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Designing renewable energy tenders for Germany

Executive Summary of Recommendations

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Authors:

Dr. Corinna Klessmann, Fabian Wigand, Silvana Tiedemann, Malte Gephart (Ecofys - leading)
Dr. Christoph Maurer, Dr. Bernd Tersteegen (Consentec)
Prof. Dr. Mario Ragwitz, Dr. Holger Höfling, Jenny Winkler (Fraunhofer ISI)
Tobias Kelm, Henning Jachmann (ZSW)
Prof. Dr. Karl-Martin Ehrhart, Marie-Christin Haufe (Takon)
Dr. Malte Kohls, Dr. Malte Linnemeyer, Christoph Meitz LL.M. (BBG und Partner)
Dr. Christoph Riese, Dr. Julian Asmus Nebel (GÖRG Partnerschaft von Rechtsanwälten mbB)

Contact:

Fabian Wigand
Senior Consultant Energy & Climate Policy
Ecofys Germany GmbH
T: +49 (0)30 2977 3579-23
E: f.wigand@ecofys.com

This document is a translation of the German executive summary of the scientific recommendations. In the case that this version contains discrepancies or a lack of clarity, the German version shall prevail. The detailed recommendations are available in German at www.bmwi.de.

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The Renewable Energy Sources Act (EEG 2014) states that financial support for electricity from renewable energy sources (RES) is determined via competitive auctions (tenders) by 2017 at the latest. The Federal Ministry for Economic Affairs and Energy (BMWi) has commissioned Ecofys, Fraunhofer ISI, Consentec, ZSW, Takon, GÖRG, and BBG and Partners to develop a concept for the design of such auctions. The interim results are laid out and submitted for comments in this report.

Objectives of the auctioning system

- *Efficient allocation and competition*
  - Auctions for renewable energy will be introduced in order to determine the level of remuneration in a competitive procedure, thereby concentrating support on the least expensive projects. In order for the auction to identify the remuneration for renewable energy that covers production costs but does not facilitate the generation of windfall profits, significant competition between the projects in the auction is required. Therefore, the number of participating projects must exceed the number of awarded bids.
- *Target achievement*
  - In an auction the volume is determined centrally by the contracting authority, while the project-specific support level is determined through the auction itself. Consequently, the expansion of renewable energy capacity has an upper limit and is controllable upward. The legal establishment of a particular auction volume alone does not guarantee that this volume will actually be built. To achieve the expansion targets according to § 1 and §3 of the EEG (2014), the auction design should be such that there is a high probability and intention for realisation of the bids. At the same time, it must also be ensured that the realisation deadlines actually allow the project to be realised.
- *Actor diversity*
  - An auction should be designed so that as many different actors as possible can participate without discrimination, which increases the intensity of competition in the auction. In addition, the design should be simple, transparent, and understandable and not require the development of a complex bidding strategy in order to participate. Therefore, a special focus is placed on the participation conditions, which should be attainable for a variety of potential bidders.

General considerations

Premises for auction design

The work of the scientific consortium is based on premises regarding various design elements of auctions. In all considerations it is assumed that a certain amount of installed capacity (as opposed to energy) will be auctioned. The energy produced in the facilities of the successful bidders is then remunerated in the form of a sliding market premium for a fixed period of years. Furthermore, aspects regarding the physical or economic integration of renewable energy into the electricity system are not

subject to the report at hand, but will be dealt with externally to the auction. At a later date (late summer 2015), these premises will be discussed in detail and evaluated in another paper produced by the consortium.

