**Federal Ministry
Republic of Austria**
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

Austrian Evaluation Plan

- For the Renewable Energy Expansion Act

Vienna, 2021

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Austrian Evaluation Plan

Plan on the evaluation of the impacts of operating aids for electricity from renewable sources included in the Renewable Energy Expansion Act 2021 (Erneuerbaren-Ausbau-Gesetz 2021)

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1 Objectives of the Aid Scheme

The aid scheme to be evaluated concerns the support of plants for the generation of renewable electricity (Photovoltaik, Wind, Hydropower, Biomass, Biogas) by means of feed-in related market premium. The amount of the market premium results from the difference between a reference value ("anzulegender Wert, AzW") determined administratively or by tender and a reference market value/price averaged on the basis of the trading result for the hourly price of the uniform day-ahead market coupling for the bidding zone relevant for Austria.

The reference value (AzW) is determined by tenders, for installations not subject to tenders, the reference value is set administratively.

This regulation intends to compensate for cost disadvantages of renewable energy plants compared to conventional generation plants and to enable renewable energy plants to be operated economically. At the same time, the aim is to ensure that the recipients of the aid behave in a way that is in line with the market.

Aid recipients are plants generating renewable energy that feed this energy into the Austrian electricity grid.

The aim of the scheme is to increase the expansion of renewable electricity generation. The support and the associated greater planning security enable the aid recipients to implement projects that would otherwise not be economically feasible. This is in the general interest, as the expansion of renewable energies is an important part of achieving climate neutrality in 2040 and the local provision of energy can increase the security of supply.

Being faced with significantly higher LCOE and the interest in keeping biomass/biogas installations active for various reasons (diversification, ability to offer base production) existing biogas/biomass installations which have received operating aid under the support scheme of the Green Electricity Act 2012 have the possibility to apply for follow-up premium under the support scheme of the Renewable Energy Act. The total duration of operating aid under the „old" and „new" support scheme may not exceed 30 years from the start of operation.

Negative effects on the aid recipients are not expected. The economy in general is affected by slightly higher levies (which are linked to grid charges) to finance the support scheme, but also benefits from the additional generation.

The support scheme is open for projects fulfilling the eligibility criteria (i.e. necessary administrative approvals for the projects, latest state of the art or ecological criteria to be met by projects).

1.1 Envisioned Expansion Path

The Renewable Energy Expansion Act (EAG) § 4, (4) intends to achieve in total the following expansion goals: Based on production in 2020, annual electricity generation shall increase by 27 TWh in terms of volume by 2030. It is planned to achieve this amount of additional annual electricity through:

- 11 TWh from photovoltaics,
- 10 TWh from wind power,
- 5 TWh from hydropower, and
- 1 TWh from biomass.

The following expansion path is envisioned for the support of each technology by means of market premiums: (volumes, which have already been planned for contracting 2021, are mostly evenly distrubted over the following years.)

Table 1: EAG market premiums (envisioned expansion path): contracting in MW

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hydropower and Wind	-	20,0	20,0	20,0	20,0	20,0	20,0	20,0	20,0	20,0
Hydropower (up to 25 MW)	-	100,0	100,0	100,0	100,0	110,0	110,0	110,0	110,0	110,0
Wind	-	200,0	475,0	475,0	475,0	475,0	475,0	475,0	475,0	475,0
Photovoltaik	-	777,8	777,8	777,8	777,8	777,8	777,8	777,8	777,8	777,8
Biomass <0,5 MW	-	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5
Biomass 0,5-5 MW	-	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5
Biogas < 250 kW	-	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
Biomass Nachfolgeprämie (follow-up bonus)	-	0,7	25,0	36,0	14,0	9,4	9,2	17,8	2,0	1,1
Biogas Nachfolgeprämie (follow-up bonus)	-	-	56,4	0,7	1,2	1,4	0,7	3,0	2,4	1,8

Table 2: EAG market premiums (envisioned expansion path): contracting in TWh

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Hydropower and Wind	-	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07
Hydropower (up to 25 MW)	-	0,45	0,45	0,45	0,45	0,50	0,50	0,50	0,50	0,50
Wind	-	0,50	1,19	1,19	1,19	1,19	1,19	1,19	1,19	1,19
Photovoltaik	-	0,78	0,78	0,78	0,78	0,78	0,78	0,78	0,78	0,78
Biomass <0,5 MW	-	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Biomass 0,5-5 MW	-	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Biogas < 250 kW	-	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
Biomass Nachfolgeprämie (follow-up bonus)	-	0,00	0,13	0,18	0,07	0,05	0,05	0,09	0,01	0,01
Biogas Nachfolgeprämie (follow-up bonus)	-	-	0,35	0,00	0,01	0,01	0,00	0,02	0,01	0,01

Table 3: EAG market premiums (envisioned expansion path): cumulative production in TWh, added delay for difference in contracting and realization

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Hydropower and Wind				0,1	0,1	0,2	0,3	0,4	0,4	0,5	0,6	0,6
Hydropower (up to 25 MW)				0,5	0,9	1,4	1,8	2,3	2,8	3,3	3,8	4,3
Wind				0,5	1,7	2,9	4,1	5,3	6,4	7,6	8,8	10,0
Photovoltaik			0,8	1,6	2,3	3,1	3,9	4,7	5,4	6,2	7,0	7,0
Biomass <0,5 MW				0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,4	0,5
Biomass 0,5-5 MW				0,1	0,1	0,2	0,2	0,3	0,3	0,4	0,4	0,5
Biogas < 250 kW				0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,1	0,1
Biomass Nachfolgeprämie (follow-up bonus)	-	0,0	0,1	0,3	0,4	0,4	0,5	0,6	0,6	0,6	0,6	0,6
Biogas Nachfolgeprämie (follow-up bonus)			0,3	0,3	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4

The volumes in table 1 to 3 show a linear approach to reach the planned amount of additional annual electricity generation from renewables. Depending upon the level of exhaustion of the volumes for the administrative set or tendered market premiums and the outcome of the planned monitoring of the process, volumes can be shifted between technologies as well as between the investment and operating support scheme:

- Instead of adding volumes missed in 2021 evenly to the remaining years until 2030, it would be possible (depending on the first evaluation results) to keep the minimum volumes for certain tenders/technologies and later add larger additional volumes towards the end of the funding scheme, when measures to increase the supply side are starting to have a greater impact on the project pipelines.
- Capacity left-overs will be shifted to the following year and, after that, to the subsequent year and thus add to the capacity offered in subsequent auctions of the same technology. After the 3rd year capacity may be re-allocated to other technologies or support mechanisms, i.e. from market premium to investment aid. See e.g. Art 41 (3) EAG.
- Where both market premium and investment aid are available, up to 30% of the volume assigned to auctions may be shifted to investment aid, independently from a particular auction result or the 3-year period referred to above; see Art. 7 (2) EAG

- Where a technology has met its specific target, auction volumes for this technology may be reduced; see Art. 7 (3) EAG.

