commission guidance for the design of renewables support schemes accompanying the document Communication from the Commission Delivering the internal market in electricity and making the most of public intervention, p. 15.

<sup>25</sup> Id.

<sup>26</sup> Cf. Directive (EU) 2018/2001, Article 3 (5).

<sup>27</sup> Iliopoulos, T. G. (2022), p. 3.

to limit tendering procedures to specific technologies, which can further support new technologies and customised solar PV. This is possible if granting support schemes to all types of renewable sources would lead to a suboptimal result, considering, among others, the long-term potential of a particular technology and the need for diversification. However, Iliopoulos argues that technology-specific bidding and feed-in tariffs are only exceptionally accepted.

**Transnational perspective:** Member States can **support electricity from renewables generated in another Member State** provided conditions under the REDII are met. For example, it must support an indicative, annual share of the newly-supported capacity of at least 5% between 2023 and 2026 and at least 10% from 2027 to 2030. Article 5 (1). Besides, Member States can cooperate on all types of **joint projects** between Member States and/or third countries to produce electricity from renewable sources and may involve private operators. Articles 9 (1) and 11 (1). Member States may also voluntarily join or partly coordinate their national support schemes. Article 13 (1).

Even though REDII grants Member States the competence to design and enact the mentioned support schemes, REDII is silent on the conditions that would justify national support schemes for renewables. These can be found in State aid law,<sup>28</sup> rules that helped shape the changes in EU secondary law for promoting RES.

#### 2.4.2 State aid for solar PV

Article 107(1) of the TFEU sets criteria for State aid: (a) aid granted by a Member State or through State resources, (b) distortion or threatening to distort competition, (c) selectivity (selective advantage), and (d) effects in trade between Member States. The European Commission assesses the compatibility of support schemes for renewable energies with the internal market. In practice, it has “[...] never rejected a support scheme as incompatible”, always affirming the need for support due to a presumed residual market failure to renewable energies.<sup>29</sup> Aligned with the EU Green Deal, the new EU State aid rules under the Guidelines on State aid for climate, environmental protection and energy 2022 (CEEAG)<sup>30</sup> apply from January 2022 and support projects for environmental protection (including climate protection) and activities in the energy sector.

Generally, the CEEAG prevents aid to fossil fuels, restricts aid to natural gas (subject to demonstration that there is no lock-in effect), integrates the do no significant harm principle, and adds assistance for the closure of coal, peat, and oil shale plants (points 72 and 74, and 420 onwards). Points 127 and 134 refer to the mentioned considering specific support for decarbonization and point 156, for example, for improving building performance. Other criteria that support integrated solar PV, for example, is that the Commission will “generally look favourably” at measures that facilitate the participation of small and medium-sized

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<sup>28</sup> Iliopoulos, T. G. (2021). The purposefulness and serviceability of renewable energy support schemes. In Ashiabor H., Milne J. E., Andersen M. S. (Ed). Environmental taxation in the pandemic era. Edward Elgar Publishing, pp. 214-228.

<sup>29</sup> Iliopoulos, T. G. (2021), p. 221.

<sup>30</sup> European Commission (2022) Communication from the Commission - Guidelines on State aid for climate, environmental protection and energy 2022 (2022/C 80/01). Available online [https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ%3AC%3A2022%3A080%3ATOC&uri=uriserv%3AOJ.C\\_.2022.080.01.0001.01.ENG](https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ%3AC%3A2022%3A080%3ATOC&uri=uriserv%3AOJ.C_.2022.080.01.0001.01.ENG)

enterprises (SMEs) and renewable energy communities in competitive bidding processes (point 75).

More specifically, item 2.2 of the CCEAG includes the following categories of activities related to solar PV integration compatible with State aid:

- a) Aid for reducing GHG emissions, including supporting all types of renewable energy; and
- b) Aid for improving energy and environmental performance of buildings.

Concerning (a), the CCEAG presumes measures to reduce GHG emissions and achieve decarbonization goals are appropriate provided all other compatibility conditions are met (point 93). For example, limited eligibility can be allowed for projects selected following an open call part of a large integrated cross-border project having an important contribution to environmental protection and applying innovative technology (point 96, item g). This is a criterion that supports customised technology for integrated solar panels.

The CCEAG also exempts the following from competitive bidding processes (point 107):

- a) Electricity generation projects up or equal to 1 MW of installed capacity; and
- b) 100% SME-owned or renewable energy community projects equal to or below 6 MW of installed capacity.

Concerning (b), the CCEAG allows State aid for installing integrated on-site renewable energy installations generating electricity (point 137). Among others, the aid must induce a reduction in the energy demand of existing buildings of at least 20% or a reduction of at least 10% compared to the threshold set for nearly zero-energy building requirements for new buildings (point 139).

#### 2.4.3 Recovery and Resilience Facility (RRF)

The RRF is a temporary instrument in place until 31 December 2026 created by Regulation (EU) 2021/241 to mitigate the impacts of the COVID-19 crisis. It provides Member States with financial support as set out in their national recovery and resilience plans to carry out reforms and implement investments. Regulation (EU) 2023/435 amended the RRF to, among others, add a REPowerEU chapter responding to the mentioned energy market disruption. It provides additional EU funding to help Member States reform and invest to end their dependence on Russian fossil fuels.

**Example:** The Belgium recovery and resilience plan<sup>31</sup> includes climate, sustainability, and innovation as one of its strategic areas, including the renovation of buildings and emerging energy technologies. For the renovation of buildings, the plan mentions the installation of RES, such as photovoltaic panels. Concerning energy technologies, the plan mentions green hydrogen, carbon capture and storage, and offshore wind power, among others. However, the Belgium plan does not refer to integrated solar PV technology or solar customised

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<sup>31</sup> Belgium Government (2021) *Plan National pour la Reprise et la Résilience Belgique*. Available online <https://dermine.belgium.be/sites/default/files/articles/FR%20-%20Plan%20national%20pour%20la%20reprise%20et%20la%20re%CC%81silience.pdf>.

products. Similarly, the Dutch recovery and resilience plan<sup>32</sup> considers switching to RES, such as solar energy, essential to achieve the country's climate and energy targets. It also mentions building renovation initiatives to, among others, reinforce roofs to install solar panels. However, the plan does not refer to integrated solar PV or support for customised PV technologies.

## 2.5 Electricity regulatory framework

The regulatory framework for electricity also influences the deployment of integrated solar PV as policy and public support have driven the introduction and increase of RES in the EU. Electricity market regulation influences the increase of RES as these technologies must be competitive in the market following their high structure cost. Literature argues the need for long-term contracts to stabilize market revenues for RES and understands that the profitability of RES depends on (a) the price level of energy commodities and the carbon price and (b) the flexibility of the electricity system to reduce the “cannibalisation effect” (when the market value is lower than the average price of electricity following the increase of renewable capacity) that renewables have on their own revenues.<sup>33</sup>

Following the mentioned 2019 Clean energy for all Europeans package, Directive EU/2019/944 and Regulation EU/2019/943 put the consumer at the centre of the energy transition and increases their participation in the energy market. Additionally, Regulation (EU) 2018/1999 establishes energy government mechanisms to ensure the Energy Union and Climate Action is reliable, inclusive, cost-efficient, transparent, and predictable. The goal is to align energy generation with climate objectives, in the core of the energy transition. Most importantly, the Regulation sets five dimensions for the Energy Union, among which research, innovation, and competitiveness. As integrated solar PV is a customised technology, this dimension is key to further develop it and ensure it is competitive in the market.

As mentioned, the European Commission adopted a proposal on 14 March 2023 to revise the electricity market design and improve the wholesale of the energy market. It proposes using long-term contracts, such as power purchase agreements (PPA) and support RES with contracts for difference. The ultimate goal is to ensure the energy transition while keeping low electricity prices, and accelerating RES.

### 2.5.1 Ownership of solar PV installations and self-generated electricity

Self-consumption of electricity from RES is “[...] the use of power generated on-site by an energy consumer in order to reduce, at least in part, the purchase of electricity from the grid”.<sup>34</sup> Article 15(3) of REDII requires Member States to regulate renewables for self-consumption. Generally, self-generation includes the right to sell the electricity exceeding consumption without disproportionate charges and procedures and participate in all electricity markets. However, the EU Solar Energy Strategy mentions these principles are not

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<sup>32</sup> Dutch Government (2021) *Het Nederlandse Herstel- en Veerkrachtplan*. Available online <https://open.overheid.nl/documenten/ronl-abc474ae7a39fe82e5f6f276ab663739cdb56902/pdf>.