Protection of actor diversity

The recommendations regarding the protection of actor diversity are currently not final. The recommendations will be revised and specified on the basis of position papers.
According to § 2(5)3 of the EEG (2014), the current actor diversity in electricity generated from renewable energy should be preserved in the transition to an auction scheme. Often it is feared that auctions could indirectly penalize "small actors", since participation in the auction exposes small bidders (such as private persons, cooperatives, and small businesses) to greater challenges than larger bidders. Because of this, smaller actors could have a competitive disadvantage because they usually have to pay higher purchase prices for installation components and cannot distribute transaction costs among several or higher bids. Also, in many cases small actors have a lower credit rating and thus cannot, or only under less favourable conditions, receive bank guarantees for bid bonds. Given the risk of not being successful in the auction, they may also not be in a position to carry out the required pre-development activities and may withdraw from the market as a result. Some of these challenges regarding participation in an auction could be addressed within the auction itself (for example, through a simple, transparent, and non-discriminatory design) or through advisory services on participating in the auction. Depending on the actor structure, there is also the possibility to give small actors and/or their projects, special treatment within the auction or to exclude them from the auction. Regardless of the route chosen, a legally sound and accurate definition of the small actors who require protection should be used. Regulations that allow for the preferential treatment of smaller actors can have negative, unintended effects on the auction results. In this case, the disadvantages should be weighed against the potential advantages of actor diversity.

Assessment of technologically-neutral auctions

The discussion on general design elements shows that the precise design has a significant influence on the operation and success of the auction scheme. The direct impact of the individual design decisions depends primarily on the market situation (esp. actor structure and competition) and the project specifics (lead time, development of costs etc.). The market analyses performed by BMWi show that both the market situation and the project specifications are heavily dependent on the specific sector (i.e. wind onshore, wind offshore, and PV). In this respect, a technology-neutral auction does not seem appropriate, seeing as the technology-specific and varying market and project structures cannot be taken into account. In this case the objectives of the auction would likely be missed. In particular, there is a high probability that this would lead to windfall profits of many plants. The negative impacts of a (hypothetical) technology-neutral auction will be elaborated upon at a later date.

Onshore wind energy

Parameters of the market segment

Since 2011, the use of onshore wind energy has boomed in Germany but the expansion has been subject to strong fluctuations in the past. A key driver of this development was and continues to be the availability of suitable sites, which will also be an important correcting variable and limiting factor in the future.

The types of installed wind turbines and parks vary throughout Germany. 15% of all wind turbines (10% of the installed capacity) are single units and 58% (53% of the installed capacity) are in wind farms with a maximum of 6 turbines. In the years 2012 to 2014, the proportion of single units was with 12% (11% of the installed capacity), slightly lower than the total portfolio. In contrast, the proportion of parks with a maximum of 6 units dropped by 5% (63% of the installed capacity)(Leipziger Institut für Energie 2015b). As a result of varying geographical and political conditions, there are more wind farms in the north than in the south of Germany.

The electricity production costs are largely determined by the amount of wind at the location and range from 5.5 ct/kWh (for a site generating 150% of the reference yield) and 9 ct/kWh (for a site generating 70% of the reference yield). Currently about 75% of the wind turbines accounted for are located at sites where 60 to 90% of the reference yield is realized. In addition to the wind resource, capital costs are an important driver of electricity production costs. Currently low interest rates push down the costs of the capital-intensive wind energy. The period from the start of the project to the commissioning of the first wind turbine of a wind farm lasts around 5 years on average. Until approval has been received according to the Federal Immission Control Act (Bundes-Immissionsschutzgesetz – BImSchG), costs of around €70/kW are incurred. The mere realisation phase following the granting of the immission control permit lasts approximately one year for most farms.

Auction design

Early/late auctions

We recommend late auctions for onshore wind energy, meaning that bidders can participate in the auction after receiving the necessary permission to build a wind farm. A late bid increases the probability of realisation of awarded projects and makes it more likely that these projects can be evaluated in a timely manner due to the shorter realisation deadline. If it turns out that the level of competition will be severely limited by the expenses required of bidders to meet the qualification criteria, the transition to an early auction could be considered. However, one must consider the fact that the level of competition of onshore wind energy is primarily dependent on the availability of land. Furthermore, some actors who could not meet the necessary financial prerequisites of the early auction may still not be able to participate in the late auction. As a result, such actors would rather acquire the rights to produce electricity on a (albeit more liquid) secondary market.

Regional control and offsetting of different site conditions

In the auction design the objectives

- auctioning a homogenous good to increase competition and
- achieving the targeted regional distribution of wind projects

are both relevant. Both objectives must be considered jointly when designing an auction, since they can only be reached by employing instruments with opposing impacts.