To ensure full exhaustion of the volumes, additional potentials have to be activated, especially with regard to wind and hydropower. As regards wind additional zones/areas are to be provided for in regional planning. As regards hydropower for example eligible projects are limited due to the ecological criteria. In the course of the evaluation particular attention has to be paid to development of the future project pipeline.

The upper limits of the operating aid (respectively the AzW) are aligned to the LCOE for each technology (including an appropriate interest rate). To determine the LCOE a study has to be commissioned each year (see the attached study on operating and investment aid).

The funding administration agency examines the eligibility criteria of the projects. Contracts are to be awarded until the volumes for each tender, or in case of administratively set market premium the volumes for each funding call, are exhausted. The provisions for reducing (ground mounted PV installations, advantaged areas for wind generation) or increasing the market premium (disadvantaged areas for wind generation) are to be applied by the funding administration agency. More detailed provisions are to be specified by means of an ordinance (§ 33 (2) and (4) EAG; § 43 EAG).

There are certain constraints/risks that might affect the intended implementation of the scheme, its expected impacts and the achievement of its objects:

The planned expansion path requires grid expansion and suitable areas for the installations in regional planning. Furthermore, projects are subject to various administrative proceedings and approvals before they can start building/operating.

Also the administratively (or as caps for tenders) determined reference values ("anzulegende Werte") could be set too low, so that the intended contracted quantities will not be reached and only a small number of projects is realized.

The expansion targets could be missed, if the implementation rate of the projects is too low, the calls for tenders are not covered or the expansion volumes are chosen too low. However, it is planned that all quantities that could not be contracted or realized will be made up later. This reduces the risk of missing the target.

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1.2 Estimated financial requirements for market premiums

The aid instrument is a feed-in market premium. Therefore, the annual budget depends both on the contracted (and installed) generation quantities and on the respective AzW in combination with future market prices. An exact forecast of the budget is therefore not possible. Based on the planned expansion paths, an assumed market price of 50 €/MWh and initial results on the possible upper limits with regard to the future possible AzW, the following cost trend is assumed (only financing for EAG market premiums estimated, running feed in tariffs from the old funding scheme or investment aids are not included):

Figure 1 EAG budget forecast market premiums
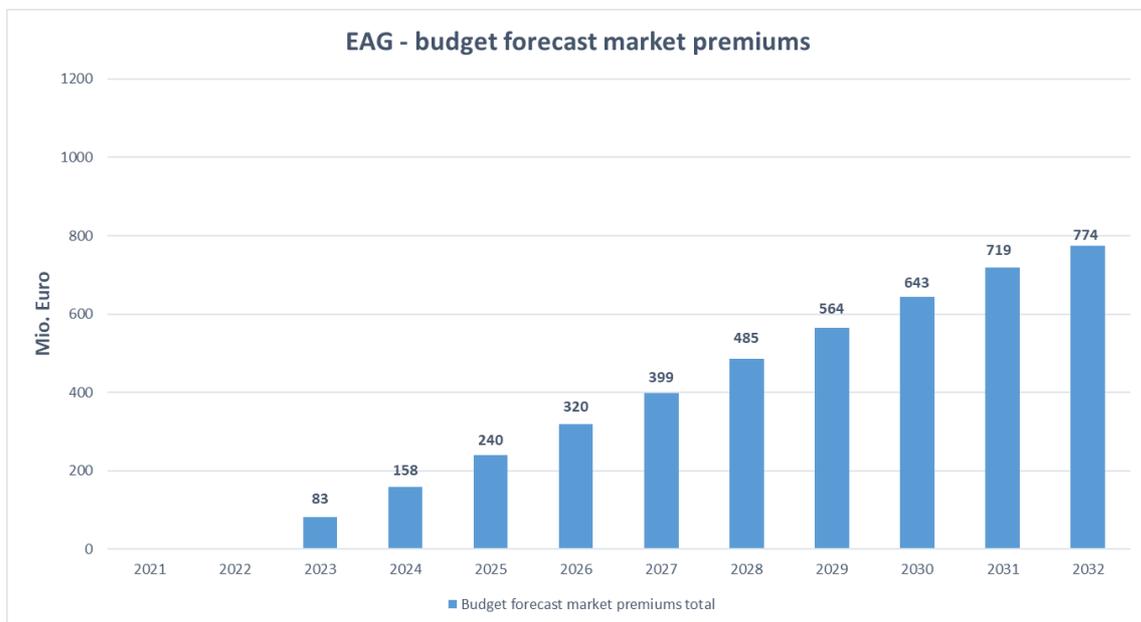
In any case, it can be assumed at the present time that the funds required for market premiums will not exceed an annual financing volume of 1 bn €, even at the peak of the volumes contracted by the scheme.

Contracting under the aid scheme is planned until 31 December 2030. Unless special regulations exist, market premiums are granted for a period of 20 years from the date on which proof of commissioning of the installation is submitted to the funding administration agency ("EAG-Förderabwicklungsstelle"), in the case of expansions and revitalisations from the date on which proof of commissioning of the expanded or revitalised plant is submitted to the funding administration agency.

The eligible costs are calculated on the basis of the levelized cost of electricity (LCOE) including an appropriate interest rate. For more detailed information, see the attached study on operating and investment aids under the Renewable Energy Act

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2 Evaluation Questions

This chapter lists the specific questions that should be addressed in the evaluation. The focus here is on quantitative evidence of the effects of the aid. In addition, it is stated how the evaluation questions relate to the objectives of the aid scheme. A distinction is made between the following types of questions:

a) questions related to the direct impact of the aid on the beneficiaries,
b) questions related to the indirect impacts and
c) questions related to the proportionality and appropriateness of the aid.

