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The state of multi-technology auctions in Europe

An analysis based on the AURES II database

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The state of multi-technology auctions in Europe

Authors: Jenny Winkler (Fraunhofer ISI)
Reviewed by: Vasilios Anatolitis (Fraunhofer ISI)
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1 Introduction

The Recast of the Renewable Energy Directive (RED II) foresees the use of auctions which are open for all technologies as a means for determining the support level for electricity generation based on renewable energy sources. It also includes reasons for differentiating between technologies, e.g. based on grid integration costs or the need for diversification of electricity supply. A similar regulation has already been in place since 2014, when the Guidelines on State aid for environmental protection and energy 2014-2020 (2014/C 200/01) were published.

This report gives an overview of the current state of multi-technology auctions in the EU Member States. Section 2 defines different forms of multi-technology auctions and summarizes the debate on advantages and drawbacks of such auctions, Section 3 gives a summary of the development of multi-technology auctions in the EU. Section 4 assesses in more detail the multi-technology auctions on country level. Section 5 summarizes and concludes.

2 Definition, drawbacks and advantages of multi-technology auctions

In the past, an extensive political and scientific debate regarding the advantages and drawbacks of support schemes open to all technologies and technology-specific support schemes has taken place. In this Section, we first define some terms for dealing with auctions that are open for several technologies. Second, we summarize the discussion on advantages and drawbacks of such auctions.

2.1 Terms for auctions open for several technologies

In the debate about open support schemes, these auctions are mostly called "technology-neutral" schemes. We recommend to not use this term but instead refer to *multi-technology* support schemes.

This term has two main advantages:

First, designing a completely neural support scheme that does not favour any technology due to specific design parameters, is hardly possible. For example, the same realization period for wind onshore and PV implies an advantage for PV due to faster cost declines of this technology[1].

Second, support schemes have made progress in recent years and countries so not opt anymore for either technology-specific or open support schemes. Instead, many combine different multi-technology auctions for similar technologies or combine multi-technology and technology-specific auctions.

Different subtypes of multi-technology auctions can be identified:

- *Open-technology auctions* allow for the participation of all renewable generation technologies.
- *Integrated auctions* do not only include electricity generation but also storages or other greenhouse gas reduction technologies (e.g. energy efficiency).
- *Technology -basket auctions* are auctions for certain groups of technologies, e.g. PV and onshore wind.
- *Combined auctions* are technology-specific, but still include more than one technology (e.g. in an auction for PV with integrated storage systems).
- *Mixed auctions* include combined technologies (as in the combined auctions) and individual technologies.

2.2 General advantages and drawbacks of multi-technology auctions

In this subsection, we give an overview of the advantages and drawbacks of multi-technology auctions based on different criteria. The respective advantages and disadvantages depend on the differences in technology costs, the market potential, the different system integration costs of a technology and the technological maturity.

Static efficiency

Multi-technology auctions all else equal leads to a higher static efficiency than a technology-specific subsidy. The reason is that in a multi-technologies those technologies with lower costs at the moment of the auctions tend to be awarded. However, static efficiency can only be fully achieved of not only generation costs but also system integration costs are included in the auction award procedure. In most countries this is however not the case. Also, fully including all system integration costs is very complex as certain components of the integration costs cannot be clearly allocated to a specific renewable energy plant. Using average cost approaches can however increase the static efficiency of multi-technology auctions.

[1] The different technology-biases and links to the auction design are assessed in detail in the AURES II report " Technology bias in technology-neutral renewable energy auctions", http://aures2project.eu/wp-content/uploads/2021/02/AURES_II_D8_2_bias_technology_neutral_auctions.pdf

Dynamic efficiency

It is often argued that in multi-technology auctions only the most advanced technologies are awarded. This can prevent a rapid cost degression of less market-ready technologies. If technologies that are not mature yet are necessary to meet expansion targets in the medium to long term, the slower cost degression might increase future total system costs for meeting ambitious climate targets. While in the last decades technology development as such was particularly relevant here, costs along the value chain, e.g. in planning and construction, are more relevant for cost-saving potentials now.

Support costs

While multi-technology auctions can increase the rate of competition as and if there are no specifications for the technology mix, these auctions can still lead to higher support costs. This is the case when in addition to the low cost technology a more expensive technology is needed to reach the auction volume. Depending on the auction design, the cheaper technology will then be awarded at a similar price as the more expansive technology which increases support costs compared to a technology-specific approach. The quantitative degree of this effect depends on the slope of the RE cost potential curves, i.e. the cost differences between different technologies, as well as on the tender volume and the market knowledge of the bidders. It can also be mitigated by different maximum values for technologies with high cost differences. This is an argument for forming several technology groups and implement technology-basket auction.

Auction design

Different technologies place different demands on the auction design, e.g. wind offshore and PV. These technologies are characterised by different project development cycles and costs leading to different prequalification requirements or penalties. Treating all technologies equally could significantly affect the performance of auctions. The design of the auction tends to become more complex as it has to be adapted to the requirements of the technologies.

Planning certainty and supply chains

Multi-technology auction can reduce the planning security for investors. Such auctions can imply stop-and-go developments for some technologies, which makes planning more difficult for project developers and investors. On the one hand, this increases the costs. On the other hand, expansion targets may not be achieved, at least temporarily, because investors/project developers cannot "ramp up" capacities at short notice and provide the corresponding projects due to supply chain constraints.

Flexibility

Multi-technology auctions can increase the rate of competition and contribute to achieving expansion targets as they allow for more flexibility between technologies. If there are for example challenges with regards to permitting for one technology, other technologies can step up and fill the gap.

3 State of multi-technology auctions in Europe

This section gives a short summary of the current usage of multi-technology auctions in the EU. As some of the auctions are based on capacities, while others are based on a budget or the amount of electricity to be auctions, we refer to the number of auction rounds for the assessment. Therefore, there is no differentiation with regard to the importance of very small or very large auction rounds. For example, the Dutch multi-technology auctions which include all technologies but wind offshore have the same weight as a small auction in Malta. Nevertheless, the data gives a first overview. More detailed country-level assessments follow in Section 4.

As shown in Figure 1, since 2011, auctions for supporting renewable electricity are on the rise in Europe. Since 205, also the number of multi-technology auctions is increasing. Especially between 2018 and 2020, a steep increase from 14 to 44 auctions can be observed.

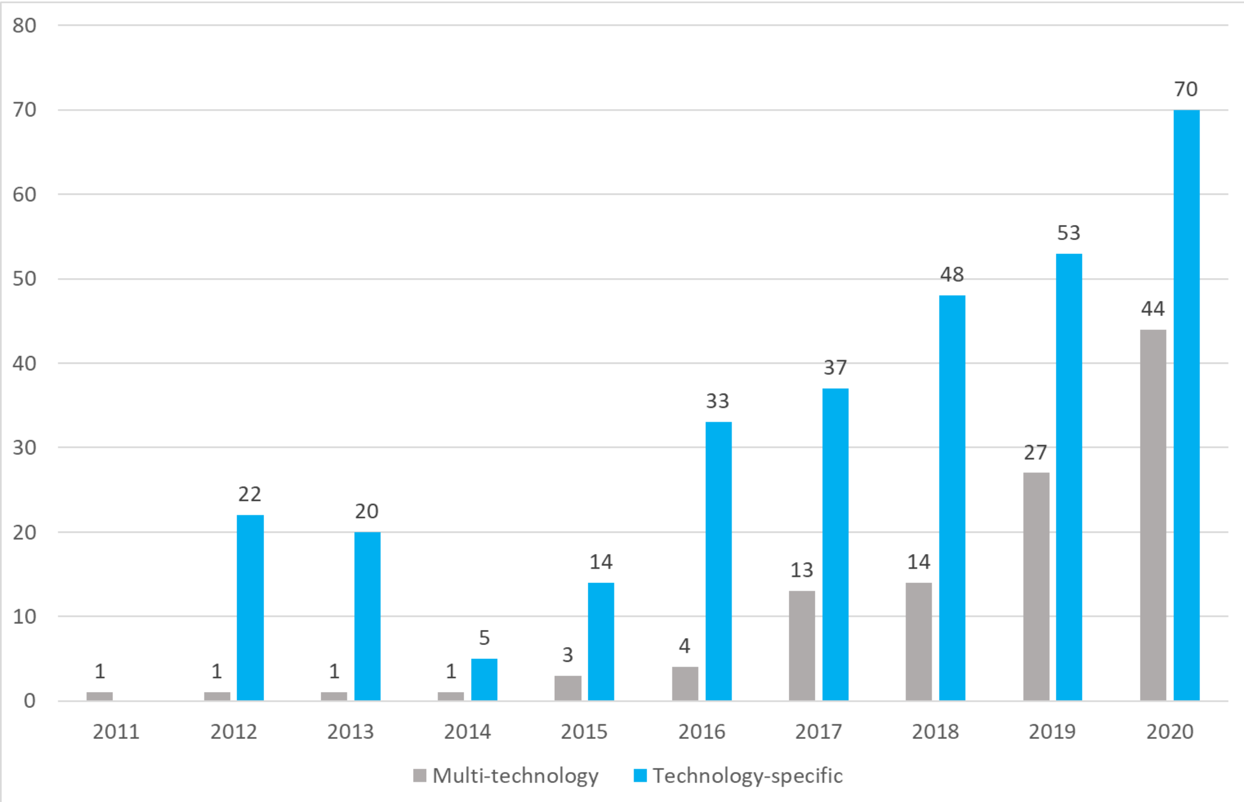


Figure 1: Number of multi-technology and technology-specific auctions in Europe per year (Source: AURES II database)

While there are still more technology-specific then multi-technology auctions, their relative importance has increased in recent years. In 2020, almost 40% of auctions were multi-technology auctions (compare Figure 2).

Also, the number of countries usind multi-technology auctions is increseadily increasing. 11 countries have conducted multi-technology auctions in 2020. The number of auctions was very high in this year because Italy alone implemented 22 multi-technology auctions rounds (see Figure 3).