Reserving a quota for one or more regions in the auction directly aims at achieving a certain regional distribution. If sufficient project sites are available, the quota can facilitate control over the regional distribution. Due to the complexity of its implementation and the difficulty of determining appropriate regions, introducing a quota is not recommended at present. If the first auction rounds lead to an unacceptable regional distribution, introducing quotas may be considered.

The reference yield model (German: "Referenzertragsmodell") is not an appropriate instrument to guide regional distribution, both in the case of a fixed feed-in-tariff or in auctions. However, it can create the conditions that facilitate the development of wind energy in regions other than those with the strongest wind resource. The more site differences are compensated for in the reference yield model, the more likely it is that projects at a site with less favourable wind resources are competitive in the auction. However, the increased level of competition and related price pressure is offset by additional costs that result from the expansion of wind turbines at sites with less favourable wind resources. It is recommended that the existing reference yield model be retained, albeit in a modified form. In particular, the competitiveness of projects at sites producing 70-82.5% of the reference yield should be improved. For reasons of efficiency, it is not recommended to compensate for all differences that result from the location. The parameterization of the reference yield model is not trivial and is subject to large uncertainties. Before changing the model, several aspects deserve a more detailed discussion, including the impact of the duration of the financing period, changes in interest rates, and reference turbine configurations at sites generating 110% of the reference yield.

Eligibility requirements	
Material & financial qualification criteria	• We recommend combining high material qualification criteria with low financial security (bid bond) to ensure a high implementation rate and allow players with limited funds to participate in the auctions. • The option of a higher, purely financial qualification could be considered, but the potential efficiency benefits due to increased flexibility have to be weighed against the resulting unequal participation opportunities between large and small actors. • As a material qualification, a permit notification under the Federal Immission Control Act should be required, but that the immission control permit ("BImSchG-approval") has legal force, should not be a requirement. A financial qualification requirement, meaning the deposit of a guarantee or security deposit, is also necessary, if an immission control permit already exists as a material qualification. In this case a bid bond of 30 €/kW is recommended.

Eligibility requirements	
	• In the case of a purely financial qualification, a bid bond of at least 100 €/kW is recommended. • Splitting the bid bond in two (division between a bid bond required before the auction and an increased amount after a successful participation to incentivise timely realisation) is not recommended.
Location und project size	• No limitations on eligible project sites • Only for administrative reasons should the project size be constrained. It is conceivable that turbines that do not exceed a maximum power of 1 MW could be excluded.

Auction procedure	
Frequency of the auction	• Auctions should be carried out with a relatively high frequency of 3-4 rounds per year. Repeated participation of non-awarded projects should be possible. Participation in an auction with a project that has already won a bid should be excluded until the realisation deadline has passed.
Auctioned volume	• The auctioned volume should cover the expansion target specified in § 3 of the Renewable Energy Act (2014). The volume can retroactively be increased by the capacity of unrealized projects or proactively in anticipation thereof. In addition, repowering should be included. To facilitate a constant expansion and keep the level of competition constant, a concept regarding the smoothing out of the repowering volume should be applied over several years.
Ceiling price/floor price	• An ambitious ceiling price should be fixed. This maximum price should be revealed to the auction participants in advance. A floor price is not necessary.
Auction procedure and pricing rule	• We recommended applying the pay-as-bid pricing rule because it is generally more stable against undesired, strategic incentives than a uniform pricing rule. Consequently, the support level is project-specific. If a sufficiently high level of competition is reached, the transition to uniform pricing can be considered.

Realisation of awarded projects	
Realisation deadline	• The implementation period should be 24 months. The grace period for delays should last 6 months. During the grace period, the penalty increases gradually but the rights to produce electricity remain.