2.1 Questions related to the direct impact (A)

RES extension

1. To what extent have the objectives of the scheme been achieved? (BGBl. I Nr. 150/2021,, 2021) (Evalsed, 2013)
2. To what extent are the scheme objectives justified in relation to needs? (Evalsed, 2013)
3. What is the development of the total plant stock (in MW, GWh and number of projects) per technology, with and without subsidies from the aid scheme? (Navigant, 2019) (EC, 2021)
4. How many projects were developed under the scheme? (EC, 2021) (differentiated between new and repowered projects)
5. How much new capacity was installed under the scheme? (EC, 2021) How much capacity was repowered?

Effect of aid

6. Has the aid had a significant effect on the course of action taken by the aid beneficiaries? (EC, 2014) (Navigant, 2019)
7. Were the intervention effects additional to what would otherwise have taken place? / Did the intervention only generate outputs and results that would in any case have occurred? (Evalsed, 2013)

8. Did the beneficiaries increase energy production from renewables? (if possible: compared to non- successful applicants or another appropriate control group) (EC, 2021)

9. Did the beneficiaries increase energy investments in RES projects? (if possible: compared to non- successful applicants or another appropriate control group) (EC, 2021)

Competition

10. What is the number and type of beneficiaries? / How many enterprises/projects/beneficiaries have received the aid under the scheme? / Which were the main types of beneficiary projects and enterprises? (EC, 2021)

11. Does the scheme contribute to market concentration or diversity of actors? (BGBl. I Nr. 150/2021,, 2021) (Navigant, 2019)

12. How did the intensity of competition develop in the auctions over time? (Navigant, 2019) (DE, 2021)

13. What effects did the different funding rates and funding approaches (auction vs. administrative award) have on the expansion in the various plant size classes and technologies? (Navigant, 2019)

14. Have beneficiaries been affected differently by the aid, depending on the company/organization size? (EC, 2014)

15. To what extent have small players and community energy projects been awarded contracts? (Navigant, 2019)

16. In the wind auctions, how much volume has been awarded with pay-as-clear? Are the beneficiaries being assigned with pay-as-clear are energy communities, small players or also large players?

17. How have the award prices developed over time? (Navigant, 2019)

18. How many auction rounds did a project take to be awarded? (Navigant, 2019)

19. Were projects that have not been awarded abandoned? If so, after how many rounds of auction participation? (Navigant, 2019)

20. How does the spatial distribution develop in the tender? How are the bids, awards and realization distributed regionally and how is the available potential used? (BGBl. I Nr. 150/2021,, 2021) (Navigant, 2019) Impact of the correction factor for wind on the bids: what is the geographical distribution of the winning bids?

21. Mixed tenders: are the tenders over/undersubscribed? Which types of technologies and installations obtain the award? Has there been adaptation of the volume of the tendered capacity (increase or decrease from 20MW)?

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22. Does the award probability differ depending on the location of the project (e.g. federal state? (Navigant, 2019)

Realization rates

23. How high are the realization rates of awarded projects? (Navigant, 2019)
24. How successful was the auction compared to deployment benchmark?
25. What are the reasons for non-realization, delays and deviations between the amount awarded and the installed capacity? (Navigant, 2019)
26. How did the location differentiation model based on rotor area-specific production yields affect the result of the auctions for wind power? (Navigant, 2019) Is there a balanced development of wind installations in line with the potential of each region?

Investment

27. What is the relationship between investment amount and aid amount? How does this relationsship evolve over time? (Navigant, 2019)
28. How successful was the auction mechanism compared to policy benchmarks on price reduction?

2.2 Questions related to the indirect impacts (B)

Energy and Emissions

1. Has the scheme contributed to the relevant policy objective? (EC, 2014)
2. Has the aid led to a decrease in the level of primary non-renewable energy consumption? (EC, 2021)
3. What are the carbon emissions avoided resulting from the aid provided? (EC, 2021)

Electricity market

4. How many jobs were created in the supplier industry? (EC, 2021)
5. What were the effects on the wholesale electricity prices (qualitative, with comparison of 15min spot market prices vs PV, wind, hydropower, biomass, biogas production curves 15min)? (EC, 2021)
6. What were the effects on the retail electricity prices (qualitative, with quantitative example for an average household)? (EC, 2021)
7. How did the aid affect cross-border trade in electricity? (DE, 2021)

8. What impact has the aid had on competition (in particular, the efficiency of entry and exit) in the electricity market in Austria? Has the aid increased the beneficiary's market power? (EC, 2021)

New projects

9. What effects does the introduction of the aid scheme have on the development and approval of new projects? (Navigant, 2019) / Description of the development of the project pipeline. In particular, explanation of the status of the National Infrastructure Plan envisaged by Art. 94 EAG, the impact on the expected pipeline, the status of approved/waiting for approval of projects. Analysis if the volume tendered yearly is proportionate to the actual envisaged pipeline.

2.3 Questions related to the proportionality and appropriateness of the aid (C)

Proporitionality

1. What are the aid volumes disbursed for electricity fed into the grid continuously in total via EAG instruments and other instruments (ÖSG)? (similar to (E-Control , 2020))
2. Was the type of public intervention efficient compared to other schemes (e.g. existing and previous AT schemes and schemes in other EU Member States)?
3. Was the aid scheme proportionate to the problem being addressed? Could the same effects have been obtained with less aid or a different form of aid? (for example, loans instead of grants) (EC, 2014)

Approriateness

4. Was the most effective aid instrument chosen? Would other aid instruments or types of intervention have been more appropriate for achieving the objective in question? (EC, 2014)
5. Can the performance of the funding instruments be improved? (BGBl. I Nr. 150/2021,, 2021) (Navigant, 2019)
6. Was there too much / too little support offered? Appropriateness of auction volumes and funding allocation, max prices and number of auctions or funding calls. (BGBl. I Nr. 150/2021,, 2021) Which % of tendered volume was assigned to bidders in each auction for each technology? What is the maximum price of the award for each technology for each tender, and how does it compare to the maximum price set? Is there a reporting of volumes from one year to the other for any technology? Does the

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reporting of the volume to the next year lead to excessive undersubscription? Has excess volume tendered for the technology specific tenders been transferred to investment aid or other technologies?