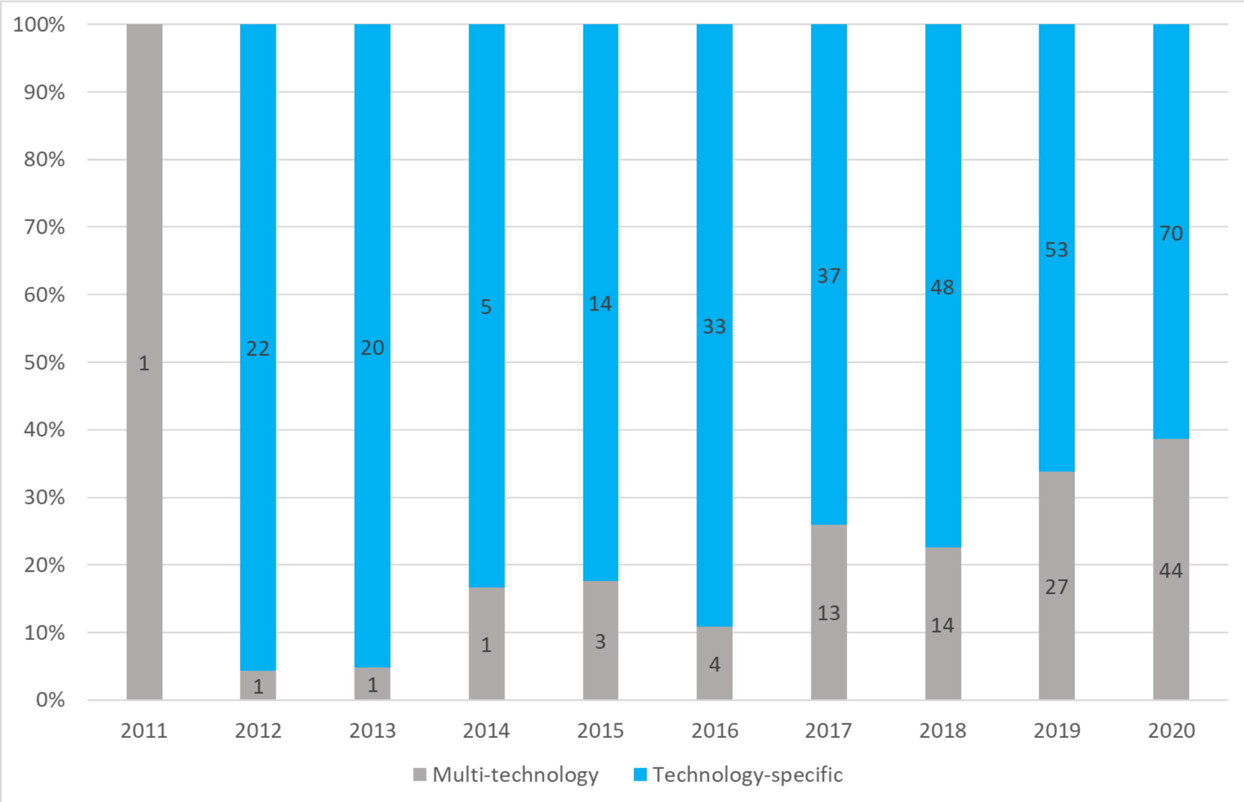


Figure 2: Development of relative importance of multi-technology auctions compared to technology-specific auctions in Europe (Source: AURES II auction database)

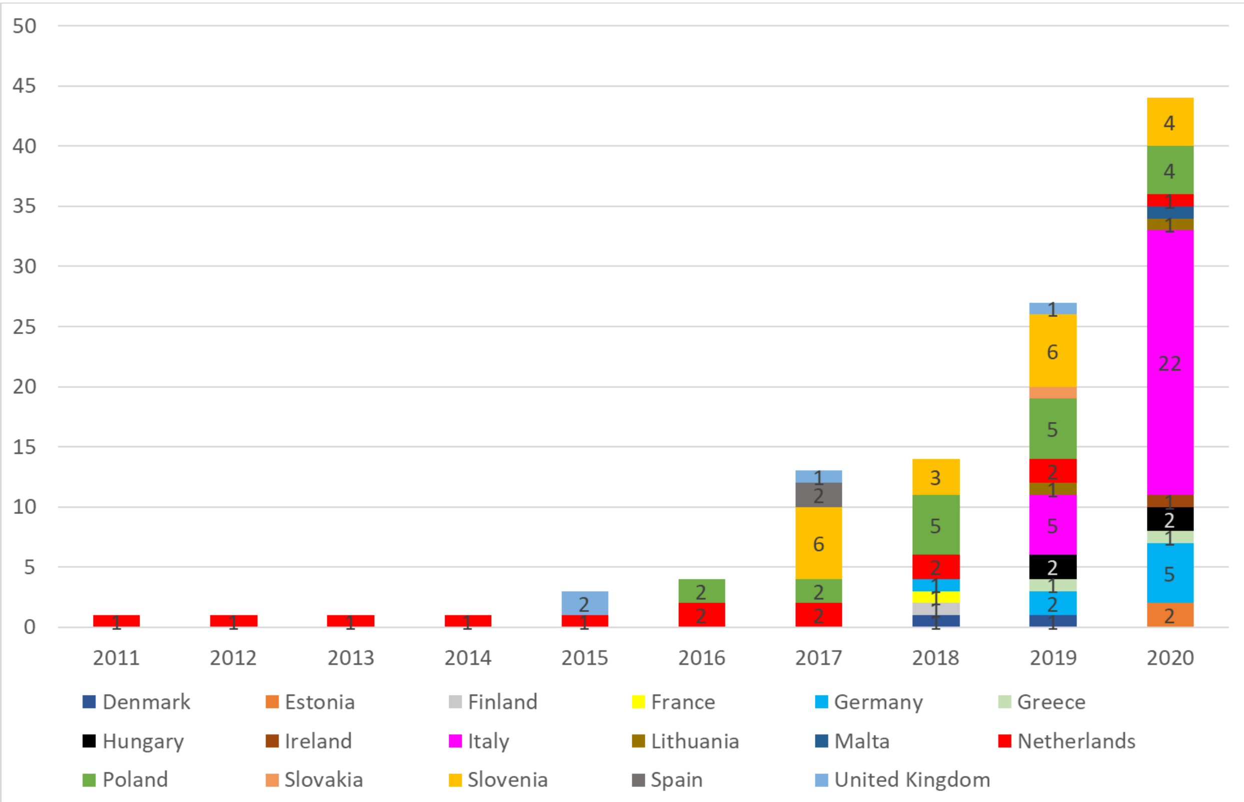


Figure 3: Development of countries using multi-technology auctions in Europe (Source: AURES II DB)

database)

Figure 4 shows which EU Member States (plus the UK) use multi-technology and technology-specific auctions respectively. It makes clear that the majority of countries (11 countries) apply a mix of multi-technology and technology-specific auctions. Countries grouped in this category are those countries that apply multi-technology and technology-specific auction at the same time (e.g. for different technologies or plant sizes), countries that have switched from technology-specific to multi-technology auctions during the last years or vice versa. While 5 countries only use multi-technology auctions, three of the countries apply technology-specific auctions only. One of these countries, Portugal, is nevertheless included in some further analysis in Section 4 as it has conducted a combined auction for PV and storage.

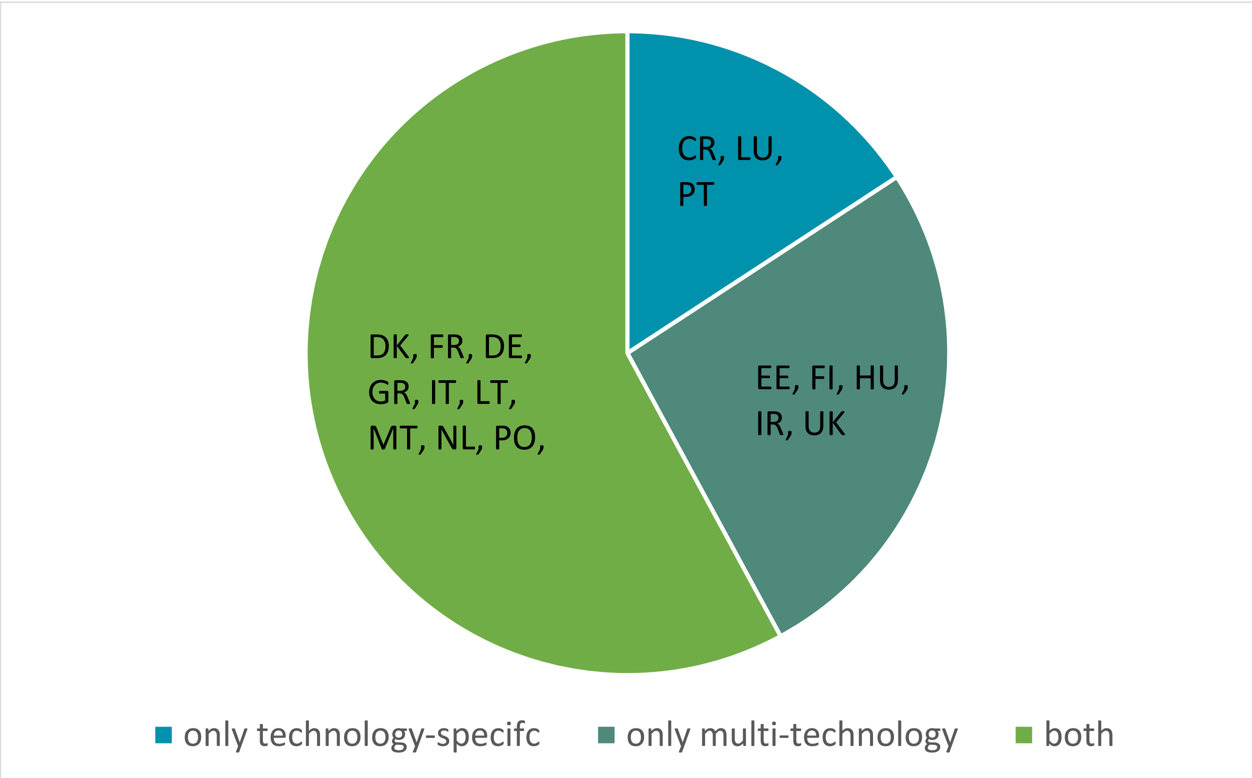


Figure 4: Usage of multi-technology and technology-specific auctions in EU Member States (Source: AURES II auction database)

Although there are by now many countries using multi-technology auctions in Europe, the concrete auction design and setting differs substantially between the countries. Therefore, the following section assesses the multi-technology auctions separated by country.

4 The state of multi-technology auctions in individual EU Member States

In this section, the auctions design and results of multi-technology auctions in Europe are presented for all EU Member States (and the UK) that have organized multi-technology auctions in the period between 2011 and 2020. The countries are divided based on the number of auctions conducted and the information that has been published for these auctions (e.g. with regards to technologies participating in the auctions, the degree of competition, resulting price spans etc.). Countries where much information is available are analysed one by one, countries with limited auctions rounds and/or available information are summarized in one subsection. In both parts, countries are presented in alphabetical order. For each country, a short conclusion is derived. The last subsection summarizes these individual conclusions.