	After another 6 months (after a total of 36 months) the rights to produce electricity should be revoked. In case of lawsuits against the immission control permit, deadlines will not be extended.
Penalties	• The penalty should be protected by a bank guarantee or deposit, which shall be provided prior to bidding (financial qualification). If the immission control permit (as a material qualification) is presented, a small penalty of 30 €/kW is recommended. If the material qualification is omitted (purely financial qualification), the penalty should be 100 €/kW. • For partial realization or delay, the penalty should be calculated proportionately. • Non-financial penalties, such as the blocking of bidders and/or projects, is generally not recommended. Exceptions could be considered for certain actors. • A downward deviation of the installed capacity from the auctioned volume should be possible, but penalized proportionately. In the case of an increase in the awarded volume, the rule analogous to § 28 (2) of the ground-mounted PV systems tender regulation would be reasonable (proportional to support level). In order to avoid hindering product innovations, a low tolerance limit of 5% for deviations exceeding the awarded volume should be taken into consideration.
Return and transferability of the rights to produce electricity	• The rights to produce electricity should be specific to the project and not the legal entity implementing it. The possibility of transferring the rights to other projects, shall be discouraged. • The option of returning the rights to produce electricity without a penalty or with a substantial reduction of the penalty, is not recommended. A slight reduction in the penalty for returning the rights before the end of the realisation deadline can be considered. In this case, the project could be prevented from taking part in future bidding rounds. Furthermore, the advantages thereof would need to be weighed against the increased complexity of the tender.

Offshore wind energy

Framework requirements of the market segment

For the expansion of offshore wind energy, there are three planned expansion stages thus far. The first stage with 12 offshore wind farms (OWF) plus the Alpha Ventus test field is currently being implemented and is already in operation. By the end of 2014 the installed capacity was 1,050 MW and

is expected to expand to about 3,000 MW by the end of 2015. In the 2nd stage of expansion, a further 3,500 MW of installed capacity should be connected to the grid by 2020 according to the targets of the Renewable Energy Sources Act (2014) (this corresponds to an annual expansion of 700 MW). Since August 2014, the extension has been controlled by the limited allocation of network capacity. Therefore, a maximum network capacity of 7,700 GW can be distributed until 2017. Between 2021 and 2030, an annual additional expansion of 800 MW is desired, which would lead to an installed capacity of about 15,000 MW in 2030.

Challenges in auction design

For the auction design of offshore wind energy, very specific challenges arise:

- Long project development and realization periods of up to 10 years

  Currently, the project development and realization period lasts up to 10 years. The long implementation period presents a problem for determining an optimum time for the auction. With a late auction the realization of the park is very likely, but the costs of the pre-development are very high. If the auction takes place at an early stage, the realisation deadline is long and it takes a long time before the auction design may be evaluated. Furthermore, the estimation of the actual technical and economic parameters of the OWP is associated with high uncertainties.

- Necessary coordination of project implementation and grid connection

  In order to realize a cost-effective development of the entire system, the planning and implementation of the grid must be coordinated with the development of the wind park. The long implementation periods for grid access, in particular in the North Sea (about 6 years), are critical for the design of each auction that occurs before the grid connection is in place.

- High investment volumes and high pre-development costs

  The investment volumes for offshore wind farms are several times higher than those of onshore wind farms, resulting in a limitation of the potential bidders, a lower level of competition, and the possibility for high sunk costs.

- Limited potential compared to the planned expansion

  Compared to the planned expansion until 2030, the economically exploitable potential of nearshore OWFs in zones 1 and 2 are relatively limited. In the late auctions in particular, this can lead to a reduction in competition between wind parks.

- Current status of the expansion is characterized by varying levels of progress and permission stages

  The current situation of the development of offshore wind energy in Germany is characterized by several existing permits and grid connection commitments, as well as by projects in different stages that have incurred very different costs thus far. This diversity challenges the introduction of auctions for offshore wind energy in Germany.

Possible auctioning systems

Centralized system

The central auctioning system is characterized by a number of players competing for a particular OWF site that has been selected and pre-developed by the government ("intra-area competition"). The pre-development of the OWF is conducted in advance of the auction by a centrally-coordinating body (e.g. BSH, the German Maritime and Hydrographic Agency). After the pre-development, which corresponds to an enhanced strategic environmental impact assessment (SUPplus), the auctioning procedure of the OWF area is carried out. Subsequently, the winner of the auction initiates the planning and authorisation procedure**.** This step of the process is significantly shorter than in the current process because numerous studies are already conducted as part of the SUPplus. The development and implementation of the grid connection can be synchronized with the OWF. The grid connection is carried out by the transmission system operator, as is currently the case.