7. Was the funding for the plants appropriate? How has the profitability of the subsidized systems developed? (Navigant, 2019)

8. Are the material and financial pre-qualification requirements appropriate? (Navigant, 2019)

9. Are the penalties in the event of non-implementation or delay in implementation appropriate? Have the security measures / penalties worked? (Navigant, 2019)

10. Are the respective implementation periods appropriate? (Navigant, 2019)

11. How transparent / understandable is the procedure? (Navigant, 2019)

12. Were there incorrect / invalid bids? If yes, how many? What are the areas, which are incorrect or lead to invalidation? (Navigant, 2019)

13. Does bidding behaviour show strategic bidding? What is the standard deviation of bid distribution? (BGBl. I Nr. 150/2021,, 2021)

3 Result Indicators

3.1 Description of indicators

The following indicators are used to calculate or evaluate the following results for both auctions and administrative awarded aid

a) Auction results, including bids, awarded bids, and non-awarded bids as well as administratively awarded projects

b) Development of the number of plants, investments and newly built capacities for the generation of energy from renewable energy technologies (solar PV, onshore wind power, biomass, biogas, hydropower) compared to a counterfactual non-aid. In order to determine the direct impact of the funding scheme on these developments, the projects developed with EAG funding ("treatment group") are compared with the projects developed without EAG funding ("control group"), projects that participated in the auction process / administrative process but were unsuccessful, as well as projects that were developed without participating in the auction / administrative process.

c) Simulation of the effects on the costs of the EAG-scheme in the event of an increase or reduction in the quantities auctioned (based on the analysis of all bids received in the auction ("supply curve analysis");

d) Contribution of each technology to the reduction of CO_2 emissions in the electricity sector and to the achievement of the overall objectives;

e) Effects on competition in the energy markets (development of market concentration);

f) Comparing the costs of the EAG-results with the LCOE estimates of renewable energy generation per technology type in order to assess the necessity and proportionality of the aid;

g) Assessment of the competitiveness of the auctions;

h) Development of the amounts of aid granted over time, regardless of whether they are awarded in the context of auctions or in the administrative area.

i) Evalution on differences and interactions between technology-specifc and cross-technology auction/aminstrative awards

In addition to the general questions, the following specific areas are evaluated:

j) Evaluation of the location differentiation model based on rotor area-specific production yields for wind auctions

3.2 Table of indicators

The following table describes which indicators are used to measure the results of the regulation. In addition, the relevant control variables including the data sources are specified and the individual result indicators are assigned to the evaluation questions. Specifically, the following information is given in the table:

a) the relevant evaluation question,
b) the indicator, (the indicators are provided in a detailed broken down way to enable the link to data sources)
c) the data source,
d) the frequency of data collection (e.g. annually, monthly, etc.),
e) the level at which data is collected (e.g. company level, company level, regional level, etc.),
f) the group covered in the data source (e.g. beneficiaries, non-beneficiaries, all companies, etc.).

The indicators chosen are the most appropriate for measuring the expected impact of the aid scheme for the following reasons: The evaluation indices and the method proposed follow a pragmatic approach (as recommended in (Evalsed, 2013)). The evaluation none-the-less aims at improving the efficiency and legitimacy of the public program by providing valuable analysis and insights in the EAG-funding schemes evaluated. Due to the pragmatic approach, the indices proposed are deemed workable with the available data and the data, which can be generated additionally with justifiable effort. The indices desripted apply for both auctioned and administratively awarded projects.

Table 4: Indicators for both auctions and administrative awarded aid (Treatment group (TG), Control Group (CG)

Evaluation question	Indicator	Source	Frequency	Level	Group
A1	Target achievement in GWh (trajectory vs. realization)	EAG-Funding agency	Yearly	Per technology National	TG
A2	Target achievement in % of share of RES-E	Statisitk Austria and EAG-Funding Agency	Yearly		TG
A3	Development of plants with aid (in MW, GWh and number of projects)	EAG-Funding agency	Yearly	Per technology, per aid instrument, regional and national	TG
	Development of plants without aid (residual of statistic minus EAG-funding) (in MW, GWh)	Statisitk Austria and EAG-Funding Agency	Yearly	Per technology, regional and national	CG
A4	Total number of developed projects (differentiated between new and repowering)	EAG-Funding agency	Per auction	Per technology and overall	TG
A5	Total installed new capacity (differentiated between new and repowering)				
A6	Counterfactual analysis RES-E generation – MW, GWh and Number of projects installed, EUR invested without aid vs with aid	See Methodology chapter	Per (Final) evaluation	Per technology, national	TG and CG
A7					
A8					

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A9					
A10	Number of beneficiaries	EAG Funding agency	Per auction/ evaluation		TG
	Type of beneficiaries (size range, organization type)				
	Number of projects that received aid				
A11	Share of bid volume vs award volume (for 1st, 2nd and 3rd vs 4th and 5th vs other bidders), Gini-Coefficient and GWB-limits	See Methodology chapter	Per evaluation		
A12	development of auctions over time				
A13	Average capacity of project EAG vs ÖSG	EAG Funding agency vs. OeMAG			TG and CG
A14	Award success and realization rate for different organization size	EAG Funding agency	Per auction /evaluation		TG
A15	Award success and realization rate small players and community energy projects				
A16	Award volume pay-as-clear vs pay-as-bid?			Wind	
	Pay-as-clear type of beneficiary				
A17	Award price development			Per technology, national	
A18	Average, Min, max number of auctions until award				
A19	Abondment rate, number of auction				CG

	rounds until abondment				
A20	Regional distribution of bids, award, realization,			Per technology, national and regional	TG
A21	Mixed tenders auction volume vs. bid volume			Mixed tenders, national	
	Mixed tenders – award volume in % per technology				
	Mixed tenders volume adaptation				
A22	Award propability depending on region			Per technology, national and regional	
A23	Realization rate			Per technology, national	
A24	Realization rate vs benchmark				
A25	Reasons for non-realization	EAG funding agency and survey			CG
	Reasons for delay				TG
	Reasons for deviation				
A26	Evaluation of location differentiation model for wind power	EAG funding agency		Wind	
A27	Aid vs. Investment			Per technology	
A28	Award price vs benchmark				
B1	Target achievement in % of share of RES-E	See Methodology	Per evaluation	Overall	TG
	Target achievement in Mio. t CO_2 emission reduction in the sector energy				