<sup>33</sup> Cf. Busch S. et al (2023) *The Development of Renewable Energy in the Electricity Market: Discussion Paper 187 - JUNE 2023*. Available online [https://economy-finance.ec.europa.eu/system/files/2023-06/dp187\\_en\\_energy%20markets.pdf](https://economy-finance.ec.europa.eu/system/files/2023-06/dp187_en_energy%20markets.pdf)

<sup>34</sup> Council of European Energy Regulators (CEER) (2021), p. 37.

yet widely implemented across the EU, especially in multi-apartment buildings (this is further analysed in Section 4.3 about energy communities).<sup>35</sup> Besides, the mentioned Commission Recommendation of 18.5.2022 recommends Member States to reduce requirements and licensing procedures to a minimum for renewable self-consumers.

#### 2.5.2 Simple-notification procedure for grid connections

Installations or aggregated production units of renewables self-consumers are subject to a simple-notification procedure for grid connections as follows:

- a) Electrical capacity of 10,9 kW or less, or equivalent for connections other than three-phase connections: connected to the grid following a notification to the distribution system operator;<sup>36</sup>
- b) Electrical capacity above 10,8 kW and up to 50 kW: connected to the grid following a notification to the distribution system operator provided grid stability, grid reliability, and grid safety are maintained.<sup>37</sup>

The mentioned Commission Recommendation of 18.5.2022 recommends Member States to establish a simple-notification procedure for grid connection from repowering existing renewables if no significant negative environmental or social impact is expected.

#### 2.5.3 Power Purchase Agreements (PPA)

As mentioned, long-term contracts such as PPA are seen as solutions to increase the deployment of RES, which could also support integrated solar PV. PPA are long-term contracts between a RES producer and businesses that agree to directly purchase electricity from them.

**Definition:** Article 2(17) of REDII defines “renewables power purchase agreement” as “a contract under which a natural or legal person agrees to purchase renewable electricity directly from an electricity producer”.

Under Article 15(8), REDII requires Member States to assess the regulatory and administrative barriers to long-term renewables PPA, remove unjustified barriers and facilitate their uptake, and not set disproportionate or discriminatory procedures or charges. However, there are still several barriers that impede the implementation of renewables PPA. Again, the mentioned Commission Recommendation of 18.5.2022 recommends Member States remove unjustified administrative or market barriers to corporate renewables PPA, especially by small and medium-sized enterprises (SME) and design and implement support schemes compatible with renewables PPA. Under the REPowerEU Plan, the European Commission also provides guidance on renewable energy and power purchase agreements and will provide a technical advisory facility with the European Investment Bank.

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<sup>35</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 10.

<sup>36</sup> Cf. Directive (EU) 2018/2001, Article 17 (1).

<sup>37</sup> Cf. Directive (EU) 2018/2001, Article 17 (2).

#### 2.5.4 Taxation and tariffs

Regulation EU/1227/2011 on Wholesale Energy Market Integrity and Transparency (REMIT) ensures fair and competitive prices avoiding market abuse. In addition, Article 15(1)(b) of Council Directive 2003/96/EC (Energy Taxation Directive) allows Member States apply under fiscal control total or partial exemptions or reductions in the level of taxation to electricity from solar energy. This is not a benefit applicable only to solar but also to electricity from wind, wave, tidal or geothermal origin; hydraulic origin produced in hydroelectric installations; generated from biomass or from products produced from biomass; or generated from methane emitted by abandoned coalmines. The 2021 Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (recast) continues to allow not taxing electricity of solar origin.<sup>38</sup>

Additionally, Council Directive (EU) 2022/542 also make it possible to Member States to apply reduced VAT rates to energy efficient, low emission heating systems, including solar panels. It has included solar panels to further support the energy transition and improve access to final consumers to such technologies. Even though it does not specifically mentions integrated solar PV, Member States are allowed to apply such reductions to foster its deployment.

National Regulatory Authorities (NRAs) are responsible for setting transparent, non-discriminatory, and cost-effective tariffs. This also include prosumers and energy communities which, even though not specifically applicable to integrated solar PV, could support their implementation.

#### 2.6 Permitting issues for solar PV

REDII requires Member States to ensure national regulations on the authorisation, certification, and licensing procedures to generate electricity from RES are proportionate, necessary, and contribute to implementing energy efficiency first principle (Article 15(1)). This includes setting timeframes, considering the particularities of individual renewable energy technologies, and simplifying procedures for decentralized devices and the production and storage of energy from RES.<sup>39</sup>

**Example:** Solar energy in Germany will require a permit depending on where and how the installation is developed. According to the Federal Building Code (BauGB), installing small rooftop solar photovoltaic systems parallel to the roof or façade by private individuals is exempted from approval. For example, solar energy is allowed in the 'external area' (*Außenbereich*)<sup>40</sup> if public interests are not opposed, including solar PV installed on buildings, integrated solar PV, and solar PV along highways and railroads.

Besides, national contact points for the permit-granting process must distinctly provide information on the procedures addressing small-scale and renewable self-consumer projects,

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<sup>38</sup> European Commission (2021) Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity (recast). Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0563>.

<sup>39</sup> Directive (EU) 2018/2001, Article 15 (1).

<sup>40</sup> The external area or *Außenbereich* refers to constructions that are not within the scope of a development plan (*Bebauungsplan*) and that do not belong to a built-up district. It is regulated § 35 of the BauGB.



which can further boost the installation of integrated solar PV (Article 16(3)). Issues in permit-granting procedures, such as complexity and duration, are the most significant barriers identified to renewable energies. The second main source of obstacles is the conflict with other public goods, such as environmental protection, especially biodiversity and the protection of endangered species<sup>41</sup>. Additional limitations to the integration of solar PV refer to listed buildings.

### 2.6.1 Duration of the process

REDII sets the maximum duration for the permit-granting process that can apply to PV<sup>42</sup>:

- a) Power plants: maximum of **two years** for power plants, extended by up to one year if duly justified based on extraordinary circumstances;
- b) Installations with an electrical capacity of less than 150 kW: maximum of **one year**, extended by up to one year if duly justified based on extraordinary circumstances;
- c) Repowering existing renewable energy plants: maximum of **one year**, extended by up to one year if duly justified based on extraordinary circumstances (such as overriding safety reasons where the repowering project substantially impacts the grid or the original capacity, size, or performance of the installation); and
- d) Grid connections for repowering projects: maximum of **six months** for simple-notification procedures to decide if the notification is sufficient and, if so, automatically grant the permit. If not sufficient, same as item c.<sup>43</sup>

REDII itself does not establish a differentiated duration or simplified procedures for the integrated solar PV permit-granting process. However, the provisional agreement reached on 30 March 2023<sup>44</sup> on the REDIII proposal includes accelerating permitting procedures for renewable energy projects (it is unclear if the maximum duration of permit-granting processes would be set in the Directive or by each Member State).

### 2.6.2 Temporary rules speeding up the permit-granting process

Following a proposal from the European Commission<sup>45</sup>, Council Regulation (EU) 2022/2577 was published on 29 December 2022 in the Official Journal of the European Union to support and accelerate the deployment of renewable energies in the EU. As mentioned, long and

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<sup>41</sup> Cf., among others, European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy.

<sup>42</sup> The deadlines apply “[...] without prejudice to obligations under applicable Union environmental law, to judicial appeals, remedies and other proceedings before a court or tribunal, and to alternative dispute resolution mechanisms, including complaints procedures, non-judicial appeals and remedies, and may be extended for the duration of such procedures.” Directive (EU) 2018/2001, Article 16 (7).

<sup>43</sup> Directive (EU) 2018/2001, Article 16 (3) (4) (5) (6) (8).

<sup>44</sup> European Council (2023). Council and Parliament reach provisional deal on renewable energy directive. Available online <https://www.consilium.europa.eu/en/press/press-releases/2023/03/30/council-and-parliament-reach-provisional-deal-on-renewable-energy-directive/>.

<sup>45</sup> European Commission (2022) Proposal for a Council Regulation laying down a framework to accelerate the deployment of renewable energy. Available online. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A0591%3AFIN>.

complex permit-granting processes have been identified as an obstacle to deploying renewables, including solar.<sup>46</sup>

Effective 30 December 2022, Council Regulation (EU) 2022/2577 sets temporary rules to speed up the RES permit-granting process, applicable until 30 June 2024<sup>47</sup> to:

1. Permit-granting processes that have a starting date between 30 December 2022 and 30 June 2024<sup>48</sup>; and
2. Ongoing permit-granting processes that did not have a final decision before 30 December 2022 provided this shortens the permit-granting process and pre-existing third-party legal rights are not affected<sup>49</sup>.