4.1 Denmark

By the end of 2020, Denmark had conducted 7 auction rounds in total. Two of these were multi-technology auctions, one of these in 2018 and one in 2019. In 2018, a technology-specific auction for PV was also conducted. Another PV auction took place in 2017. The remaining auctions were project-specific offshore wind auctions in the years 2015 and 2016 respectively. In the following, we present the auction design and results of the multi-technology auctions and compare them to the technology-specific PV auction taking place in the same year. All of these auctions were used to determine a fixed premium support payment, i.e. a fixed amount that is paid on top of the market price for a period of 20 years.

Auction design

The two multi-technology auctions in Denmark were targeted towards wind onshore, PV and offshore nearshore plants. In both rounds, only wind onshore and PV plants participated in the auction. The participation requirements for the different technologies differed in the auctions. The prequalification requirements and the required realization period for the project was adapted for each technology while the same ceiling price applied for all three technologies (compare Table 1). Apart from a reduced ceiling price, the conditions between the two multi-technology auctions rounds did not change.

Table 1: Overview of differences in relevant design parameters of Danish auctions (Source: AURES II database)

<table>
<tr><th>Auction round</th><th>Technology</th><th>Ceiling price (fixed premium, €/MWh)</th><th>Financial prequalification (€/kW)</th><th>Material prequalification</th><th>Realization period</th></tr>
<tr><td>Specific 2018</td><td>PV</td><td>20,00</td><td>26,31</td><td rowspan="3">EIA screening, local development plan, rural zone permit, description of installation</td><td rowspan="3">24</td></tr>
<tr><td rowspan="3">Multi-technology 2018</td><td>PV</td><td rowspan="3">17,50</td><td>26,37</td></tr>
<tr><td>Wind onshore</td><td>77,63</td></tr>
<tr><td>Wind nearshore</td><td>101,6</td><td>In addition: construction license, declaration of non-objection by relevant municipal board</td><td>48</td></tr>
<tr><td rowspan="2">Multi-technology 2019</td><td>PV</td><td rowspan="2">8,00</td><td>26,31</td><td rowspan="2">EIA screening, local development plan, rural zone permit, description of installation</td><td rowspan="2">24</td></tr>
<tr><td>Wind onshore</td><td>77,45</td></tr>
</table>

	Wind nearshore		101,37	In addition: construction license, declaration of non-objection by relevant municipal board	48

Auction results

Figure 5 shows the submitted and awarded capacity in the Danish PV auction and the multi-technology auctions. The figure shows that the capacity in the technology-specific auction was only a small share of the multi-technology auction. Hence, only a small share of projects had the chance to be awarded in this auction, the majority of projects had to compete in the multi-technology auction. The figure however also shows that the degree of competition was much lower in the PV auction compared to the 2018 multi-technology auction. In 2019, the competition also decreased in the multi-technology auction.

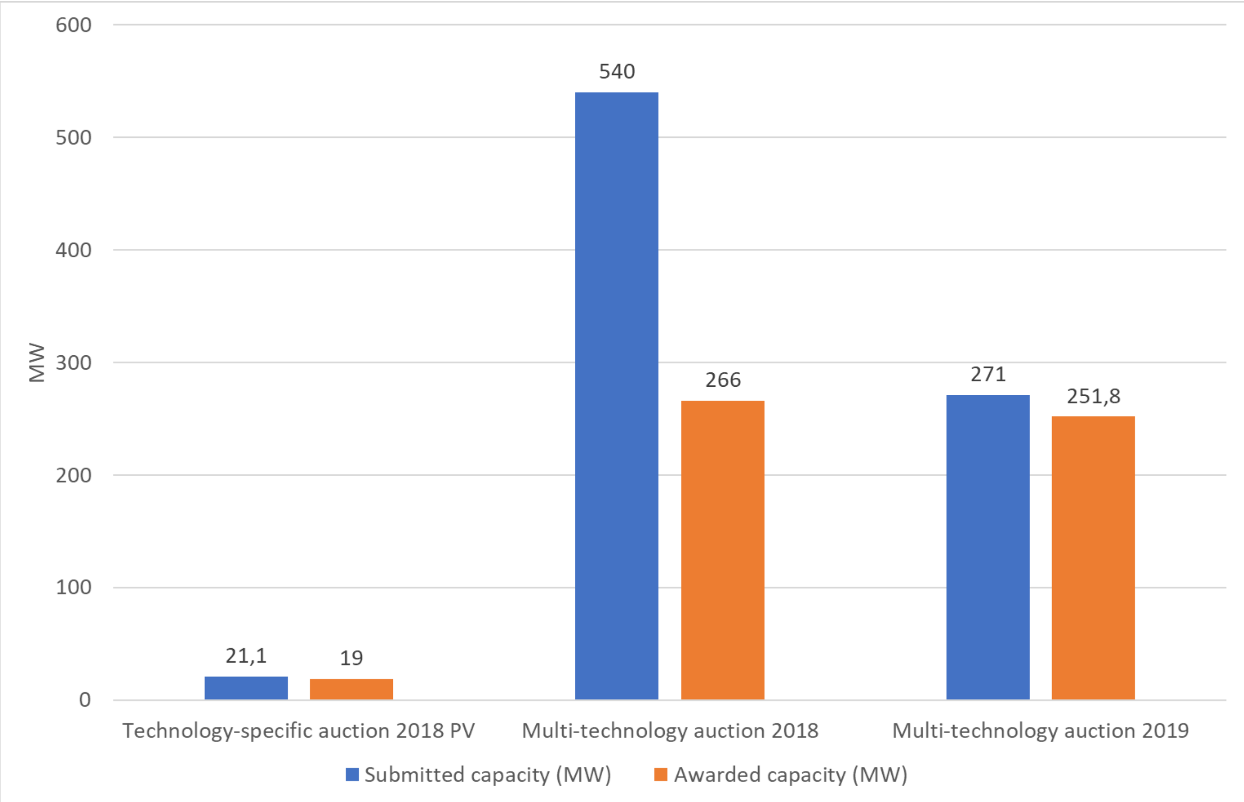


Figure 5: Submitted and awarded capacities in PV and multi-technology auctions in Denmark (Source: AURESII auction database)

Figure 6 gives an overview of the technology shares, i.e. the capacity submitted and awarded by technology. In the multi-technology auction, the three technologies PV, onshore wind and nearshore wind were allowed to participate. No nearshore wind project applied to the auction. There was thus only a competition between PV and wind onshore projects. In both auction rounds, PV projects contributed a bit more than 50% to the submitted capacity while their share in awarded capacity was about 38% in 2018 and 48% in 2019. Thus, wind onshore performed a bit better in the auction, but the position of PV improved substantially between the two auction rounds.

The support level resulting from the auctions decreased substantially especially between the pure PV auction and the first multi-technology auction in 2018 (compare Figure 7). While in the PV auction, the highest awarded bid was at the level of the ceiling price, the resulting awarded prices in both multi-technology auction rounds were substantially below the ceiling price. This holds for both PV and wind onshore, with prices for wind onshore being even lower.

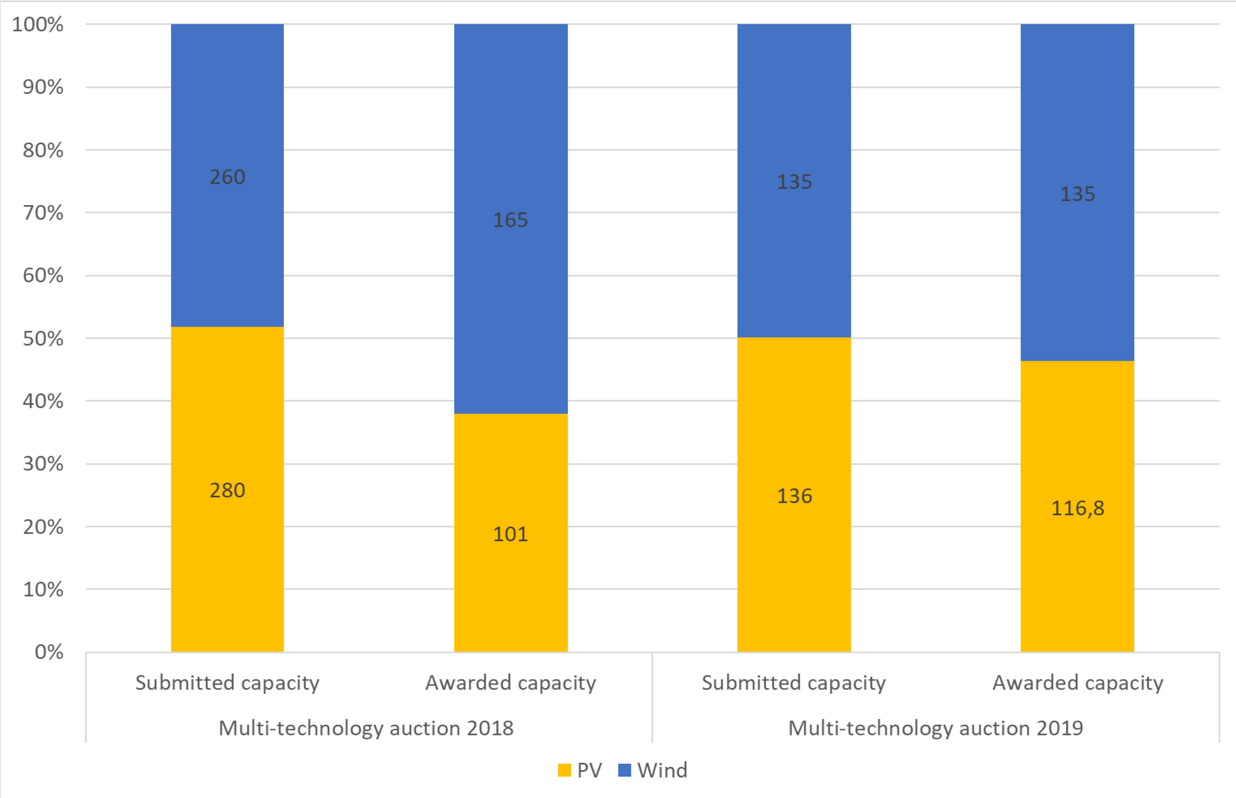


Figure 6: Technology shares of submitted and awarded bids in Danish multi-technology auctions (Source: AURES II auction database)