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B2	Avoided primary non-renewable energy production				
B3	Avoided CO_2 emissions from aid provided				
B4	Jobs created or kept				
B5	Effects on wholesale electricity prices				
B6	Effects on retail electricity prices				
B7	Effects on cross-border electricity trade				
B8	Market shares; market concentration			Per technology	
B9	Number of projects in development (number, MW, GWh)				
	Number of projects approved (number, MW, GWh)				
C1	Aid volumes EAG	EAG funding agency	yearly	Per technology	TG
	Aid volumes ÖSG	OeMAG			
C2	Efficiency, Award price comparison, FiT comparison	See Methodology	Per evaluation	Per technology	
C3	Supply curve analysis				TG and CG
C4	Instrument effectiveness	See Methodology	Per evaluation	Per technology	
C5	Improvement potential general	EAG funding agency plus survey			

C6	Supply curve analysis, Auction volume vs. Bid volume, Award price vs. Max price, development per auction	See Methodo logy,	Per auction		
C7	Award price vs. LCOE analysis	LCOE studies plus EAG funding agency	Per auction		
C8	Appropriateness of financial pre-qualification	EAG funding agency plus survey	per evaluation		
C9	Appropriateness of penalities and security measures				
C10	Appropriateness of implementation period				
C11	Understandability of procedure				
C12	Number and type of incorrect and invalid bids	EAG funding agency	Per auction / per evaluation		
C13	Strategic bidding	See Metholo dgy			

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4 Envisaged Methods

The envisaged methods are seen as recommendations for independent evaluators. In case the evaluators propose methods of equal or better quality or providing more concrete results the European Commission will be informed for a jointly agreement.

To specify the methodology used in the evaluation in more detail, a methodology report will be submitted to the Commission 9 to 12 months after the notification of the market premiums is completed.

A central component of the evaluation is the analysis of the EAG's impact chains, with regard to the objectives that are to be achieved with this policy instrument. Due to the special features of the funding system and data availibility, the counterfactual impact evaluation will be supplemented by the approach of the theory-based evaluation. For this purpose it is planned to develop the "Theory of Change" on which the EAG is based and test the identified mechanisms, i.e. examine the causation behind the observed results.

4.1 Methods for direct impacts

For most of the direct impacts the quantitative evaluation is relatively straight forward. The qualitative interpretation of the results requires expert knowledge.

The methodology and/or results for any question which was extracted from the source (Navigant, 2019) can be found in this source and will not be elaborated here at this point. This concerns the following questions: A3, A11, A12, A13, A15, A17, A18, A19, A20, A22, A23, A25, A26, and A27.

Question A1 on achievement of objective need to evaluate bid, awarded and realized projects in comparison to a target trajectory.

Question A2 can evaluate if the planned contracted and realized capacity until 2030 is sufficient to achieve the aim of 100% of electricity demand covered through renewable electricity on an annual balance basis. For this, the target trajectory can be compared with electricity demand projections until 2030.

Questions A4 and A5will be evaluated similarly to questions A3.

Questions A6, A7, A8 and A9 require a counterfactual analysis. For this counterfactual analysis, either a regression discontinuity design (RDD), a difference-in-difference (DiD) with staggered time aid intervention approach or simplified approach (in case of insufficient data) will be used. The counterfactual will either be generated based on control group data (bottom-up) when sufficient data is available or expert estimates /available literature and a scenario analysis (top-down). Control group data for these funding schemes is available through unsuccessful bids, projects being built without aid or projects being awarded at a later auction. This data may not be available in a quantity and quality to allow a comparison to the treatment group. Additionally in some cases a large selection bias (EC, 2012), the inherent ability of different members of the treatment and control group, may prevent the use of control group data for the calculation of counterfactuals. Expert estimates, are in general not a recommended approach. However, in cases with insufficient control group data it is deemed better to build a counterfactual based on expert estimates than to have no counterfactual analysis at all. These expert estimates may be provided with confidence intervals (5%, 95%) to allow for a scenario analysis of counterfactual cases. In any case, the underlying calculation methodology and assumptions for the counterfactual need to be clearly stated.

Question A10 will be answered using standard methodology, analysis of number and type of beneficiaries.

Question A14 on different effects of aid on beneficiaries can evaluate how companies of different sizes, e.g. determined based on the number of employees in ranges (e.g. Micro (<10), Small (<50), Medium (<250), Large (>250)) performed in the auctions / requests for aid.

Question A16 and A21 will be answered through quantitativ analysis of data collected in the bid, award, realization process by the EAG Funding agency.

Question A24 on deployment benchmarks can define a benchmark after which realization rates can be deemed successful. This may differ for the different technologies. The benchmark can be informed by realization rates achieved and aimed for neighbouring countries (e.g. Germany). The actual realization rates are then compared with the benchmark.

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Question A27 on policy benchmarks on price reduction can quantify the extent with which the auction process led to a fall in procurement cost relative to a counterfactual feed-in tariff price. A methodology for this may be forthcoming from the Joint Research Centre.

4.2 Methods for indirect impacts

Question B1 evaluates the impact of the funding scheme in light of the overall policy objectives, which are defined as the supply of 100% of electricity demand with renewable energies in 2030 and the GHG emission reduction targets for 2030.

Question B2 evaluates the impact of the aid in terms of avoided primary non-renewable energy production. This shall be evaluated on a yearly national balance and in regards to 15min electricity production curves.

Question B3 evaluates the CO2 emission reduction supported through the EAG-funding instrument concretely for each technology group. This depends on the generation technology substituted in the system. For this, several methods exist to estimate this type of impact (e.g. for wind power (Cullen, 2013) (Di Cosmo, 2018) (Kaffine, 2020) (Oliveira, 2019)). Methods applied for the evaluation may deviate if necessary due to data availability in Austria.