It establishes a maximum deadline of:

1. **Three months**<sup>50</sup> for the permit-granting process for installing solar energy equipment and co-located storage assets on existing or future artificial structures created for purposes different than solar energy production, such as **building-integrated solar installations** and rooftop solar energy equipment.<sup>51</sup> Member States can further shorten this deadline<sup>52</sup>; and
2. **Six months**<sup>53</sup> for the permit-granting process of repowering existing installations.<sup>54</sup>

In addition, the installation of solar PV with a capacity of 50 kW or less<sup>55</sup> benefits from positive administrative silence. If the relevant authorities do not reply within one month in the permit-granting process for such installations, their permit is considered granted if their capacity does not exceed the existing capacity of the connection to the distribution grid.<sup>56</sup>

**Transnational perspective:** Council Regulation (EU) 2022/2577 refers to the principle of energy solidarity as a general principle of Union law according to the European Court of Justice judgment of 15 July 2021 in Case C-

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<sup>46</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 6.

<sup>47</sup> Article 9 of Council Regulation (EU) 2022/2577 contains a review clause for the Commission to propose extending its validity, if necessary.

<sup>48</sup> Council Regulation (EU) 2022/2577, Article 1, part 2.

<sup>49</sup> Council Regulation (EU) 2022/2577, Article 1, part 3.

<sup>50</sup> Not counting (a) grid connections and related necessary grid infrastructure being built or repowered except when it coincides with other administrative stages of the permit-granting process and (b) the time spent on the administrative stages necessary for completing significant upgrades to the grid required to ensure grid stability, reliability, and safety. Cf. Council Regulation (EU) 2022/2577, Article 8.

<sup>51</sup> Council Regulation (EU) 2022/2577, Article 4 (1).

<sup>52</sup> Council Regulation (EU) 2022/2577, Article 1, part 2.

<sup>53</sup> Within the mentioned deadlines, environmental impact assessments are included if applicable and the upgrade of the assets needed for grid connection if the repowering also increases the installations' capacity.

<sup>54</sup> Council Regulation (EU) 2022/2577, Article 5 (1).

<sup>55</sup> Member States can apply a lower threshold above 10,8 kW if the mentioned capacity threshold results in a significant administrative burden or constraints to the operation of the grid. Council Regulation (EU) 2022/2577, Article 4 (4).

<sup>56</sup> Council Regulation (EU) 2022/2577, Article 4 (3).



848/19 P<sup>57</sup>, Germany v Poland. The Regulation affirms it implements the principle of energy solidarity as it allows for cross-border distribution of the positive effects of the faster deployment of renewable energy projects in all Member States, including solar PV on existing and new structures and the repowering of existing installations.

Aside from Council Regulation (EU) 2022/2577, the above-referred Commission Recommendation of 18.5.2022 mentions complex and long procedures as a significant barrier to RES. It recommends Member States on faster and shorter procedures for renewables (including repowering), including qualifying them for the most favourable procedure, setting accelerated and short deadlines, binding maximum deadlines for the environmental impact assessment procedure, and, specifically relevant for solar PV, a maximum duration of three months to the permit-granting procedures for installing solar energy equipment in artificial structures. Other recommendations include further coordination between levels of competencies and authorities, decisions subject to positive silence, and designing a "one-stop-shop" for granting permits.

Again, the REDIII proposal will further simplify and harmonize the EU's permit-granting procedures for renewable energy projects. It considers the particularities of integrated solar PV, especially the promotion of renewables in buildings (this topic is detailed under item 4.1).

### 2.6.3 Environmental impact assessment

Under Directive 2011/92/EU or EU Environmental Impact Assessment Directive (EIA Directive), Member States are responsible for determining if solar PV projects, as well as changes or extensions to existing ones, are subject to environmental impact assessments.<sup>58</sup>

**Example:** The Environmental Impact Assessment Act in Germany (UVPG) does not list solar PV in Annex 1 as projects to which an environmental impact assessment is mandatory. Solar PV is also not listed in Subsection C of the Dutch Decision Environmental Impact Assessment of 4 July 1994 concerning mandatory environmental impact assessment.

However, Council Regulation (EU) 2022/2577 establishes temporary exemptions considering the particularities of solar PV for (a) solar panels on roofs, parking lots, sheds, along transport infrastructure, or any other artificial structures, and (b) small installations below 50 kW. More specifically, between 30 December 2022 and 30 June 2024, installing solar energy equipment and co-located storage assets on existing or future artificial structures created for purposes different than solar energy production, such as building-integrated solar installations and rooftop solar energy equipment, is exempted from carrying out an environmental impact assessment or being subject to a determination to assess whether they must carry out one in all Member States.<sup>59</sup> Member States remain allowed not to apply the exemption to certain areas or structures to protect the cultural or historical heritage or for national defence interests or safety.<sup>60</sup>

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<sup>57</sup> Judgment of the Court of Justice of 15 July 2021, Germany v Poland, C-848/19 P, ECLI:EU:C:2021:598

<sup>58</sup> Directive 2011/92/EU, Article 2 (1), Article 4 (2), and Annex II, points 3 (a) and 13 (a).

<sup>59</sup> Council Regulation (EU) 2022/2577, Article 4 (1).

<sup>60</sup> Council Regulation (EU) 2022/2577, Article 4 (2).

Besides, in the case of repowering solar energy equipment, an environmental impact assessment or prior determination, if required, must be limited to the potentially **significant** impacts from the change or extension compared to the original project.<sup>61</sup> However, solar installations are again exempted if the repowering does not result in using additional space, and the repowered installation complies with the environmental mitigation measures set for the original one.<sup>62</sup>

Member States can also exempt solar energy installations from carrying out an environmental impact assessment and species protection assessments<sup>63</sup> under the following conditions<sup>64</sup>:

1. The project is located in a dedicated renewable area (if Member States have set one) and carried out a strategic environmental assessment;
2. The competent authority applies appropriate and proportionate mitigation measures to protect animal and bird species<sup>65</sup>; and
3. The competent authority ensures the operator pays monetary compensation for species protection programmes if the measures under item 2 are not available.

The mentioned Commission Recommendation of 18.5.2022 recommends Member States streamline environmental impact assessment requirements by, among others, applying available technical guidance to reconcile renewable energy and environmental legislation and integrating environmental impact assessment with other applicable environmental assessments.

The original REDIII proposal does not mention environmental impact assessments. However, the provisional agreement reached on 30 March 2023 includes accelerating permitting procedures, allowing Member States to design acceleration areas for renewable energy projects and presuming them of overriding public interest, limiting objections to new installations.

#### 2.6.4 Overriding public interest in RES

The provisional agreement under the REDIII Proposal aims to enshrine in a Directive the overriding public interest of renewable energy projects (not further specified). Currently, Council Regulation (EU) 2022/2577 gives a temporary rebuttable presumption that the planning, construction, and operation of renewable energy projects, their connection to the grid, and storage assets are of **overriding public interest** and serve public health and safety and, therefore, have priority when balancing legal interests. Member States can restrict this

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<sup>61</sup> Council Regulation (EU) 2022/2577, Article 5 (3).

<sup>62</sup> Council Regulation (EU) 2022/2577, Article 5 (4).

<sup>63</sup> Referring to the species protection assessments under Article 12 (1) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora and Article 5 of Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

<sup>64</sup> Council Regulation (EU) 2022/2577, Article 6.

<sup>65</sup> Protected animal species are those listed under Annex IV to Council Directive 92/43/EEC. Directive 2009/147/EC protects all naturally occurring bird species in the wild state, as well as their eggs, nests, and habitats.

provision to certain parts of their territory and technologies or projects.<sup>66</sup> Nevertheless, the presumption applies to decision-making authorities when balancing legal interests for:

1. Article 6(4)<sup>67</sup> and Article 16(1)(c)<sup>68</sup> of Council Directive 92/43/EEC;
2. Article 4(7) of Directive 2000/60/EC<sup>69</sup> of the European Parliament and of the Council; and
3. Article 9(1)(a)<sup>70</sup> of Directive 2009/147/EC of the European Parliament and of the Council.

In the case of species protection, the renewable energy project can only be considered a priority when balancing legal interests if and to the extent that the entrepreneur takes appropriate species conservation measures contributing to the maintenance or restoration of the populations of the species at a favourable conservation status, and provides sufficient financial resources and areas for that purpose.<sup>71</sup>

The mentioned Commission Recommendation of 18.5.2022 recommends Member States presume renewable energies of overriding public interest for permitting-granting purposes. It also recommends that Member States ensure killing or disturbing individual specimens of wild birds and protected species is not an obstacle to renewables. This would require renewables to integrate mitigation measures to prevent the killing and disturbance, monitor the effectiveness of such measures, and take further actions if necessary. Compliance with the mentioned would presume incidental killing or disturbance from renewables is not deliberate<sup>72</sup>.

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<sup>66</sup> Council Regulation (EU) 2022/2577, Article 3 (1) and (2).

<sup>67</sup> "Article 6(4): If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest."