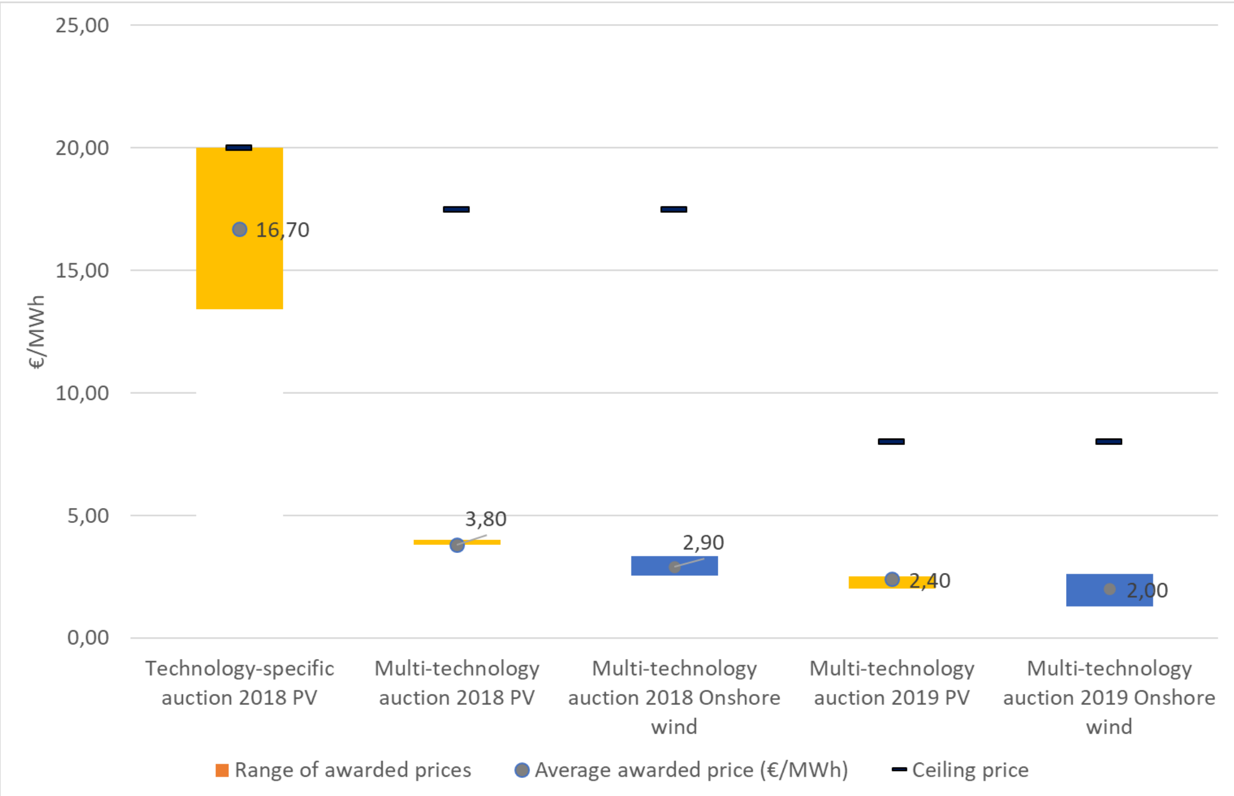


Figure 7: Development of awarded prices in Danish multi-technology and technology-specific PV auction

compared to ceiling price (Source: AURES II database)

Conclusions

In Denmark, the multi-technology auctions in 2018 and 2019 applied a distinct ceiling price and financial prequalification requirement for onshore wind and PV. Apparently, the conditions were set right for a fair competition, as both technologies were awarded at almost equal rates. The multi-technology auctions were the only possibility for wind onshore plants to receive support payments. For PV, there was only a very restricted outside option in 2018. Therefore, the auctions had a high importance for bidders, which is also shown by the high degree of competition, at least in the 2018 round. The resulting prices of both auction rounds were extremely low, especially compared to technology-specific PV auction in the same year (2018).

4.2 France

In France, 64 auctions rounds for renewable electricity have taken place in France until the end of 2020. Only one of these auctions was a multi-technology auction for PV and onshore wind. This auction was conducted in 2018. In the same year, 7 technology-specific auctions for PV plants in the relevant size range and one auction for onshore wind was organized. In France, the auctioned product is a two-sided sliding feed-in premium (also called contract-for-difference) with a duration of 20 years. For small PV plants (not included here), a feed-in tariff is auctioned.

In the following, the auction design and results of the multi-technology auction and the technology-specific PV and wind onshore auctions in the same year are presented.

Auction design

Table 2 shows the most important differences regarding the French auction design in the multi-technology and the technology-specific auctions taking place in the same year. While France has used minimum and maximum prices in the multi-technology and PV auctions, no minimum price was applied in the onshore wind auction. Furthermore, the ceiling price was higher in the PV auction compared to the multi-technology auction but lower in the wind onshore auction. The price was used as the only award criterion on the onshore wind and multi-technology auction, in the PV auction additional selection criteria were included. In addition, the supported full load hours in the PV auctions were restricted to 1600 (or 2200 under certain conditions). The multi-technology auction used different material prequalification requirements for wind onshore and PV but the financial prequalification and the realization period were the same for PV and wind onshore. Compared to the technology-specific auctions, the realization period for wind onshore was shorter, for PV is was equal or a bit longer. The financial prequalification for wind onshore was higher in the multi-technology auction, for PV it was higher or the same. France applied plant size restrictions for the auctions in 2018. PV auctions differentiated between different plant sizes, although with some overlaps. The multi-technology auction plant size restrictions were similar to the technology-specific auctions for larger PV plants. In the wind onshore auction, no maximum project size applied.

Table 2: Overview of differences in relevant design parameters of French auctions (Source: AURES II database)

Auction round	Technology	Allow bid levels (CfD, €/MWh)	Financial prequalification (€/kW)	Material prequalification	Realization period	Plant size restrictions (MW)	Award procedure
Multi-technology auction	PV	40-90	50	Building permit, business plan	24	5-18	Price only
	Wind	40-90	50	EIA		5-18	Price

	onshore						only
Technology-specific auctions	PV Mar	76-114	30	Building permit, business plan	20	0.5-8	Multi-criteria
	PV Jun1	45-99	50		24	5-17	
	PV Jun2	63-135	50		24	0.5-10	
	PV Jul	64-102	30		20	0.5-8	
	PV Nov	62-100	30		20	0.5-8	
	PV Dec1	43-95	50		24	5-17	
	PV Dec2	61-130	50		24	0.5-10	
	Wind onshore	0-74.8	30	EIA	36	Minimum 3	Price only

Figure 8 shows the auctioned capacities in the relevant French auction rounds in 2018. It becomes clear that both wind onshore and PV plants had options for receiving support also outside the multi-technology auction which only represented a relatively small share of the overall auctioned capacity.

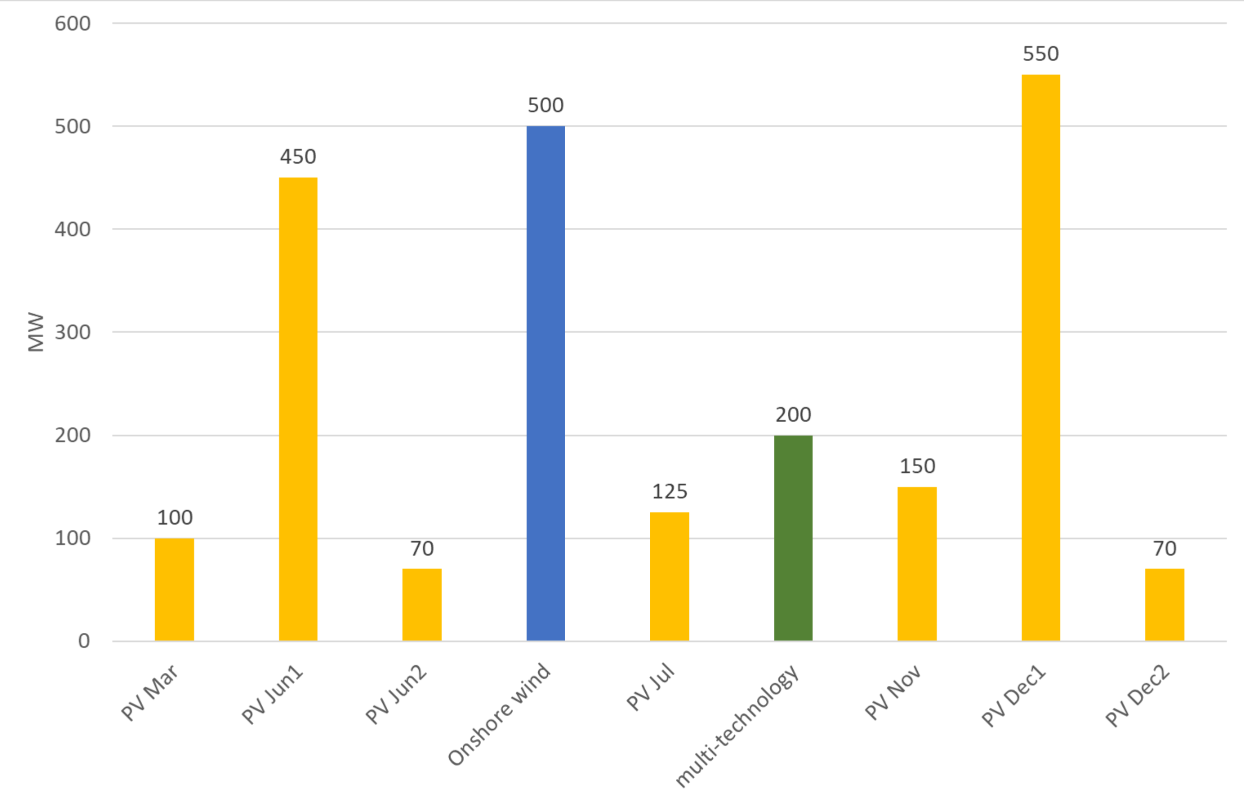


Figure 8: Auctioned capacity in relevant mutli-technology, PV and wind onshore auction rounds in France 2018 (Source: AURES II database)

Auction results

Even though there were other options, the French multi-technology auction had a high degree of competition.

While onshore wind projects made up more than 20% of the submitted capacity, only PV projects were awarded in the auction (compare Figure 9).