System O-NEP+

The auctioning system O-NEP+ essentially builds on the current system. Several OWP areas that are pre-developed by the private sector until permission is obtained compete for the rights to generate electricity ("inter-area competition"). The grid connection in this model would be developed according to the criteria and the timetable of the O-NEP (offshore grid development plan) and is the precondition for participation in the auction. In the auction all players with an approved OWF project that is located in an area with sufficient and pre-existing, transmission-service-operator-allocated grid connection capacity, can participate.

System with accelerated grid connection

Also in the auction system with accelerated grid connection, several OWF areas that are pre-developed by the private sector until permission is obtained, compete for the rights to generate electricity ("Inter-area Competition") and obtain a grid connection. The grid connection would follow the auction results in this model and connect the OWF areas that have emerged as winners from the auction. A precondition for this approach is the shortening of the realisation phase for the grid connection (periods of approximately 4 years, incl. auctioning, would be desirable). Whether or not this is actually feasible depends, among other things, on the development of technical standards, which cannot be conclusively assessed at this time.

Comparison of auctioning systems

A comparison of the auctioning systems that takes design challenges into account shows that especially in the long-term, the central system is advantageous in terms of competition and minimizing system costs. The system with accelerated grid connection could also meet the competition requirements and lead to low system costs under the assumption of technical feasibility. However, when the necessary technical standards will be developed is not currently foreseeable. The O-NEP+ system is expected to be unsustainable in terms of competition, but facilitates a "soft" transition towards an auctioning system with minor changes to the current one. It also allows the current actor structure and the interests of actors with highly developed OWF projects to be safeguarded.

Pathways to the introduction of an auctioning system for offshore energy

Based on the aforementioned characteristics of the design options, a two-tiered path for the introduction of auctions can be developed. In the first phase, a tendering system could be implemented according to O-NEP+, which, in the second phase, is converted to the central tendering system. With this combination, the positive features of both models can be utilised and the undesirable effects can be avoided. O-NEP+ would facilitate a system change with minor changes, preservation of the actor structure, and investment protection, while a stable competitive position can be achieved in the long term with a central system in a very limited market (tenders for 800 MW/year corresponds to 1-2 projects).

Several variants are conceivable for this two-step path. In the first phase, the O-NEP+ system can be configured so that at regular intervals, 800 MW, for example, are auctioned or that all players with pre-developed projects can theoretically participate in a large one-off auction. In the second phase, the planned transition to the central system is carried out. Alternatively, in phase two it would also be possible, with the appropriate progress on the technical standards, to facilitate improved competition with the "accelerated grid connection" model.

According to the current analysis there is a preference for a one-off auction as a way to transition to a central auction system in the short term, seeing as it has the potential to achieve a high level of competition and the expectation that an accelerated grid connection in the foreseeable future is uncertain.