<sup>68</sup> "Article 16(1)(c): Provided that there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range, Member States may derogate from the provisions of Articles 12, 13, 14 and 15 (a) and (b): [...] (c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment."

<sup>69</sup> This concerns water policy, which is not relevant to this Report as not including solar offshore technologies.

<sup>70</sup> "Article 9(1)(a): Member States may derogate from the provisions of Articles 5 to 8, where there is no other satisfactory solution, for the following reasons: (a) in the interests of public health and safety, in the interests of air safety, to prevent serious damage to crops, livestock, forests, fisheries and water, for the protection of flora and fauna."

<sup>71</sup> Council Regulation (EU) 2022/2577, Article 3 (2).

<sup>72</sup> Not under Article 12(1) of Directive 92/43/EEC nor Article 5 of Directive 2009/147/EC of the European Parliament and of the Council.

### 2.6.5 Other limits: monumental and historical buildings

Aside from environmental and species assessments, solar energy is also subject to environmental and building construction limits (such as cultural and heritage protection). The mentioned Council Regulation (EU) 2022/2577 to accelerate the deployment of renewable energy provides Member States with the possibility of excluding certain areas or structures due to reasons of cultural or historical heritage protection from the maximum three months duration for the permit-granting process for the **installation of BIPV** in new and existing structures.

The protection of historical buildings is also mentioned in Directive 2010/31/EU on the energy performance of buildings (Energy Performance of Buildings Directive - EPBDII). It requires Member States to take the necessary measures to ensure minimum energy performance requirements for buildings or building units, except for buildings officially protected as part of a designated environment or because of their special architectural or historical merit, provided compliance with certain minimum energy performance requirements would unacceptably alter their character or appearance (Article 4(2)a).

**Example:** In July 2023, the Berlin State Heritage Authority and the Senate Department for Economics, Energy and Public Works published guidelines for installing solar PV on listed buildings<sup>73</sup>. This follows the Berlin Solar Act, which mandates, as of 1 January 2023, that 30% of the gross roof area of new buildings and significant construction work on roofs in buildings with a usable area of more than 50 square meters have solar PV. However, the Act exempts the solar obligation if the installation of solar PV contradicts other regulations under public law, including the protection of historical monuments under the Monument Conservation Act (DSchG Bln). In any case, installing solar PV in monument buildings requires a permit. Noteworthy is that the mentioned guidelines include the use of integrated solar PV in monument buildings. Despite being easier to install BIPV in new buildings, the guidelines include several BIPV use examples due to its high potential for design options, visually unobtrusive solutions used in roof coverings, and other systems meeting high aesthetic requirements.

### 2.7 Integrated solar PV manufacturing

In 2021, China produced 75% of worldwide solar photovoltaic modules.<sup>74</sup> This number is even higher when it comes to supplying solar PV equipment and all the manufacturing stages of solar panels (such as polysilicon, ingots, wafers, cells, and modules). For example, China produces 96.8% of global wafers, 85.1% of cells, and 79.4% of polysilicon.<sup>75</sup> It has helped decrease the costs of solar PV and, therefore, increased its deployment worldwide. China remains “the most cost-competitive location to manufacture all components of the solar PV supply chain”. For example, manufacturing costs in China are 35% less than in Europe.<sup>76</sup> Such

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<sup>73</sup> Landesdenkmalamt Berlin (2023) *Denkmale & Solaranlagen: Möglichkeiten, Anforderungen und Rahmenbedingungen* (2023). Available online <https://www.berlin.de/landesdenkmalamt/aktivitaeten/kurzmeldungen/2023/denkmale-und-solaranlagen-1349588.php>.

<sup>74</sup> Statista (2022) Distribution of solar photovoltaic module production worldwide in 2021, by country. Available online <https://www.statista.com/statistics/668749/regional-distribution-of-solar-pv-module-manufacturing/>

<sup>75</sup> International Energy Agency (IEA) (2022) Special Report on Solar PV Global Supply Chains. Available online: <https://iea.blob.core.windows.net/assets/d2ee601d-6b1a-4cd2-a0e8-db02dc64332c/SpecialReportonSolarPVGlobalSupplyChains.pdf>

<sup>76</sup> International Energy Agency (IEA) (2022), p. 10.

numbers result from heavy investments in the sector, which represented ten times more than what Europe invested.<sup>77</sup>

### 2.7.1 EU Solar PV Industry Alliance

Within the EU Solar Energy Strategy, the EU Solar PV Industry Alliance aims to regain production lost to China, create entire solar PV value chains in the EU, invest in innovation, and expand the PV manufacturing sector in the EU. Among the first priority actions for the Alliance is the implementation of ecodesign requirements for PV systems and products<sup>78</sup>.

Investments in the manufacturing industry are essential for BIPV as customised options. According to the EU Solar Energy Strategy, the rapid growth of solar energy in general requires new technological, digital, and operational advances and supportive policies and instruments that provide “a level playing field for all solar technologies and do not favour one against the other”, leaving to national and local authorities the promotion of the most efficient solution for each situation<sup>79</sup>. As a result, the EU Solar Energy Strategy predicts financial support for **innovation in tailored products and integrated design**.<sup>80</sup> The Commission will develop a guidance for Member States to promote innovative forms of solar energy deployment. Currently, the Commission Recommendation of 18.5.2022 recommends Member States to set regulatory sandboxes to exempt innovative technologies, products, services, or approaches from regulatory frameworks and facilitate their permit-granting process.

### 2.7.2 Product regulation for integrated solar PV

Integrated solar PV products are both energy-related<sup>81</sup> and construction ones<sup>82</sup>. Directive 2009/125/EC (Ecodesign Directive) establishes a framework for setting ecodesign requirements for energy-related products covered by a specific EU Regulation. There is currently no specific regulation applicable to solar PV or BIPV. Concerning construction products, Regulation EU/305/2011 (Construction Products Regulation) requires manufacturers to, among others, comply with the essential requirements laid out in harmonised standards or European Technical Assessments (ETA) to ensure the safety and

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<sup>77</sup> International Energy Agency (IEA) (2022), p. 10.

<sup>78</sup> About the European Solar PV Industry Alliance. Available online <https://solaralliance.eu/about-us/>.

<sup>79</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 12.

<sup>80</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 16.

<sup>81</sup> “‘Energy-related product’, (a ‘product’), means any good that has an impact on energy consumption during use which is placed on the market and/or put into service, and includes parts intended to be incorporated into energy-related products covered by this Directive which are placed on the market and/or put into service as individual parts for end-users and of which the environmental performance can be assessed independently”. (Article 2(1) of Directive 2009/125/EC).

<sup>82</sup> “‘Construction product’ means any product or kit which is produced and placed on the market for incorporation in a permanent manner in construction works or parts thereof and the performance of which has an effect on the performance of the construction works with respect to the basic requirements for construction works”. (Article 2(1) of Regulation EU/305/2011).

performance of construction works and draw up a declaration of performance (DoP) (Article 4(1)). For example, the following harmonised standards apply to BIPV<sup>83</sup>:

- a) CLC/TS 61836:2009 – Solar photovoltaic energy systems – Terms, definitions and symbols;
- b) EN 50583-1:2016 - Photovoltaics in buildings - Part 1: BIPV modules. Applies to BIPV modules as construction products;
- c) EN 50583-2:2016 - Photovoltaics in buildings - Part 2: BIPV systems. This standard addresses requirements on the BIPV systems in the specific ways they are intended to be mounted but not the BIPV modules as construction products;
- d) prEN 50583-1 - Photovoltaics in buildings - Part 1: BIPV modules; and
- e) prEN 50583-2 - Photovoltaics in buildings - Part 2: BIPV systems. It applies to BIPV systems in the specific ways they are intended to be mounted but not the BIPV modules as construction products.

The Commission has adopted a Proposal for a Regulation repealing Directive 2009/125/EC<sup>84</sup> to reduce the negative life cycle environmental impacts of products and improve the functioning of the internal market. The choice for a Regulation (directly applicable to all Member States) is to provide harmonised requirements for the industry. The Proposal mentions that its requirements would prevail over those under Regulation EU/305/2011 concerning products that are energy-related and construction ones (such as photovoltaic products), **expressly excluding building-integrated photovoltaic panels**.<sup>85</sup>

Regulation (EU) 2017/1369 sets a framework for energy labelling of energy-related products placed on the EU market. It also establishes requirements for providing standard product information on energy efficiency, energy consumption, and other resources during their use and supplementary information to allow consumers to select the most energy-efficient products. As ecodesign requirements, the energy labelling only applies to those energy-related products covered by a specific EU Regulation. Commission Delegated Regulation EU/812/2013, Commission Delegated Regulation EU/811/2013, and Commission Delegated Regulation 2015/1187/EU sets requirements for energy labelling of solid fuel boilers and packages of a solid fuel boiler, supplementary heaters, temperature controls, and solar devices. They define solar device as “a solar-only system, a solar collector, a solar hot water storage tank or a pump in the collector loop, which are placed on the market separately” (among others, Article 2(1) of Commission Delegated Regulation EU/811/2013). However, they do not apply to solar PV in general or BIPV customised technologies.