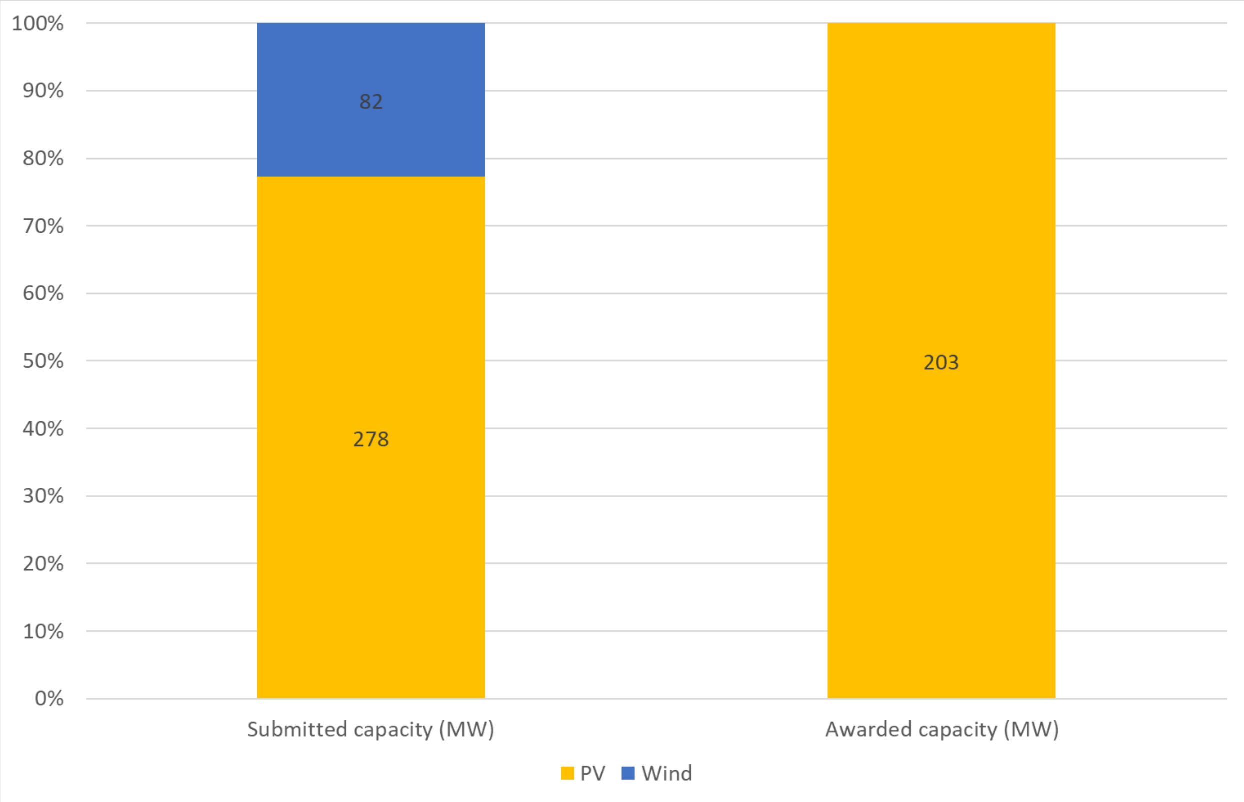


Figure 9: Technology shares of submitted and awarded bids in French multi-technology auctions (Source: AURES II auction database)

The resulting support level was lower than the one resulting from the technology-specific wind onshore auction but slightly above the larger size PV auction. The technology-specific auctions that included smaller PV plants resulted in a substantially higher support level compared to the other auctions (see Figure 10).

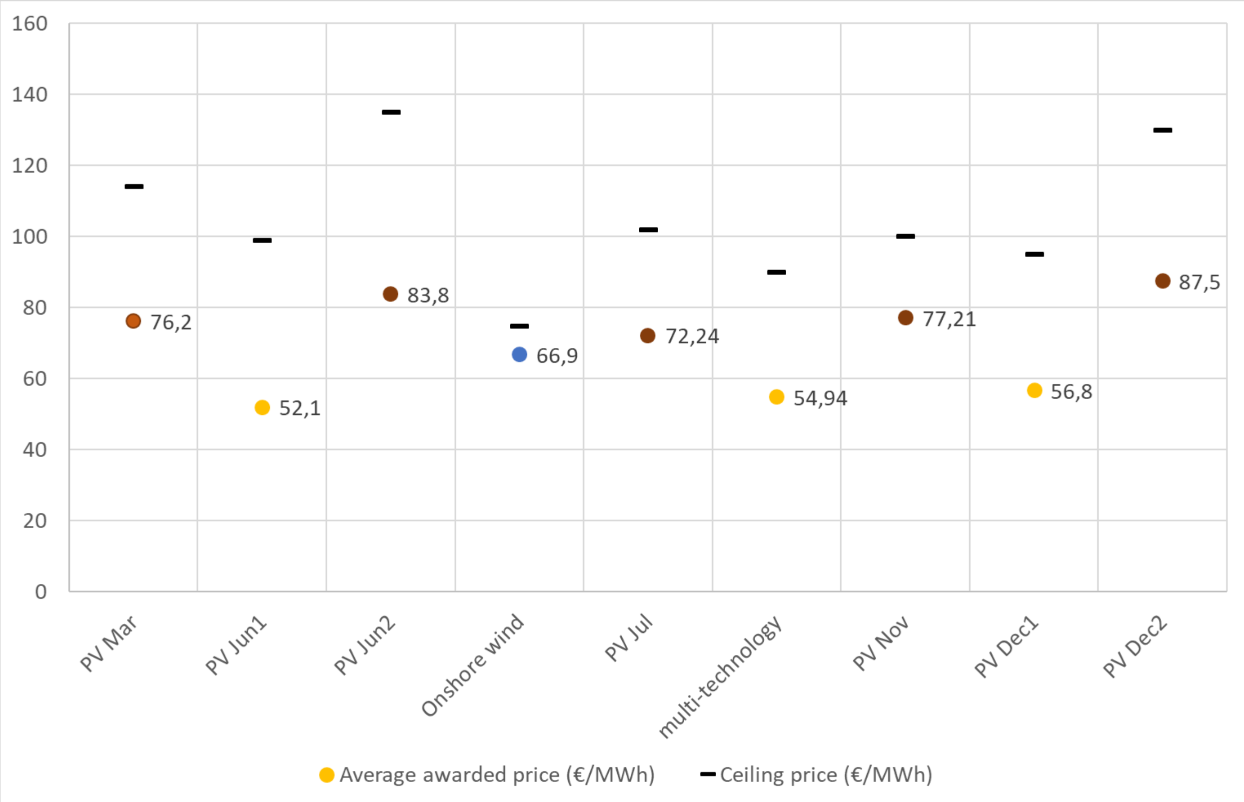


Figure 10: Awarded prices compared to ceiling prices in French PV and wind onshore auctions 2018

Conclusions

As stated above, the multi-technology auction in France had a relatively low capacity compared to the technology-specific auctions. Only PV was successful in the auction and the resulting support level was relatively low (but at the same level as in the comparable technology-specific PV auctions).

4.3 Germany

Between 2015 and 2020, Germany has conducted 75 auctions for renewables in the electricity sector, whereof 7 were multi-technology auctions. In Germany, there are two types of multi-technology auctions: technology basket auctions for wind onshore and PV as well as so-called "innovation auctions" where flexible renewable capacities (e.g. wind and solar with storage or biomass plants) are awarded. The latter multi-technology auction type (combined auction) is assessed in the next section as not only renewable generation but also storage is included. In the following, the multi-technology auctions for PV and wind and relevant technology-specific auctions in the same year are analyzed and described. All auctions included here are used to determine the level of a one-sided feed-in premium with a support duration of 20 years.

Auction design

Table 3 gives an overview of relevant design parameters of both the multi-technology and technology-specific auctions for PV and wind onshore in Germany. Basically, all design parameters from the technology-specific auction also apply in the multi-technology-auction with the exemption of the plant size restrictions for PV: while in most of the technology-specific auctions rounds, plants with an installed capacity of up to 10 MW are allowed, the size limit is 20 MW in the multi-technology auctions.

Table 3: Design parameters of German multi-technology and technology-specific auctions (Source: AURES II

database)

Auction type	Technology	Financial prequalification (€/kW)	Material prequalification	Realization period	Plant size restrictions (MW)
Multi-technology auction	PV	50	Ground-mounted projects need a construction plan	18	0.75-20
	Wind onshore	30	Permit according to the Federal PollutionControl Act (BImSchG)	24	0.75 minimum
Technology-specific auctions	PV	50	Ground-mounted projects need a construction plan	18	0.75-10
	Wind onshore	30	Permit according to the Federal PollutionControl Act (BImSchG)	24	0.75 minimum

As in France, the capacity auctioned in the multi-technology auctions was relatively small compared to the respective technology-specific auctions, especially those for onshore wind (compare Figure 11).

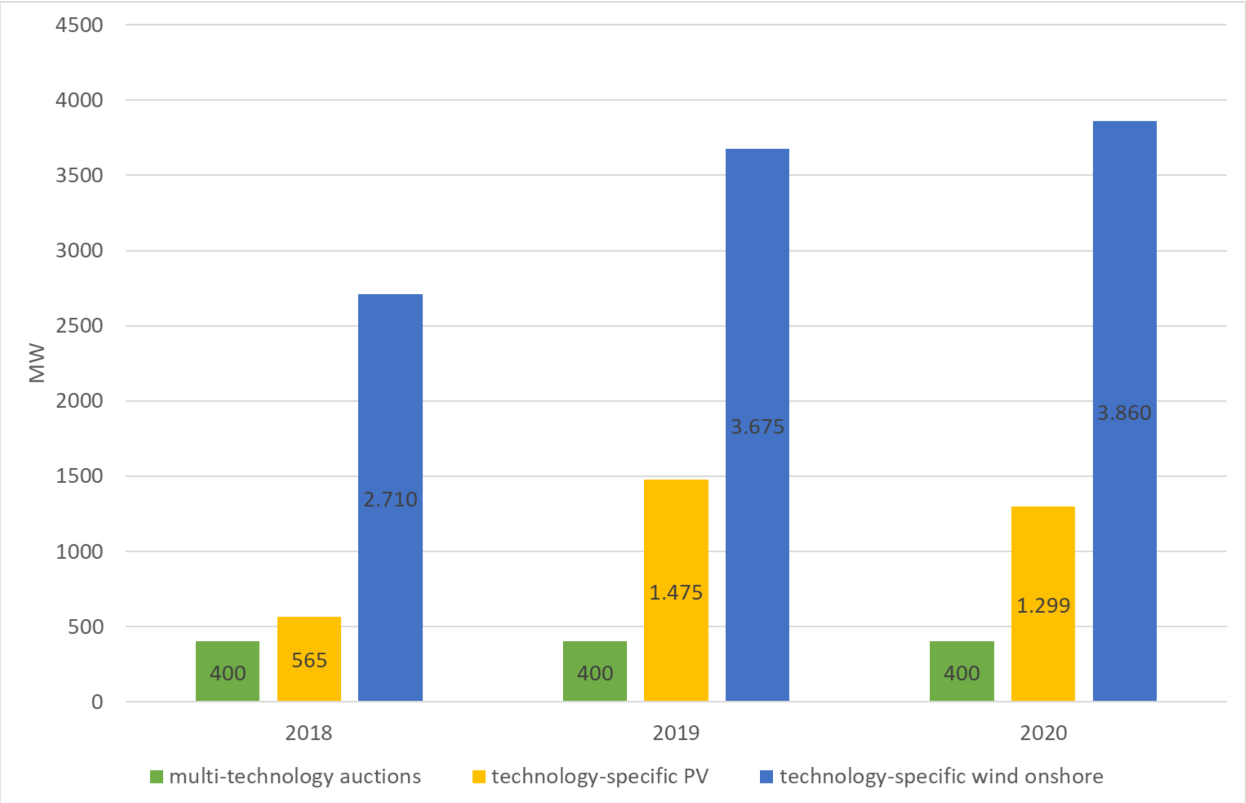


Figure 11: Auctioned capacity by technology and year in Germany (Source: AURES II database)

Auction results

Figure 12 shows the submitted and awarded capacities in the German multi-technology auctions, In the first auction round, almost 40% of the submitted capacity came from wind onshore plants but none of these was awarded. In the second auction round, the participation from wind onshore wind plants was already very restricted and again not successful. In 2019 and 2020, no wind onshore plants participated in the auctions and support was only awarded to PV plants.