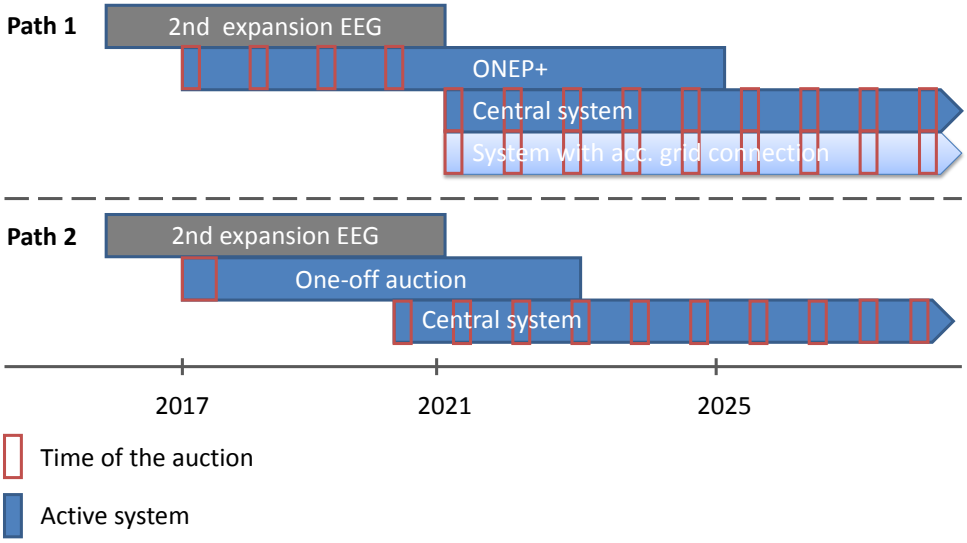

Figure 1: Overview of the pathways to the introduction of an auctioning system for offshore energy

PV roof installations

Framework requirements of the market segment

After years of high expansion rates of over 7 GW/year, which clearly exceeded the target corridors, the German PV market has declined sharply since 2013. Given this, only 1.9 GW of new capacity was installed in 2014. This market decline is primarily due to a combination of continually declining remuneration rates, stagnant system prices, and uncertainties in terms of self-consumption.

The operators and investors of the PV roof-mounted installation segment are extremely diverse and heterogeneous and the market is made up of a number of small and mid-sized units. In 2013 roof-mounted installations up to 100 kW accounted for over 70% of the newly-installed capacity and 98% of the total number of installations; in 2014, the shares are likely to be similar[1].

Self-consumption

Since 2009, and especially since 2012 when the self-consumption premium was removed, self-consumption, as well as the business models and technical configurations based on it, have gained importance. New PV systems are almost exclusively designed in such a way that a part of the energy produced is self-consumed despite the fact that nowadays, and also in the future, the macro-economic importance of self-consumption from PV installations is low compared to that of other power plants.

If self-consumption were permitted in tendering systems, it would likely cause significant distortions of the auction. Potential plant operators would factor in the realisable revenue, meaning the avoided electricity purchase price, into the calculation of the required remuneration for the excess supply. Consequently, the plants with the lowest required support level would receive the support rather than those with lowest electricity generation costs. Therefore, installations with the highest portion of self-consumption would be encouraged and site quality criterion, on the other hand, would be of secondary importance. Due to the described effects, the ground-mounted PV systems auction regulation (FFAV) requires that all electricity generation must be fed into the grid and not self-consumed.

Auction design

We propose integrated auctions for ground-mounted and large PV installations on roofs or other built structures of a capacity at or above 1 MW. In the framework of this joint auction, the main elements of the auction system for ground-mounted PV installations are retained, since large PV installations on roofs and other built structures with a capacity at or above 1 MW show structural similarities to that of ground-mounted installations. The joint auction volume should be at least 600 MW, given that the market potential is expanded by the inclusion of large roof-mounted PV installations and installations on other built structures. For smaller installations we recommend applying the De-Minimis-regulations of the EC State Aid Guidelines.

[1] Since the transaction data with respect to the Renewable Energy Sources Act is not yet available for 2014, the corresponding evaluation for 2014 cannot yet be made.

Overview of the essential design elements of the recommendations:

- Joint auction with a volume of at least 600 MW/year for large roof-mounted PV installations, large installations on other built structures, and ground-mounted installations;
- Fully applying the De-minimes-rules of the EU State Aid Guidelines: Exception from auctions for installations below 1MW;
- Incentivising participation and increasing the likelihood of large roof-mounted PV installations being successful in the auction by granting a premium to make up for higher specific costs of such installations compared to ground-mounted ones;
- Exclude self-consumption and require commitment to fully feed in the produced electricity (analogous to ground-mounted PV auction scheme) to avoid market distortion;
- Maintain most of the parameters of the ongoing auction for ground-mounted PV.