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<sup>83</sup> CEN standards are not available for free and can be purchased online under [https://standards.cencenelec.eu/dyn/www/f?p=CEN:105::RESET:::~:](https://standards.cencenelec.eu/dyn/www/f?p=CEN:105::RESET:::)

<sup>84</sup> European Commission (2022) Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC. Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022PC0142>

<sup>85</sup> European Commission (2022) Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC, Paragraph 43.



In this context, the European Commission carried out a public consultation<sup>86</sup> between 23 September and 16 December 2022 to collect feedback on potential new ecodesign and energy labelling requirements for solar PV modules, inverters, and systems. This initiative is part of the new Circular Economy Action Plan supporting the EGD and would build on Directive 2009/125/EC and Regulation (EU) 2017/1369. The European Commission would propose to improve the energy and material efficiency of solar PV products and extend their lifetime through several policy options, including establishing reparability requirements (such as ensuring the availability of spare parts); durability obligations (to ensure resistance to climate hazards); recycling requirements; information requirements related to the carbon footprint of the manufacturing and shipment phases; and an energy label for solar PV products (to allow products' efficiency comparisons).

In relation to waste, Directive 2012/19/EU regulates the management of waste from electrical and electronic equipment (WEEE)<sup>87</sup> and applies to solar PV according to Annex IV. Among others, it mandates Member States to promote the design and production of EEE in view of facilitating re-use, dismantling, and recovery of WEEE, its components, and materials; adopt appropriate measures to better manage WEEE disposal, treatment, and collection, considering solar PV as a priority; prohibit the disposal of separately collected untreated WEEE; and implement a minimum producer collection rate (for solar PV, this corresponds to 75 % recovery and 55 % prepared for re-use and recycled according to Annex V).<sup>88</sup>

**Example:** In the Belgium Flemish Region, the Environmental Policy Agreement of 13 November 2015 on the take-back obligation of waste photovoltaic solar panels creates obligations for companies who are member or a work organisation that is a party to the Policy Agreement. The Policy Agreement specifies how the take-back of waste photovoltaic solar panels is to be organised within its members and what goals must be achieved. Manufacturers, retailers and installers have to take back waste photovoltaic solar panels free of charge and have to utilise work organizations' waste collection structures for the temporary storage of waste solar panels. A message regarding compliance with the policy agreement also needs to be displayed at all retail locations. Manufacturers, retailers and installers have to pay a fee to the work organisation every year. Similarly, in the Walloon Region, the Environmental Agreement of 4 February 2021 on the take-back obligation of waste photovoltaic solar panels specifies how the take-back of waste photovoltaic solar panels is to be organised within its members and what goals must be achieved following the Walloon Government Order of 23 September 2010 on the introduction of a take-back obligation for certain waste materials. It applies to companies manufacturing or placing on the market photovoltaic solar panels and that are members of a work organisation that is a party to the Agreement. If they are not, the Agreement does not apply to them. According to the Environmental Agreement, solar PV manufacturers or trades that are members of a work organisation that is a party to the Agreement must, among others, take back waste photovoltaic solar panels free of charge; utilise work organizations' waste collection structures for the temporary storage of waste solar panels; display a message

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<sup>86</sup> European Commission (2022) Ecodesign – European Commission to examine need for new rules on environmental impact of photovoltaics. Available online [https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12819-Ecodesign-European-Commission-to-examine-need-for-new-rules-on-environmental-impact-of-photovoltaics/public-consultation\\_en](https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12819-Ecodesign-European-Commission-to-examine-need-for-new-rules-on-environmental-impact-of-photovoltaics/public-consultation_en).

<sup>87</sup> Art. 3(1)(e) of Directive 2012/19/EU defines “Waste electrical and electronic equipment or WEEE means electrical or electronic equipment which is waste within the meaning of Article 3(1) of Directive 2008/98/EC, including all components, sub-assemblies and consumables which are part of the product at the time of discarding”.

<sup>88</sup> Cf. Art. 4 and followings to Directive 2012/19/EU.

regarding compliance with the policy agreement at all retail locations; pay a fee to the work organisation every year; and give the necessary incentives to improve the eco-design and recyclability of the new photovoltaic panels.

### 2.7.3 Supply chain

Some raw materials necessary to manufacture solar PV are subject to a high level of supply risk, the so-called “critical raw materials” (CRMs). In this context, the European Commission has adopted on 16 March 2023 a Proposal for a Regulation of the European Parliament and of the Council establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020.<sup>89</sup> The proposal, among others, strengthen the EU value chain for CRM, diversity the EU’s CRM import, set import monitoring and mitigating disruption risks, and provides for the circularity and sustainability of CRM value chain. According to Section 1, Annex II to the mentioned proposal, CRM include copper, lithium, and nickel. The proposal also provides for strategic raw materials (SRMs), which include copper, lithium, and nickel, according to Section 1, Annex I. For example, it sets measures on Strategic Projects focus on these materials brings within the proposal’s scope the most needed materials needed in the EU’s objectives for the green and digital transitions.

Another proposal targeting supply chains to increase their sustainability and transparency is the Proposal for a Directive on corporate sustainability due diligence (CSDDD).<sup>90</sup> It was adopted by the European Commission on 23 February 2022 and, on 1 June 2023, the European Parliament adopted an amended version of the proposal<sup>91</sup> to, among others, expand its scope<sup>92</sup> and include additional more measures to remediate human rights or environmental adverse impacts. Under the proposal, companies would need to implement due diligence procedures. For example, companies must, where necessary, prioritize potential and actual adverse impacts and remedy them; establish or participate in a

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<sup>89</sup> European Commission (2023) Proposal for a Regulation of the European Parliament and of the Council establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020. Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52023PC0160>.

<sup>90</sup> European Commission (2022) Proposal for a Directive on corporate sustainability due diligence (CSDDD). Available online [https://commission.europa.eu/publications/proposal-directive-corporate-sustainability-due-diligence-and-annex\\_en](https://commission.europa.eu/publications/proposal-directive-corporate-sustainability-due-diligence-and-annex_en).

<sup>91</sup> European Parliament (2023) Amendments adopted by the European Parliament on 1 June 2023 on the proposal for a directive of the European Parliament and of the Council on Corporate Sustainability Due Diligence and amending Directive (EU) 2019/1937 (COM(2022)0071 – C9-0050/2022 – 2022/0051(COD)). Available online [https://www.europarl.europa.eu/doceo/document/TA-9-2023-0209\\_EN.html](https://www.europarl.europa.eu/doceo/document/TA-9-2023-0209_EN.html).

<sup>92</sup> The following companies would be in the scope of the CSDDD: a) EU companies with over 250 employees (originally, it was 500 employees) and a global turnover of over EUR 40 million (originally, it was EUR 150 million); b) EU parent companies with over 500 employees (before it was 250 employees on average) and a global turnover of over EUR 150 million (before it was EUR 40 million); c) non-EU companies with a global turnover of over EUR 150 million if at least EUR 40 million of this is generated in the EU; and d) non-EU ultimate parent companies of a group that has 500 employees and a net worldwide turnover of more than EUR 150 million, with at least EUR 40 million being generated in the EU in the last financial year. Furthermore, directors of companies with more than 1,000 employees would be responsible for ensuring the company implements a transition plan compatible with the Paris Agreement's goals.



notification and non-judicial grievance mechanism instead of only establishing and maintaining a complaints procedure; monitor and verify the effectiveness of their due diligence policy and measures instead of only monitoring; include a description of their identified potential or actual adverse impacts in their due diligence policy; respect obligations under international humanitarian law if operating in areas in a state of armed conflict or fragile post-conflict, areas under occupation or annexation, and areas witnessing weak or non-existent governance and security; and take appropriate measures to prevent, or where prevention is not possible or not immediately possible, adequately mitigate potential adverse human rights impacts and adverse environmental impacts.

**Example:** In Germany, the Act on Corporate Due Diligence Obligations for the Prevention of Human Rights Violations in Supply Chains (LkSG)<sup>93</sup> is in force as of 1 January 2023. It requires large companies to observe social and environmental standards in their supply chain. Companies must set up processes to identify, assess, prevent, and remedy human rights and environmental risks and impacts in their supply chains and their operations. They must also ensure they provide ways for employees of indirect suppliers to file a complaint alerting the company of human rights or environmental violations. It applies to companies, regardless of their legal form, that have their central administration, principal place of business, administrative headquarters, or statutory seat in Germany and that usually have at least 3,000 employees in Germany, including employees posted abroad. It also applies to companies, regardless of their legal form, that have a domestic branch office (as defined by the German commercial code) with at least 3,000 employees in Germany (this threshold will be reduced to 1,000 employees in 2024).