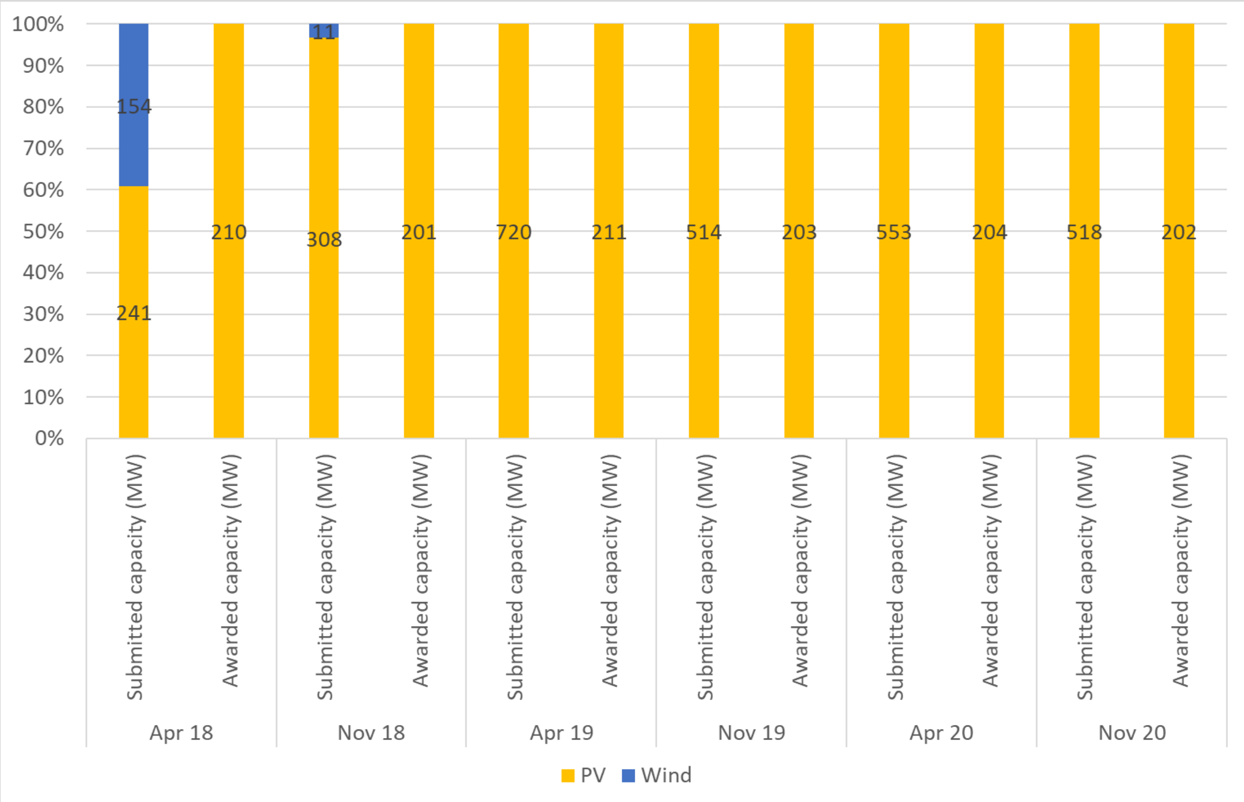
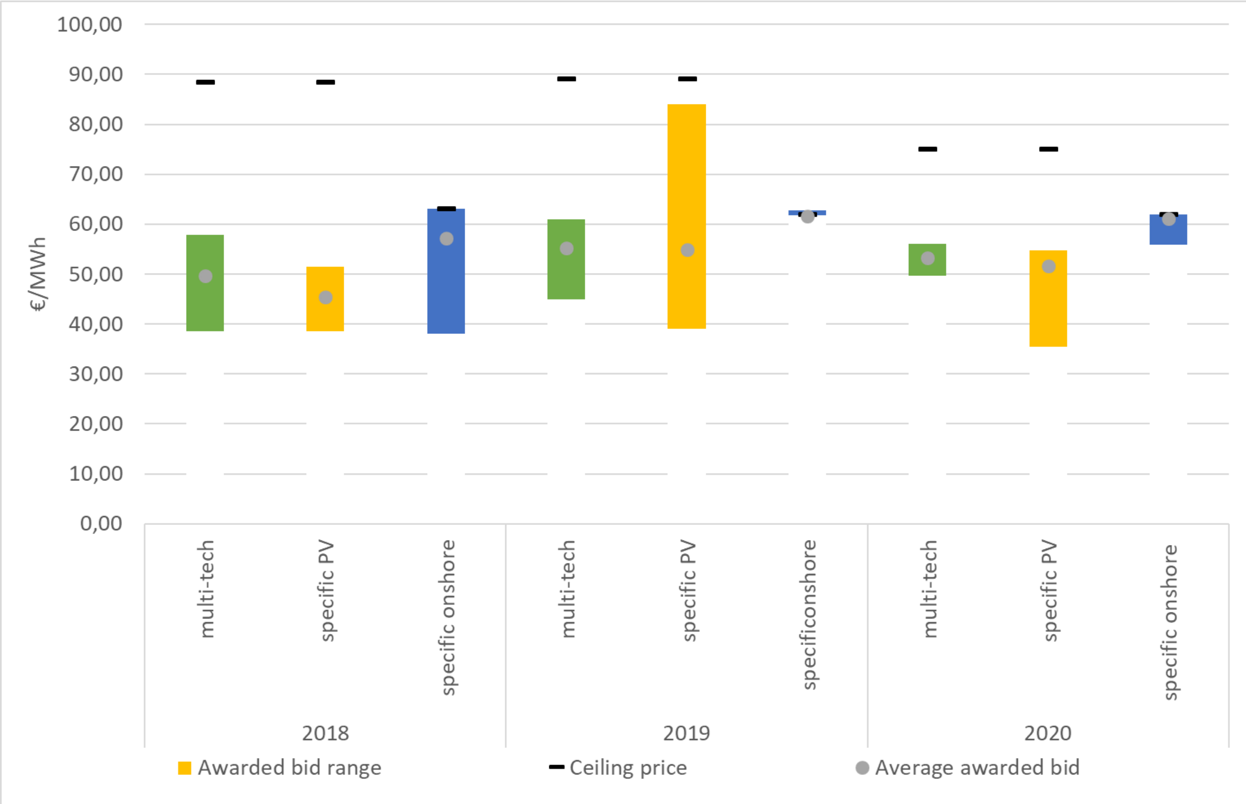


Figure 12: Submitted and awarded capacity in German multi-technology auctions (Source: AURES II database)

Figure 15 shows the support levels resulting from the different auctions rounds. While ceiling prices in the wind onshore auctions were below those in the PV and multi-technology auctions rounds, resulting support levels were higher. Thus, for wind onshore plants the participation in the multi-technology auctions was not attractive. Interestingly, the average awarded price in the multi-technology auction was slightly above the price in the technology-specific PV auctions but mostly with broader price ranges in the PV auctions.



Conclusions

Germany applied most design parameters from the technology-specific auctions in the multi-technology auctions. However, only PV plants were successful in the auction and participation from wind onshore plants increasingly limited. One reason for this was probably the low competition and therefore relatively high prices in the technology-specific wind onshore auctions. With regards to resulting support levels, the multi-tech average awarded bid was slightly higher than the bid in the PV auctions results, but the price ranges show a large overlap.

4.4 Greece

Greece has so far organized 16 auctions rounds for PV and wind onshore of which two were open for both technologies. The multi-technology auctions in Greece are used for plants with an installed capacity of more than 20 MW and 50 MW for PV and wind onshore respectively, while the technology-specific auctions apply for smaller plants. As there is no overlap with regards to participation, in the following only the multi-technology auctions are described and analyzed. The Greek auctions determine a two sided premium (CfD) level with a support duration of 20 years. In each of the two rounds 600 MW were auctioned.

Auction design

In Greece, apart from the minimum size requirements, the conditions for participating in the multi-technologies only differ with regards to the prequalification requirements. All other aspects are kept stable for both PV and wind onshore. The ceiling price has decreased from the first to the second round of multi-technology auction (compare Table 4).

Table 4: Design parameters of Greek multi-technology auctons (Source: AURES II database)

Auction type	Technology	Ceiling price (€/MWh)	Financial prequalification (€/kW)	Material prequalification	Realization period	Minimum plant size (MW)
Multi-technology auction 2019	PV	64,70	40	Production license, grid connection agreement	36	20
	Wind onshore		50			50
Multi-technology auction 2020	PV	61,30	40			20
	Wind onshore		50			50

Auction results

Figure 13 shows the technology mix of submitted and awarded capacity in the Greek multi-technology auctions. In the first auction round, all participating wind onshore projects (about 10% of the submitted capacity) were successful. In the second auction round, some PV projects outcompeted the some of the wind onshore projects and the success rate was substantially higher for PV (83%) than for wind onshore (53%).