Question B4 on jobs created will be regularly evaluated separately and will be included in the evaluation report.

Question B5 the effects on wholesale price will at least be evaluated qualitatively comparing 15min electricity generation curves of supported PV, wind, hydropower, biomass and biogas with 15min spot market prices.

Question B6 the effects on retail prices will be evaluated qualitatively for an average household electricity consumption separating different cost parameters. A comparison with 2020 average household electricity cost parameters and a qualitative analysis allows to assess the effects of the aid scheme on retail prices.

Question B7 the effects on cross-border electricity trade will show the changes of exports and imports compared with the generation of renewable electricity depending on 15 min production, export and import curves.

Question B8 will be answered by computing and comparing the concentration metric (HHI) of conventional with RE market.

The methodology and results for question B9 should be similar to how this question was evaluated in the underlying source (Navigant, 2019).

4.3 Methods for the evaluation of the proportionality and appropriateness

Question C1 evaluates the total aid volumes disbursed per year according to EAG, and ongoing ÖSG-funding.

Question C2 will compare the award prices reached in similar auctions in neighboring countries in the same year. Potential differences in award prices will be analysed qualitatively.

The question C3 on proportionality of aid, may either compare the cost of emission reduction achieved through the EAG-funding schemes vs. the cost of emissions as calculated in renowned studies. An analysis of LCOE cost will, additionally, be used to assess the proportionality.

Question C4 requires to compare the quantitative results with expert qualitative analysis on alternative instruments.

Question C5 summarizes and combines the results of the next questions in a holistic way.

Question C6 will be answered using supply curves analysis of individual tenders. "The slope of the constructed supply curve or curves formed by the bids received in individual tenders allows a comparative static analysis of price and cost effects of an exogenous change in the tender volume. Such analysis is based on the assumption that bidding behaviour does not depend on tender volume, which appears justified if there is a sufficiently high level of competition and the change in the tender volume considered is not too big. Subject to this assumption, supply curves can effectively inform the evaluator on the effectiveness of the aid." (EC, 2021) Additionaly, the auction volume vs. bid volume and award price vs. max price for each auction will be analysed. The analysis will be conducted for each auction separtly.

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For question C7 the award prices will be compared with LCOE analysis for AT. Major deviations will be analysed.

For questions C8, C9, C10, and C11 stakeholder surveys can be conducted. Methodology and results from an evaluation in 2019 in Germany (Navigant, 2019) can be used as a reference.

For question C12 both the number and type of incorrect bids will be evaluated.

Question C13 strategic bidding behaviour can be evaluated assessing estimated LCOE cost vs. bid prices, bid price distribution, bid price changes between auction rounds.

4.4 Treatment group and control group

The most effective method to produce causal results would be to conduct the evaluation by applying the Regression Discontinuity Design (RDD) approach, which focuses on projects that are 'near-marginal' in the auctions: both marginal winning bids and marginal losing bids. This kind of approach exploits a threshold (i.e. clearing in the auction) that can be used to assess the effects of the aid on these two categories by evaluating the impact on both the ultimate financing and realisation of the projects. Nevertheless, the specific characteristics of the scheme pose some methodological issues that shall be considered when estimating the causal effect associated with the aid. To begin with, and in accordance with the evidence brought about by similar renewable energy schemes, it seems very implausible that renewables technology will be implemented without the aid support. Hence, the possibility to create a control group based on non-successful applicants is undermined, as it is unlikely that unsuccessfully applicants will develop renewables without support. Moreover, there might be the non-negligible risk that the size of the group of both beneficiaries and unsuccessfully applicants is not large enough for conducting ex-post evaluations based on counterfactual methods, as already documented by similar schemes.

In case the data quality allows to form a representative control group based on the RDD approach this approach will be build upon unsuccessful bids, successful bids that were not realized as well as projects, which were built without aid. Undersigned auctions/funding rounds, high realization rates and limited project implementation outside of the aid

scheme can, however, lead to insufficient or low representation of control group data and the need to use an alternative methodology.

Given the characteristics of the aid scheme and the limitations described above, the most viable methodology to be applied for the purpose of the evaluation of the effectiveness of the Aid scheme appears to be Difference-in-Differences (DiD). In particular, undertaking the staggered time of the aid intervention allows to exploit the different round of calls foreseen in the scheme. Along these lines, successful projects in a given call are compared, over the same period, to other projects that have not been granted the aid yet, but they will be successful in the next call. More in details, projects that at time, say t, are not started yet could represent the "control" group of projects that, instead, have already started over the same time.

This approach would allow the identification of the causal effect of the aid. To this end, the analysis shall include the relevant statistical exercises that allow testing the main assumptions underlying the applied model. These will encompass an event-study analysis to assess the absence of differential trends in performance across beneficiaries and non-beneficiaries before the intervention, at least in the context of the direct effects of the aid. If feasible, also a placebo test shall be implemented, either on a related-but-unaffected outcome or treatment group or based on a "fake" treatment date (in this latter case, the sample would be restricted to the pre-implementation period only). In case the validity of the applied method is not confirmed by these tests, the evaluation report should clearly specify and discuss to what extent the estimated relationships can be interpreted as simple correlations.

However, a staggered time analysis for these tenders in Austria may likely result in inconclusive results due to issues of strategic bidding. Prescribing this as a methodology for independent evaluation seems, at this point, to be not practical. Instead this methodology is given as a preferred option in the evaluation plan. The independent evaluator in his application needs to plausibly establish the reason if not applying this preferred option.

At a minimum an approach using expert estimates is prescribed. In case of insufficient control group data it is deemed better to build a counterfactual based on expert estimates than to have no counterfactual analysis at all. These expert estimates may be provided with confidence intervals (5%, 95%) to allow for a scenario analysis of counterfactual

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cases. In any case, the underlying calculation methodology and assumptions for the counterfactual need to be clearly stated.

The above empirical approach, as well as all possible caveats and issues equipped in the context of this specific scheme, shall be described in a methodological report in more detail. Then, in agreement with the European Commission, it will be decided whether to confirm the use of the DiD in the final version of the evaluation or to investigate and pursue different evaluation strategies.