### 3. Legal issues related to solar PV integration

#### 3.1 Introduction

This section addresses the most relevant legal issues arising from the integration of solar PV with regard to different applications. Where the main focus of this deliverable lies in the existing EU legal framework applicable to PV integration, an array of pointed issues will be discussed as subject to further research domestically.

The set of legal issues identified in this Section relate to the design, construction and performance of buildings with integrated and customized solar PV. They thus unfold specific challenges, risks or potential advantages that must be borne in mind when undertaking solar PV integration under different applications.

For the purposes of this Section, three main categories of legal issues must be distinguished:

- *Legal hurdles:* Barriers present in the current EU or domestic regulatory framework, which directly or indirectly hamper the uptake of solar PV integration across its design, manufacturing and application.

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<sup>93</sup> Gesetz über die unternehmerischen Sorgfaltspflichten zur Vermeidung von Menschenrechtsverletzungen in Lieferketten (Lieferkettensorgfaltspflichtengesetz - LkSG). Available online <https://www.gesetze-im-internet.de/lksg/>

- *Legal opportunities*: Enabling elements provided by the current legal and regulatory framework, which favor the adoption and uptake of solar PV integration.
- *Knowledge gaps*: Aspects of solar PV integration, which are currently not yet addressed by the existing legal framework and require further inquiry and investigation.

The findings of this Section draw extensively from the desk-based analysis carried out throughout the project, as complemented with the discussion held at the Solar EMR's project workshops with selected stakeholders representing both solar PV and infrastructure developers and decision-makers.

## 3.2 Legal issues for solar PV integration

### 3.2.1. Legal hurdles to integrated solar PV

#### *Regulation of Peer-2-Peer (P2P) sharing of energy*

Integration and mass-customization of solar PV fosters the uptake of presuming. Hence the absence of dedicated legislative frameworks for peer-2-peer trading of electricity curtails the efficient management of electricity generated and its remuneration.

#### ***Conceptualizing building façades as assets***

With an increased application of integrated solar PV in buildings, the same buildings' façades acquire a new economic value as they contribute to the generation of electricity. However, the current legislative framework is ill-suited to address the potential economic value of façades against multiple ownership and management. In integrated solar PV applications, potentially at least three types of building owners could come into play: the building occupant; the investor and the developer. Since integrated solar PV systems are capital-intensive investments with low running expenses, the long-term owner-occupant is usually best positioned to reap the benefits of a system and is thus the most likely investor. Yet the current legislative framework neither provides for an enabling framework to access finance due to different ownership regimes on the same façade, nor it allows to take into account different consumption profiles of different users.

#### *Aesthetics*

With regard to the existing and older buildings, strict domestic law requirements related to cultural heritage protection result in roadblocks to the adoption of solar PV integrated applications.

#### *Integrated Solar PV technologies certification*

The certification system for solar PV technologies hardly captures the concept of mass-customization, which is also evolving at an extremely rapid pace both in terms of its technical features and its potential applications. In this connection, a more flexible and adaptive certification regime is needed provide prompt and responsive signals to the market.

#### *Definition of renewable energy communities in the EU*

The existence of multiple definitions of energy communities (as well as material elements thereof) under EU legislation – namely, the REDII and the Electricity Market Directive – also as transposed into national legislation impacts the optimization of business models with regard to the adoption of integrated PV applications in decentralized community contexts.

#### *Noise barriers application*

With regard to the specific application of solar PV to noise barriers, two main problems arise: a) the issue of allocation of maintenance costs, liability for damages caused by solar PV panels and responsibility for reparation of solar PV panels, and b) the issue of grid connection for noise barriers. As regards to a), ad hoc arrangements should be taken during the tendering process for the infrastructure, and also specific insurance coverage could help allocating risks across the project development entities. As regards to b), the possibility of feeding into the grid eventual electricity surplus would greatly favor the marketability of integrated solar PV, also in relation to its potential connection and integration to micro-grids and/or energy communities in proximity.

### 3.2.2 Legal opportunities for integrated solar PV

#### ***Conceptualizing building façades as assets***

A flexible and conducive framework (e.g., in relation to building codes and general property regime for buildings) dealing with joint ownership of building façades and related integrated solar PV panels could greatly maximise the overall benefits of integrated solar PV applications. In this respect, a legal regime which takes into due account the different expected development and operational costs and rate of returns could be a key enabler to integrated solar PV.

#### *Storage integration*

The integration of storage into the existing remuneration regimes for electricity self-generation is key to both enhance a fully integrated application of integrated solar PV.

#### *Prototype-based approach to integrated solar PV*

A new, more flexible and calibrated certification process for solar PV would support the rapid marketability of customized solar PV. Such certification scheme should also include specific produce design obligations to minimize life-cycle impacts of customized solar PV panels, as well as specific recycling obligations and at least minimum safety standards with regard to a

series of applications. Specific contractual obligations related to the performance of integrated solar PV panels can also be included, at least as a standardized model to be adopted within the market.

### 3.2.3 Knowledge gaps about integrated solar PV

#### ***Conceptualizing building façades as assets***

How to regulate multiple entitlements and multiple economic interests on a shared asset entails the establishment of a complex, ad hoc regime, which ultimately impinges on the domestic ownership regimes. This requires thorough analysis as to how to frame both the general legal requirements under building codes and property rules, as well as the eventual incentive regimes for the adoption of integrated solar PV panels (e.g., tax incentives).

#### *Technology-logic certification of solar PV technologies*

The establishment of a truly adaptive legislative framework for customized and integrated solar PV rests on an adequate balance between the need to ensure flexibility against rapid technological advancements and to ensure certainty and level-playing field within the solar PV manufacturing market. Differentiation based on inherent technological maturity and marketability can be drivers for such regime, including a dedicated regime for monitoring and reporting.

## 4. Specific applications

One of the dimensions of the EU Solar Strategy under the REPowerEU Plan is to increase access to sustainable solar products, within which innovation support plays an essential role. As mentioned, this Report analyses two types of integrated solar PV: (a) buildings and (b) noise barriers. Additionally, it also explores legal support for energy communities on the use of solar PV. Again, this Section explores EU law in general and provides jurisdictional examples for Belgium, Germany, or the Netherlands.

### 4.1 Integrated solar PV in buildings

Article 15(4) of REDII mandates Member States to set measures in their building regulations and codes to increase RES in the building sector. This includes requiring the use of minimum energy levels from RES in new and existing buildings subject to major renovation as technically, functionally, and economically feasible, reflecting the results of cost-optimal calculation and not affecting indoor air quality.

In addition, Directive 2010/31/EU on the energy performance of buildings (EPBD) mandates Member States to establish a strategy to support the renovation of buildings so they can be highly energy efficient and decarbonised into nearly zero-energy buildings. It currently does not oblige Member States to promote solar installations on buildings.

**Example:** In the Belgium Flemish Region, the Decree of the Flemish Government of 17 February 2023 amending the Energy Decree of 19 November 2010<sup>94</sup> establishes the obligation for buildings connected to an exit point with a purchased gross amount of electricity of more than 1 gigawatt per hour (GWh) per year to, as of 24 June 2023, install photovoltaic solar panels. The deadline to install these photovoltaic solar panels depends on when the buildings were connected to an exit point for electricity and when the threshold of 1 GWh was achieved. For instance, buildings connected to an exit point with a purchased gross amount of electricity of more than 1 GWh during 2021 must install photovoltaic solar panels by 30 June 2025 at the latest. It is a common practice to install these photovoltaic solar panels on horizontal roof surfaces, but buildings can also choose to install these panels on, for instance, carports or bicycle parking on their site. As an alternative to photovoltaic solar panels, companies can also opt for a new wind turbine or a repowering of a wind turbine; a new cogeneration plant for the combustion of biomass or biogas (as long as it is not biomethane); or a new heat pump. The Flemish Energy and Climate Agency (VEKA) can grant a postponement to companies that own buildings that will be demolished and rebuilt or whose roofs will be replaced. Several German States also mandate the installation of solar PV in buildings (see section 2.6.5 for Berlin). For example, the Bremen Act to Accelerate the Expansion of Installations for the Generation of Electricity from Solar Radiation Energy<sup>95</sup> requires building constructors and building owners to install photovoltaic systems on the roofs of buildings. Among others, they must install photovoltaic systems on the roofs of buildings whose application for planning permission is received by the competent authority after 1 July 2025; create the necessary technical prerequisites for installing photovoltaic systems if the roof cladding undergoes fundamental renovations after 1 July 2024 and complete the installation within two years; and provide proof of their compliance with the obligation to the competent authority within a period of six months after completion of the construction project or the fundamental renovation of the roof cladding.