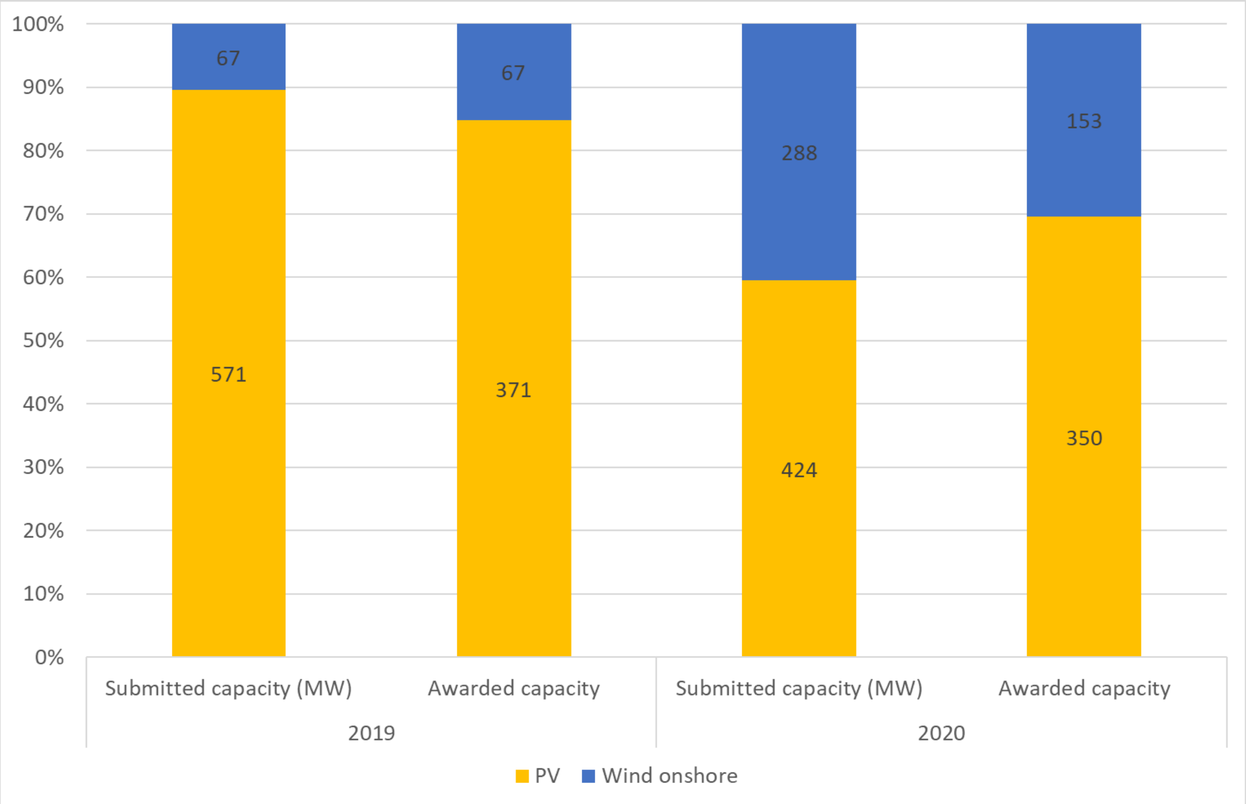


Figure 13: Technology mix of submitted and awarded capacity in Greek multi-technology auctions (Source: AURES II database)

As illustrated in Figure 14, the resulting average awarded prices from the multi-technology auctions in Greece were lower for PV than for onshore wind in both auctions rounds. The range of prices was however broader for PV as in each round only one wind onshore project was successful. While in 2019, PV projects with a bid price equal to the ceiling price were awarded, the 2020 auction round led to a substantially lower maximum awarded price.

Figure 14: Ceiling price and awarded price ranges for PV and wind onshore in Greek multi-technology auctions (Source: AURES II database)

Conclusions

In the Greek multi-technology auctions, only the financial prequalification criteria differed slightly between PV and wind onshore. Both technologies were awarded with a lower average awarded price but a larger price range for PV plants.

4.5 Hungary

Hungary has implemented 4 multi-technology auctions, two in 2019 and two in 2020. The auctions were divided in two categories, one for plant sizes between 200 kW and 1 MW, the other for bigger plants between 1 MW and 20 MW. With the auction, Hungary determines the level of a two-sided sliding premium (FIP) with a duration of 15 years.

Auction design

Table 5 shows the design elements of the design elements of the Hungarian multi-technology auctions. Even though all renewable electricity generation technologies are allowed in the auctions, only the financial prequalification requirements differ between technologies (if investment expenditures differ).

Table 5: Auction design elements of Hungarian multi-technology auctions (Source: AURES II database)

	Plant size	Financial	Material	Ceiling price	Realization period

	(MW)	prequalification	prequalification	(€/MWh)	(months)
Category I (small scale)	0.2 - 1	Bond of 5% of investment	Grid connection agreement	78.1	36
Category II (large scale)	1-20		Techno-economic fact sheet from the DSO regarding the grid connection	75	

Auction results

Apart from the small-scale auction round in 2019 in which also a very small amount of bioenergy (<1% of total awarded capacity) was awarded, in Hungary, only PV plants participated and were successful in the multi-technology auctions. The resulting prices are shown in Figure 15. A clear price downwards trend can be observed in price levels. Also, the level of competition was apparently higher in 2020 where awarded prices were substantially below the ceiling price.

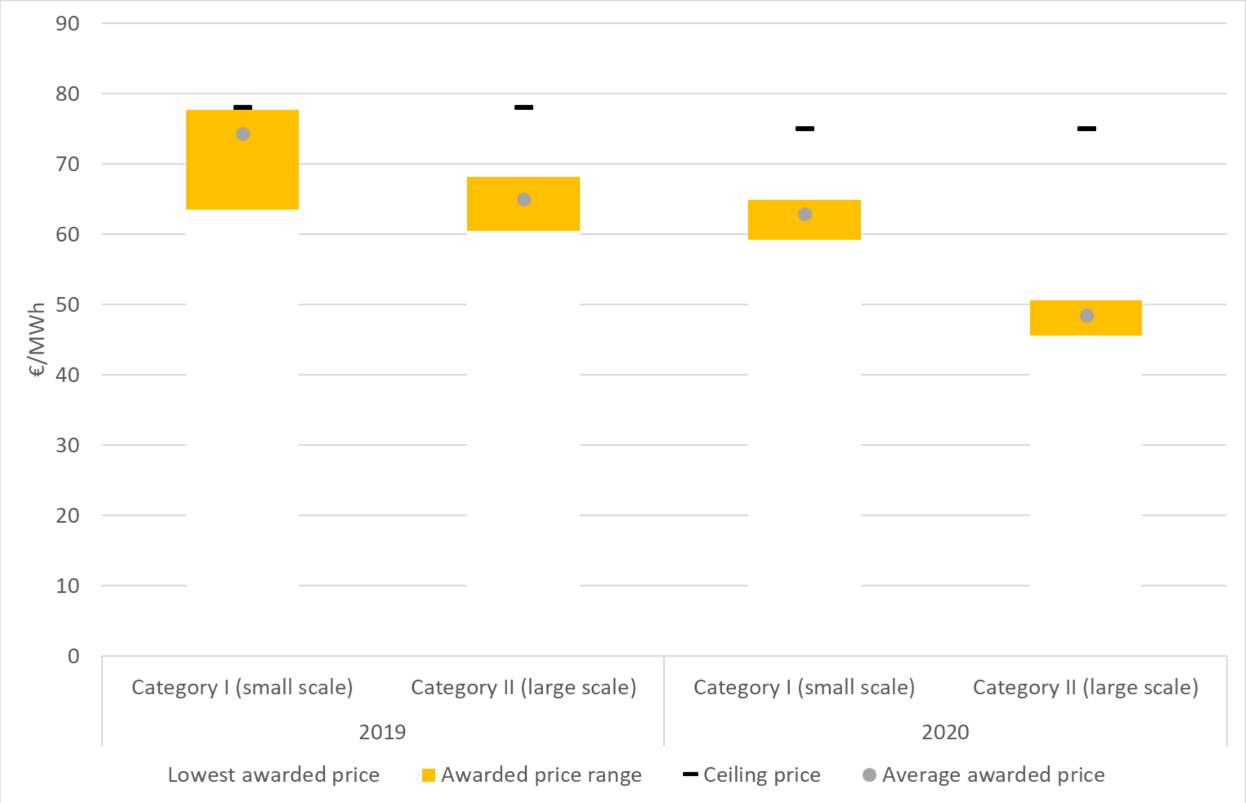


Figure 15: Development of prices in multi-technology auctions in Hungary (Source: AURES II database)

Conclusions

Hungary only applies multi-technology auctions. However, mainly PV plants participated and were awarded in the auctions.

4.6 Italy

Between 2012 and 2020, Italy has conducted 42 auctions for renewable electricity whereof 23 were multi-technology auctions realized in the years 2019 and 2020. In these two years, also 4 technology-specific auctions took place but these were targeted towards a very special segment - PV to replace asbestos - and are therefore not discussed in the following. Italy organizes auctions for different technology baskets: Group A includes wind onshore and PV, group B targets hydropower and sewage gas and group 3 includes wind onshore repowering in addition to hydropower and sewage gas. However, sewage gas plant have not participated in the auctions so far. In the following, the different Italian multi-technology auctions are presented and discussed.

Auction design

For each technology basket, Italy differentiates auctions for smaller and bigger plants as shown in Table 6. As a material prequalification requirement, all plants participating in the auctions need to have a building permit and a grid connection agreement. The auctions are used to determine a two-sided sliding premium (CfD) and feed-in tariffs for plants with an installed capacity below or equal to 250 kW. The duration of support is 20 years for PV and onshore wind and 30 and 22.5 years for hydropower in Group B and C respectively. While smaller plants are awarded based on a multi-criteria assessment, bigger plants are awarded based on price only.

Table 6: Auction design elements of Italian multi-technology auctions (Source: AURES II database)

Auction type	Technology	Ceiling price (€/MWh)	Floor price (€/MWh)	Financial prequalification (€/kW)	Award procedure	Realization period	Plant size (MW)
Group A large	PV	68.6	21	100	price	19	From 1000
	Wind onshore			110.26		24	From 1000
Group A small	PV	105 for plants 20-100 kW, 90 for plants above 100 kW	68.3	10 for plants 20 - 100 kW, 20 for plants above 100 kW	multi-criteria	19	20-1000
	Wind onshore	150 for plants 20-100 kW, 90 for plants above 100 kW	84	38.7		24	1-1000
Group B large	Hydropower	78.4	24	181.13	price	51	From 1000
	Sewage gas	No info	No info	No info		No info	No info
Group	Hydropower	118.3	82.8	59.4	multi-	31	1-1000

B small	Sewage gas	No info	No info	No info	criteria	No info	No info
Group C large	Hydropower	78.4	24	256	price		From 1000
	Sewage gas	No info	No info	No info		No info	From 1000
	Wind onshore repowered	68.6	21	110.26			From 1000
Group C small	Hydropower	118.3	82.8	59.4	multi-criteria	31	1-1000
	Sewage gas	No info	No info	No info		No info	No info
	Wind onshore repowered	120	84	39.7		24	1-1000

Figure 16 shows the auctioned capacity in the Italian multi-technology auctions. A clear focus is on the large Group A segment, i.e. PV and onshore wind. Auctioned capacities have however increased over time in most categories.