In principle the PV targets can be ensured by ground-mounted systems alone, however a significant contribution by roof-mounted systems is politically desired. For the joint auction the initial conditions should include a bonus for large roof-mounted installations so they can compete with ground-mounted systems despite having higher specific costs. Because of the De-minimis rules, much of the PV market will remain subject to the previous funding system (with all applicable rules). The volume of the roof-mounted segment outside of the auction system is controlled by the flexible cap ("atmender Deckel").

Eligibility requirements	
Material & financial qualification criteria	• Because PV roof–mounted systems are not subject to legal approval and construction planning requirements comparable to that of ground-mounted installations, it is proposed that PV roof-mounted systems are not subject to any material qualification requirements. • Building on the suggestion that no material qualification requirements should be set, a first bid bond of €4/kW and a second bid bond of €50/kW are proposed. • To simplify the system, the advantages and disadvantages of a merger of primary and secondary bid bonds as well as a possible corresponding adjustment for ground-mounted systems, should be discussed throughout the consultation.
Project location und size	• The location for ground-mounted systems should be evaluated after the first tender rounds. • Regulating eligible locations is not necessary for roof-mounted systems. • The maximum unit size should be 10 MW for both ground-mounted systems as well as PV systems on buildings or other structures. • The minimum project size is limited by the De-minimes rules and should therefore be set at 1 MW.

Auction procedure	
Auction frequency	• In accordance with the ground-mounted PV systems tender regulation, 3 to 4 bidding rounds should be conducted per year
Auctioned volume	• The joint auction volume for large PV systems on roofs or other structures and ground-mounted systems should be at least 600 MW/year. • To increase the chances of a successful bid for large rooftop systems in direct competition with ground-mounted systems, we propose the granting of a bonus for rooftop installations. It is yet too early to set the bonus for large rooftop installations.
Ceiling price/floor price	• As for ground-mounted systems, a ceiling price should be set for roof-mounted systems. In this respect, the proposed bonus should be taken into account. A minimum price should not be established.
Auction procedure and pricing rule	• The pay-as-bid price rule set out by the ground-mount PV systems tender regulation applicable from 2016 should also be applied to large roof-mounted systems

Realisation of awarded bids/projects	
Realisation deadline	• The realisation period for large rooftop systems should be approximately 9 months or adjusted to match that of ground-mounted installations, e.g. 12-15 months. Additionally, as is the case in the ground-mounted PV systems tender regulation, a realisation buffer with a reduction in the support level should be allowed. • In the course of the evaluation of the auction of ground-mounted PV systems, opportunities to standardise the realization period should be examined.
Penalties and right to produce electricity	• The penalty should be uniform for ground-mounted and large PV installations on roofs and other built structures and amount to €50/kW. The bid bond should secure the penalty. • Analogous to ground-mounted PV systems, a support right should only exist if the total power generation is fed into the grid and not used for self-consumption. Therefore, self-consumption is ruled out for all projects involved in the auction.
Return and transferability of the rights to produce electricity	• Trading the support right should not be allowed. For ground-mounted PV installations, the existing possibility for flexible realisation of the project should remain. Transferability of the support

	right should be possible within a legal entity. If the rights are transferred, the support level will be reduced slightly • Given that there is a low risk of roof-mounted PV installations not being realised, we do not recommend transferring the rights to produce electricity between two different legal entities. This is also the case for the option of returning the rights to produce electricity. • An option to return support rights should be considered throughout the consultation.

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ECOFYS Germany GmbH | Albrechtstraße 10 c | 10117 Berlin | **T** +49 (0)30 29773579-0 | **F** +49 (0)30 29773579-99 | **E** info@ecofys.com | **I** www.ecofys.com

Managing Director C. Petersdorff | **Register Court:** Local Court Cologne | **Chamber of commerce Cologne** HRB 28527 | **VAT ID** DE 187378615

Fraunhofer ISI consentec ECOFYS sustainable energy for everyone

Takon GmbH Spieltheoretische Beratung BBG und Partner GÖRG ZSW

ECOFYS Germany GmbH

Albrechtstr. 10 c
10117 Berlin

T: +49 (0)30 2977 3579-0
F: +49 (0)30 2977 3579-99

E: info@ecofys.com
I: www.ecofys.com