However, under the EGD, the EPBD is being revised (EPBDII proposal)<sup>96</sup> to require under Article 7 that all new buildings are zero-emission ones<sup>97</sup> as of 1 January 2023 (original version). On 14 March 2023, the European Parliament adopted amendments to this proposal<sup>98</sup> including to align it with the European Solar Rooftops initiative, for example, so that all new buildings are “solar ready” and existential buildings have the installation of solar technologies without structural interventions. Among the provisions to support integrated solar PV:

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<sup>94</sup> *Besluit van de Vlaamse Regering tot wijziging van het Energiebesluit van 19 november 2010, wat betreft de verplichte installatie van fotovoltaïsche zonnepanelen op dakoppervlakte.* Available online <https://emis.vito.be/nl/actuele-wetgeving/17-februari-2023-besluit-van-de-vlaamse-regering-tot-wijziging-van-het>

<sup>95</sup> *Bremisches Gesetz zur Beschleunigung des Ausbaus von Anlagen zur Stromerzeugung aus solarer Strahlungsenergie (BremSolarG).* Available online [https://www.gesetzblatt.bremen.de/fastmedia/218/2023\\_05\\_23\\_GBI\\_Nr\\_0071\\_signed.pdf](https://www.gesetzblatt.bremen.de/fastmedia/218/2023_05_23_GBI_Nr_0071_signed.pdf)

<sup>96</sup> European Commission (2021) Proposal for a Directive of the European Parliament and of the Council on the energy performance of buildings (recast). Available online <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52021PC0802>.

<sup>97</sup> Under the Proposal, “‘zero-emission building’ means a building with a very high energy performance, as determined in accordance with Annex I, where the very low amount of energy still required is fully covered by energy from renewable sources generated on-site, from a renewable energy community within the meaning of Directive (EU) 2018/2001 [amended RED] or from a district heating and cooling system, in accordance with the requirements set out in Annex III”.

<sup>98</sup> European Parliament (2023) Amendments adopted by the European Parliament on 14 March 2023 on the proposal for a directive of the European Parliament and of the Council on the energy performance of buildings (recast) (COM(2021)0802 – C9-0469/2021 – 2021/0426(COD)). Available online : [https://www.europarl.europa.eu/RegData/seance\\_pleniere/textes\\_adoptes/definitif/2023/03-14/0068/P9\\_TA\(2023\)0068\\_EN.pdf](https://www.europarl.europa.eu/RegData/seance_pleniere/textes_adoptes/definitif/2023/03-14/0068/P9_TA(2023)0068_EN.pdf)

- a) Member States must establish a national building renovation plan so that buildings are zero-emission by 2050. Each plan must encompass a roadmap with nationally established targets, measurable progress indicators, and, among others, the estimated availability of construction materials and renovation materials, including prefabricated building elements, such as **building integrated solar PV**; and
- b) Member States must ensure all new buildings are designed to have solar energy generation potential and enable the cost-effective installations of solar through, among others, streamlined permitting procedures (as mentioned above). In addition, Members States must ensure the deployment of solar energy installations if technically and economically feasible:
  - a. in up to 24 months after the date of entry into force of the proposal to all new public and non-residential buildings;
  - b. by 31 December 2026, on all existing public and non-residential buildings;
  - c. by 31 December 2028, on all new residential buildings and roofed carparks; and
  - d. by 31 December 2032, on all buildings undergoing major renovation<sup>99</sup>.

As mentioned, the European Solar Rooftops Initiative is one initiative of the EU Solar Energy Strategy under the REPowerEU, and sets measures as a priority, using available EU funding. Its main element is to introduce a solar mandate on all new public and commercial buildings. The three main elements of the European Solar Rooftops Initiative are<sup>100</sup>:

1. Limit the length of permitting for rooftop solar installations, including large ones, to a maximum of 3 months;
2. Adopt provisions to ensure that all new buildings are “solar ready”; and
3. Make the installation of rooftop solar energy compulsory.

#### 4.2 Integrated solar PV in noise barriers

The EU Solar Energy Strategy mentions the unexploited potential for solar energy deployment in transport infrastructure. It exemplifies with the installation of solar panels on highway sound barriers in a pilot project in the Netherlands.<sup>101</sup>

**Example:** LIFE Solar Highways project in the Netherlands is a project of Rijkswaterstaat (the executive body of the Dutch Ministry of Infrastructure and Water Management).<sup>102</sup> The integrated solar PV technology (bi-facial

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<sup>99</sup> Under the proposal, “major renovation means the renovation of a building where either, depending on the choice of a Member State: (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”.

<sup>100</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 3.

<sup>101</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 7.

<sup>102</sup> Solar Highways (2020) LIFE Project: Final Report. Available online <https://www.solarhighways.eu/en/document/final-report/>.

PV modules) followed sub-optimal results of installing conventional solar panels on existing noise barriers, in which either the solar panels are adapted to the barrier, or the barrier is adapted to the panel. In this project, the certified barrier was connected to the electricity grid, designed to operate for around 30 years, and the beneficiary intended to lease the electric installation to an energy cooperative of citizens living in the direct surroundings of the barrier (therefore, contributing to local energy communities). This information is important to understand the legal framework applicable to noise barriers with integrated solar PV in innovative projects and technologies. The legislation applicable did not differ from the usual construction of noise barriers, addressing aspects such as noise reduction, soil condition, flora and fauna, archaeological values, explosives, and cabling. Regulations applicable referred to noise standards, regulations to build noise barriers, and regulations on the financial aspect of solar PV, for example, net metering, national subsidy and fiscal regulations. The construction of the barrier was subject to contractual obligations under private law.

Noise barriers are construction products under Regulation EU/305/2011 (Construction Products Regulation) to which harmonized standards<sup>103</sup> apply, such as:

- CEN FPREN 14388 Road traffic noise reducing devices – Characteristics;
- CEN EN 14388:2015 Road traffic noise reducing devices – Specifications;
- prEN 1793-1:20211, Road traffic noise reducing devices - Test method for determining the acoustic performance – Part 1: Intrinsic characteristics - Sound absorption under diffuse sound field conditions;
- prEN 1794-1:2021, Road traffic noise reducing devices - Non-acoustic performance – Part 1: Methods of determination of the mechanical and stability characteristics;
- prEN 1794-2:2021, Road traffic noise reducing devices - Non-acoustic performance – Part 2: Methods of determination of the general safety and environmental characteristics;
- prEN 14389:2021, Road traffic noise reducing devices - Procedures for determining long-term performance; and
- EN 13501-1:2018, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

The standards define “road traffic noise reducing device – RTNRD” as a “device designed to reduce the propagation of traffic noise away from the road environment” and “noise barrier” as “road traffic noise reducing device which obstructs the direct transmission of airborne sound emanating from road traffic”.

EU regulations applicable to noise barriers in general include, among others, Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe and Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise. There is currently no specific mention to integrated solar PV in noise barriers at the EU level. However, as mentioned for the EU Solar Energy Strategy, the Commission will develop guidance for Member States to promote the development of the innovative forms of solar energy, which could support the further development of integrated solar PV in noise barriers.

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<sup>103</sup> The mentioned standards are not available for free and can be purchased online.



### 4.3 Energy communities

Literature argues “community-based energy systems are gaining traction among policymakers and practitioners as promising models for implementing a low-carbon energy transition”.<sup>104</sup> In the EU, there are two types of energy communities: citizen energy communities (CEC) and renewable energy communities (REC). Differences between them include, among others:

- a) The geographical scope: CECs do not need to be in the immediate vicinity of energy installations while RECs must be in the vicinity of RE the community owns or develops; and
- b) Activities: CECs are technology-neutral, meaning they may engage in the generation of electricity of any source (including fossil fuels), while RECs have activities related only to renewable energy sources.

Both the Directive (EU) 2019/944 and REDII contain provisions on collective self-consumption. Directive (EU) 2019/944 mandates Member States to regulate CEC:

**Definition:** Article 2(11) of Directive (EU) 2019/944 defines CEC as “[...] a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and (c) may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders”.

REDII requires Member States to provide for REC:

**Definition:** Article 2(16) of REDII defines REC “[...] as a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits”.

Under the EU Solar Energy Strategy, even though current legislation already supports these communities, as well as collective solar initiatives to generate, store, share, exchange, and use energy, they still face significant barriers. These barriers include difficulties in securing financing, navigating licensing and permitting procedures or developing sustainable business models. In addition, as they are often initiated by a group of volunteers, they suffer from limited time and lack of access to technical expertise.