4.5 Selection bias

Possible selection biases (EC, 2012), the inherent ability of different members of the treatment and control group, may prevent the use of control group data for the calculation of counterfactuals. The evaluators will make a determination if this is the case for the control groups of each technology and funding scheme.

4.6 Relevance of the methods for complex schemes

The evaluation indices and the method proposed follow a pragmatic approach (as recommended in (Evalsed, 2013)). The evaluation none-the-less aims at improving the efficiency and legitimacy of the public program by providing valuable analysis and insights in the EAG-funding schemes evaluated. Due to the pragmatic approach, the methods proposed do not cover the gold standard of evaluation - randomised experiment - and do not promise a control group based counterfactual. Instead, the methods proposed are deemed workable with the available data and the data, which can be generated additionally.

5 Data Collection

5.1 Mechanism and sources

The indicator description includes a list of data or detailed indicators and the source for the respective data.

Most data on auction, funding schemes, bids, awards, realized projects will be collected by the EAG-Funding agency continuously with each round of auction, funding and in the scope of it responsibilities after realization.

Some regularly publicly provided data from Statistic Austria will be used. For evaluation purposes special analysis on total number and capacity of installations (to derive the number and capacity of installations without aid) will be requested from Statistic Austria.

Ongoing aid disbursements on the basis of previous funding schemes (ÖSG) is available from (E-Control , 2020).

Below is a table of the data collected by a specific organization or through a specific instrument. Any bidding related data will also be collected for aid requesting companies, if the data is applicable in similar form.

Source: EAG Funding agency (Treatment group (TG), Control Group (CG)**)**

Data	Frequency	Level	Group
Maximum bid price and auction volume, AzW	Per auction	Per technology National and regional	TG and CG
Size of bidding company (in ranges based on number of employees)			
Number of bid installations			
Volume of bid investment			
Bid capacity in MW			
Average bid annual electricity generation in GWh			
Bidding price in EUR/MWh			
Number of rejected / invalid bids			CG
Volume of rejected / invalid bids investments			

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Metric	Frequency	Breakdown	Group
Rejected / invalid bid capacity in MW			
Rejected / invalid annual electricity generation in GWh			
Number of awarded installations			Extra
Volume of awarded investments			
Awarded capacity in MW			
Awarded annual electricity generation in GWh			
Awarding price min, max and average EUR/MWh			TG
Wind auction: Awarded number of project pay-as-clear vs. pay-as-bid		Wind auction	
Wind auction: Awarded volume pay-as-clear vs. pay-as-bid			
Wind auction: Awarded capacity pay-as-clear vs. pay-as-bid			
Wind auction: Awarded annual electricity generation pay-as-clear vs. pay-as-bid			
Wind auction: Awarding price min, max and average in EUR/MWh pay-as-clear vs. pay-as-bid			
Mixed tender: Awarded number of project per technology		Mixed tenders, national	
Mixed tender: Awarded volume per technology			
Mixed tender: Awarded capacity per technology			
Mixed tender: Awarded annual electricity generation per technology			
Mixed tender: Awarding price min, max and average in EUR/MWh per technology			
Realized Number of installations	Quarterly	Per technology National and regional	
Volume of realized investment			
Realized capacity in MW			
Average realized annual electricity generation in GWh			
Auction volume vs volume of bids	Per auction		TG and CG
Supply curve analysis	Per evaluation		TG and CG
Number of bidders with successful bids	Per auction		TG
Number of bidders with unsuccessful bids			CG
Share of bidding volume in company size classes			TG and CG

Data	Frequency	Level	Group
Share of awarded volume in company size classes			TG
Analysis of awarded bids depending on different yield classes		Wind	TG and CG
Number of bid trials for the same project		Per technology	TG and CG
The same unique identifier for project in multiple auction rounds			
Reasons for non-realization	Continuous		TG and CG
Reasons for delays			
Reasons for deviations			
Energy share in electricity production	Yearly	Per technology, overall	TG
Aid volume (EAG)			
Type of bidding organization	Per auction	Per auction	TG

Source: Statistic Austria

Data	Frequency	Level	Group
Renewable Energy share in total electricity production	Yearly	Overall	Extra
Number of installations without aid	yearly	Per technology	CG
Installed capacity without aid in MW			
Average annual electricity generation without aid in GWh			

Source: Stakeholder survey

Data	Frequency	Level	Group
Potential for improvement of funding instrument	Per evaluation	Per technology	TG and CG
Appropriateness of pre-qualification criteria			
Appropriateness of implementation period			
Transparency and understandability of procedure			
Reasons for non-realization			
Reasons for delays			
Reasons for deviations			

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Source: Data generated per evaluation

Data	Frequency	Level	Group
Number of installations - counterfactual	Per Evaluation	Per technology	Counterfactual
Installed capacity - counterfactual			
Average yearly electricity - counterfactual			

Other

Data	Source	Frequency	Level	Group
Aid volume (ÖSG)	OeMAG	Per year	Per technology	Extra
LCOE-estimate	External	Per year		Extra
Employment created	external study	Per study		Extra
Herfindahl-Hirschman Index (HHI)	External study	Per study	RES market, conventional market	Extra
Wind power potential per region	External study	Per study	Wind	Extra
Project pipeline data	Diverse external stakeholders	Per evaluation report	Per technology	Extra

5.2 Frequency of data collection

The frequency of data collection is defined in the data tables above. In principle, the data collection frequency of the source of data is given. Data can be collected continuously, per auction / funding round, per year, quarterly.

5.3 Limitations factors

When the funding is undersigned (offer volume <tender volume), no control group can be formed over projects that took part in the tender process but were unsuccessful. If there

is a small or non-representative number of projects that were developed without participating in the tender, a representative control group cannot be formed either. No control group would therefore be available for technology groups in which both cases occur. For evaluations (per technology) were this is the case expert estimate may be used for the generation of counterfactuals.

5.4 Surveys and external information sources

Stakeholder surveys will be used to evaluate parts of the design of the funding instruments. External information sources, like publications on renowned sources (e.g. for LCOE-estimates, benchmarks from other countries) will be used in the evaluations.

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6 Timeline

The Renewable Energy Expansion Act (Erneuerbaren-Ausbau-Gesetz) already includes certain milestones for data collection, interim reports and the possible involvement of stakeholders:

• The agent responsible for processing the funding (EAG-Förderabwicklungsstelle) has to submit short term reports after each funding call (providing data on the projects which applied for funding and the results of funding calls),

• Yearly reports ("monitoring reports") by the regulatory authority (based in part on data provided by the agents responsible for processing the old and new funding scheme but also on data concerning the total development of the market)

• Yearly studies on the development of LCOE according to the different technologies.

• An evaluation report two years after the funding system enters into force (the first report is planned for December 2024, followed by additional evaluation reports every five years. Those Evaluation reports already collect and analyse data to provide information on the following aspects:

  – Status and development of target achievement;
  – Analysis of the intensity of competition, diversity of actors, regional distribution of the subsidized systems as well as the degree of realization of the existing potentials;
  – Appropriateness of the tender volume and allocation of funds, maximum prices, funding rates and the number of tenders and funding calls;
  – bidding behaviour;
  – Effects of the exemption regulation in accordance with § 73 (5);
  – Potential for improvement and need for adjustment.

• Another report that provides essential additional information for the evaluation (e.g. on areas with high potentials) is the integrated network infrastructure plan, which should be published on the end of June 2023 and be updated every five years.

Since these reports already cover some of the evaluation questions, they are a good opportunity to test methodologies and data availability for the final report and apply changes if needed. Therefore it es intended to include feasible questions from the overall Evaluation Plan to the planned interim evaluation reports.

To specify the methodology used in the evaluation, a **First Methodological Interim Evaluation Report** will be submitted to the European Commission 9 to 12 months after the notification of the market premiums is completed. This report shall describe in detail the methodology that will be used to address each of the proposed evaluation question, the indicators that will be used and their characteristics, as well as the assumptions on which the implementation of the methodology is based. The final decision on the methodology for the evaluation will be taken in agreement with the Commission. As an annex to this first report, Austria will provide the revised/completed III.8.

A **Second Interim Evaluation Report** will be submitted to the European Commission in Q4 2024 or in any case no later than Q2 2025, which will be based on evidence from the first years of the functioning of the notified scheme. The report will include at least the following points/questions:

- Description of the development of the project pipeline. In particular, explanation of the status of the National Infrastructure Plan envisaged by Art. 94 EAG, the impact on the expected pipeline, the status of approved/waiting for approval of projects. Analysis if the volume tendered yearly is proportionate to the actual envisaged pipeline. (Question B9)
- Which % of tendered volume was assigned to bidders in each auction for each technology? What is the maximum price of the award for each technology for each tender, and how does it compare to the maximum price set? Is there a reporting of volumes from one year to the other for any technology? Does the reporting of the volume to the next year lead to excessive undersubscription? (Question C6)
- Has excess volume tendered for the technology specific tenders been transferred to investment aid or other technologies? (Question C6)
- For the wind tenders:
  - In the wind auctions, how much volume has been awarded with pay-as-clear? Are the beneficiaries being assigned with pay-as-clear are energy communities, small players or also large players? (Question A16)
  - Impact of the correction factor for wind on the bids: what is the geographical distribution of the winning bids? (Question A20)
  - Is there a balanced development of wind installations in line with the potential of each region? (Question A26)
- Mixed tenders: are the tenders over/undersubscribed? Which types of technologies and installations obtain the award? Has there been adaptation of the

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volume of the tendered capacity (increase or decrease from 20MW)? (Question A21)

- In addition to the questions outlined above and with respect to the questions outline in the JRC comments, the following questions could be addressed in the Second Interim Report.
    - How much aid was given? (Question C1)
    - How many enterprises/projects/beneficiaries have received the aid under the scheme? (Question A10)
    - Which were the main types of beneficiary projects and enterprises? (Question A10)
    - How many projects were developed under the scheme? (Question A4)
    - How much new capacity was installed under the scheme? (Question A5)

All the remaining questions should be addressed in the final report (2030) and in the additional report (2034).

In case the methodologies foreseen in the evaluation plan cannot be applied (e.g. due to lack of data), Austria commits to swiftly inform the European Commission and jointly agree on a possible solution.

The delivery of the **Final Evaluation Report** is planned by 30 June2030, an **Additional Report** which will analyse the overall impact of the scheme is scheduled for 2034.

The proposed timeline might be affected by methodological problems (e.g. due to lack of data) or additional questions, which could arise during the evaluation and lead to a need to extend the timeline for the preparation of the final report.

7 Evaluation Body

It is planned to conduct the final evaluation by an external, independent evaluator, which is to be selected through tender procedure. The evaluation must be carried out by an expert independent from the aid granting authority. The tender procedure to select the evaluator therefore will include criteria to exclude possible conflicts of interest

Skills and experience that will be relevant selection criteria in the planned tender procedure could include:

• relevant experience of the tender applicants in the field of quantitative evaluation methods
• experience with conducting studies concerning the electricity generation in Austria

The funding required for the preparation of the final evaluation report is estimated as soon as a sufficiently specific service description of the evaluator is present.

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8 Publication

The evaluation results and the data on which they are based will be published, unless there are predominant public or individual interests that oppose this. Predominant public interests may exist, for example, if the publication of data would enable bidders to act strategically. Private interests can be affected in the case of business and trade secrets or personal data.

Additional to the published information Austria will share additional information with the Commission (in line with the General Data Protection Regulation) if necessary for purposes of transparency and replicability.

The final evaluation report will be published on the website of the Austrian Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology.

Austria will take the evaluation results of the evaluation duly into account for future policy-making.

Table of Tables

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Table of Figures

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Abbrevations

AzW	Anzulegender Wert (reference value)
CG	control group
CO2	carbon dioxid
EAG	Erneuerbare-Ausbau-Gesetz
Etc	et cetera
EUR	Euro
GWh	Gigawatthours
LCOE	Levilized cost of electricity generation
MW	Megawatt
MWh	Megawatthours
ÖSG	Ökostromgesetz
PV	Photovoltaic
TG	treatment group
TWh	Terawatthour