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<sup>104</sup> Bauwens T., et al (2022) Conceptualizing community in energy systems: a systematic review of 183 definitions *Renew Sustain Energy Rev*, 156.



**Transnational perspective:** Cross-border energy communities, which can exploit<sup>105</sup> complementary renewable energy potentials in EU border regions, face additional challenges linked to legal, technical or administrative inconsistencies across borders.<sup>106</sup>

To address these issues, the mentioned Commission Recommendation of 18.5.2022 also recommends Member States to support the participation of energy communities in renewable energy projects, set simplified permit-granting procedures for renewable energy communities and connection of community-owned plants to the grid, and reduce requirements and licensing procedures to a minimum. The EU Solar Energy Strategy also proposes to ensure that at least one renewable energy community is set up in every municipality with a population of more than 10,000 people by 2025. It will also support Member States in implementing collective self-consumption and energy community frameworks.<sup>107</sup> The EU Solar Energy Strategy mentions that Member States should support partnerships between local authorities, energy communities and social housing managers to facilitate collective and individual self-consumption schemes. Pre-financing shares in energy communities can be used for this purpose.<sup>108</sup> The European Solar Rooftops Initiative mentioned above includes ensuring that EU legislation is fully implemented in all Member States allowing consumers in multi-apartment buildings to effectively exercise their right to collective self-consumption, without undue costs. Additionally, as mentioned in section 2.4 for State aid CEEAG guidelines, it includes exemptions for renewable energy community projects with installed capacity equal to or below 6 MW from mandatory competitive bidding processes, or to facilitate their participation in such processes.

**Example:** In Belgium<sup>109</sup>, the Brussels Capital Region transposed the mentioned EU framework under the Ordinance published on 20 April 2022<sup>110</sup> created energy communities as a new market player. It distinguishes

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<sup>105</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 10.

<sup>106</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 11. See also Report from the Commission “EU Border Regions: Living labs of European integration”, COM(2021) 393 final.

<sup>107</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 4.

<sup>108</sup> European Commission (2022) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Solar Energy Strategy, p. 9.

<sup>109</sup> Cf. Belgium Government (2022) Monitoring Report: Belgian electricity market Implementation plan - July 2022. Available online <https://economie.fgov.be/sites/default/files/Files/Energy/CRM-Monitoring-Report-Belgian-electricity-market-Implementation-plan-2022.pdf>.

<sup>110</sup> *Ordonnance modifiant l'ordonnance du 19 juillet 2001 relative à l'organisation du marché de l'électricité en Région de Bruxelles-Capitale, l'ordonnance du 1er avril 2004 relative à l'organisation du marché du gaz en Région de Bruxelles-Capitale, concernant des redevances de voiries en matière de gaz et d'électricité et portant modification de l'ordonnance du 19 juillet 2001 relative à l'organisation du marché de l'électricité en Région de Bruxelles-Capitale et l'ordonnance du 12 décembre 1991 créant des fonds budgétaires en vue de la transposition de la directive 2018/2001 et de la directive 2019/944.* Available online [https://www.ejustice.just.fgov.be/mopdf/2022/04/20\\_1.pdf#page=113](https://www.ejustice.just.fgov.be/mopdf/2022/04/20_1.pdf#page=113)

between energy sharing (P2P trading and collective self-consumption within a building operationalizing the concept of active consumers) and energy communities, whose control is limited to members connected to the distribution system or regional transmission system. In the Walloon region<sup>111</sup>, Decree ensuring the transposition of RED II and Market Design directives<sup>112</sup> defines collective self-consumption of renewable energy as exercised collectively by a group of active customers located or established in the same building; P2P exchanges as the sale of electricity produced from RES between active customers or energy communities through contracts; and energy communities (citizen and renewable) as “legal persons in which ones may openly and voluntarily participate, destined to deliver economic, social and/or environmental to its members and/or region and allowed to produce electricity, to supply electricity, to self-consume electricity produced within it, to practice aggregation and participate in flexible supply services, to store energy, to provide recharging services for electric vehicles, to provide energy efficiency or other energy services and to sell self-produced and not self-consumed electricity, where appropriate in the case of electricity from renewable energy sources, through a power purchase agreement or through peer-to-peer trading.”

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<sup>111</sup> Cf. Walloon Region (2023) *Communautés d'énergie et partage d'énergie au sein d'un même bâtiment (Electricité)*. Available online <https://energie.wallonie.be/de/communautes-d-energie-et-partage-d-energie.html?IDC=10295>

<sup>112</sup> *Décret modifiant diverses dispositions en matière d'énergie dans le cadre de la transposition partielle des directives 2019/944/UE du 5 juin 2019 concernant des règles communes pour le marché intérieur de l'électricité et 2018/2001/UE du 11 décembre 2018 relative à la promotion de l'utilisation de l'énergie produite à partir de sources renouvelables et en vue d'adapter les principes relatifs à la méthodologie tarifaire*. Available online [https://etaamb.openjustice.be/fr/decret-du-05-mai-2022\\_n2022033591](https://etaamb.openjustice.be/fr/decret-du-05-mai-2022_n2022033591)

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## List of legislation

### EU

Commission Delegated Regulation (EU) 811/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device

Commission Delegated Regulation (EU) 812/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of water heaters, hot water storage tanks and packages of water heater and solar device

Commission Delegated Regulation (EU) 2015/1187 of 27 April 2015 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of solid fuel boilers and packages of a solid fuel boiler, supplementary heaters, temperature controls and solar devices

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity

Council Directive (EU) 2022/542 of 5 April 2022 amending Directives 2006/112/EC and (EU) 2020/285 as regards rates of value added tax

Council Regulation (EU) 2022/2577 of 22 December 2022 laying down a framework to accelerate the deployment of renewable energy

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (no longer in force)

Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast)

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Codified version)

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (codification)

Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) (recast)

Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast)

Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast)

Regulation (EU) 1227/2011 of the European Parliament and of the Council of 25 October 2011 on wholesale energy market integrity and transparency

Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC Text with EEA relevance

Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU

Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast)

Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')

Regulation (EU) 2021/1153 of the European Parliament and of the Council of 7 July 2021 establishing the Connecting Europe Facility and repealing Regulations (EU) No 1316/2013 and (EU) No 283/2014



Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013

Regulation (EU) 2023/435 of the European Parliament and of the Council of 27 February 2023 amending Regulation (EU) 2021/241 as regards REPowerEU chapters in recovery and resilience plans and amending Regulations (EU) No 1303/2013, (EU) 2021/1060 and (EU) 2021/1755, and Directive 2003/87/EC

Treaty on the Functioning of the European Union (TFEU)

## **Belgium**

### *Brussels Capital Region*

*Ordonnance modifiant l'ordonnance du 19 juillet 2001 relative à l'organisation du marché de l'électricité en Région de Bruxelles-Capitale, l'ordonnance du 1er avril 2004 relative à l'organisation du marché du gaz en Région de Bruxelles-Capitale, concernant des redevances de voiries en matière de gaz et d'électricité et portant modification de l'ordonnance du 19 juillet 2001 relative à l'organisation du marché de l'électricité en Région de Bruxelles-Capitale et l'ordonnance du 12 décembre 1991 créant des fonds budgétaires en vue de la transposition de la directive 2018/2001 et de la directive 2019/944*

### *Flemish region*

*Besluit van de Vlaamse Regering tot wijziging van het Energiebesluit van 19 november 2010, wat betreft de verplichte installatie van fotovoltaïsche zonnepanelen op dakoppervlakten*

*Milieubeleidsvereenkomst van 13 november 2015 betreffende de Aanvaardingsplicht voor Afgedankte Fotovoltaïsche Zonnepanelen*

### *Walloon Region*

*Convention environnementale concernant l'obligation de reprise des panneaux photovoltaïques usagés*

*Décret modifiant diverses dispositions en matière d'énergie dans le cadre de la transposition partielle des directives 2019/944/UE du 5 juin 2019 concernant des règles communes pour le marché intérieur de l'électricité et 2018/2001/UE du 11 décembre 2018 relative à la promotion de l'utilisation de l'énergie produite à partir de sources renouvelables et en vue d'adapter les principes relatifs à la méthodologie tarifaire*

## **Germany**

### *Federal level*

*Baugesetzbuch – BauGB*

*Gesetz über die Umweltverträglichkeitsprüfung – UVPG*

*Lieferkettensorgfaltspflichtengesetz - LkSG*

### *State level*

*Bremisches Gesetz zur Beschleunigung des Ausbaus von Anlagen zur Stromerzeugung aus solarer Strahlungsenergie – BremSolarG*

*Solargesetz Berlin*

*Denkmalschutzgesetz Berlin – DSchG Bln*



## The Netherlands

*Besluit milieueffectrapportage van 4 juli 1994*