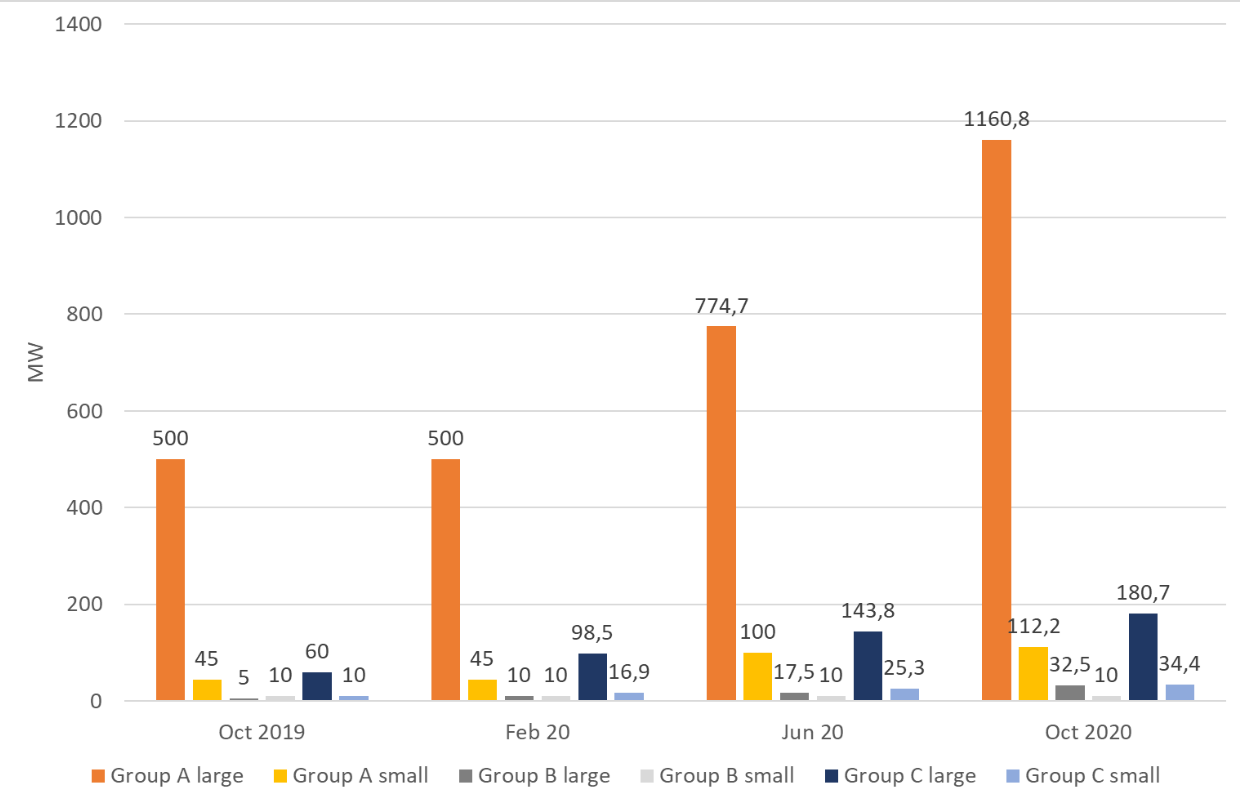


Figure 16: Auctioned capacity in the Italian multi-technology auctions (Source: AURES II database)

Auction results

In the following, the auctions results of Group A and Group C are presented. In Group B for projects from 1 MW, 3 auctions were cancelled due to no bids. The fourth auction also had a very low participation where the participating bid was awarded. In Group B auctions for projects below 1 MW, only hydropower participated and was awarded. Therefore, Group B results are only considered with regards to resulting FIT or CfD levels but not with regards to the technology shares.

Figure 16 and Figure 17 show the development of submitted and awarded bids from PV and onshore wind in Group A. In all auctions, much more onshore wind capacity participated. The share of both technologies is however relatively stable when comparing submitted and awarded bids. Thus, there seems to be no structural competitive advantage for either technology. In the auctions for smaller size plants, the share of PV capacity has steadily increased over time. However, also in this category, both technologies are awarded at a similar rate.

Figure 18 and Figure 19 show the technology shares for the Group C auctions where repowered wind onshore competes with repowered hydro plants. Apart from the auctions in 2018, only hydropower plants participated in these auctions. In 2018, only hydropower plants were awarded in the auction for smaller projects, while many of the applying larger wind plants were successful in the auction.

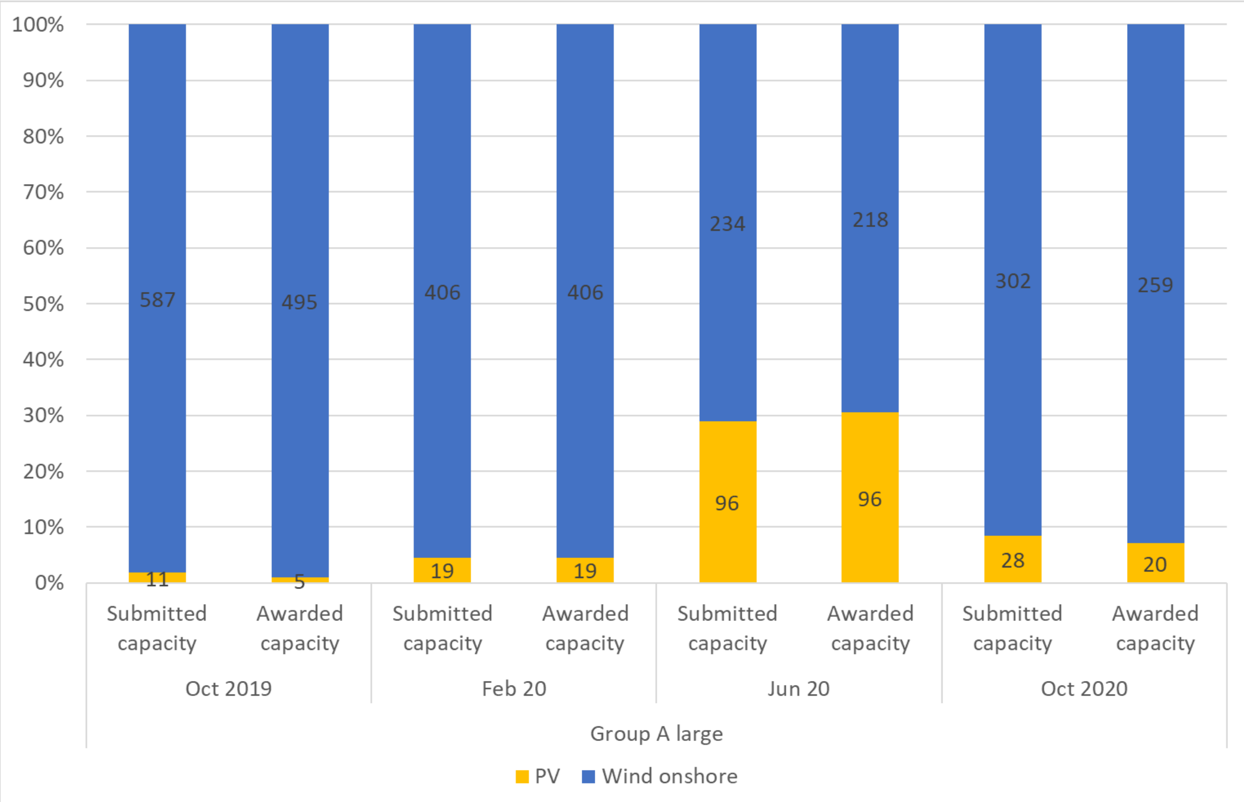


Figure 17: Technology shares of submitted and awarded bids in Italian Group A (plant size from 1 MW) multi-

technology auctions (Source: AURES II auction database)

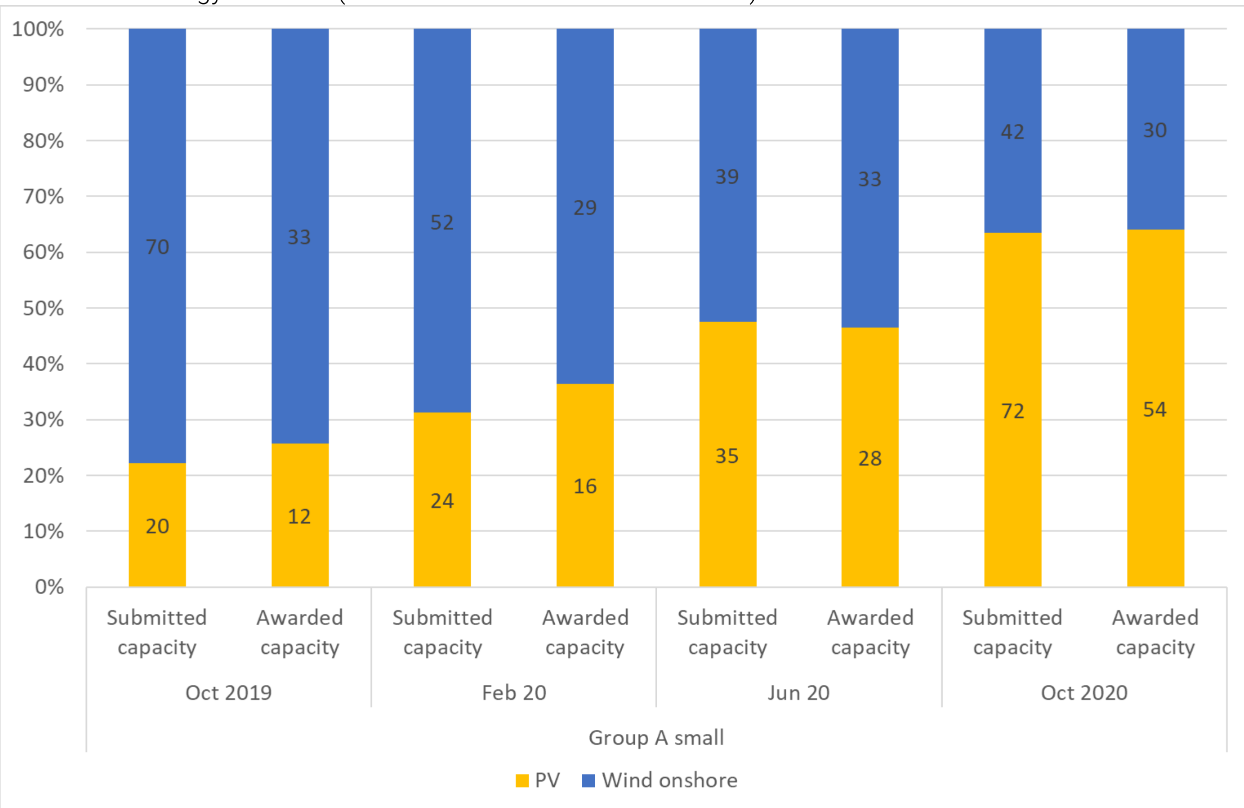


Figure 18: Technology shares of submitted and awarded bids in Italian Group A (plant size from 1 MW) multi-technology auctions (Source: AURES II auction database)

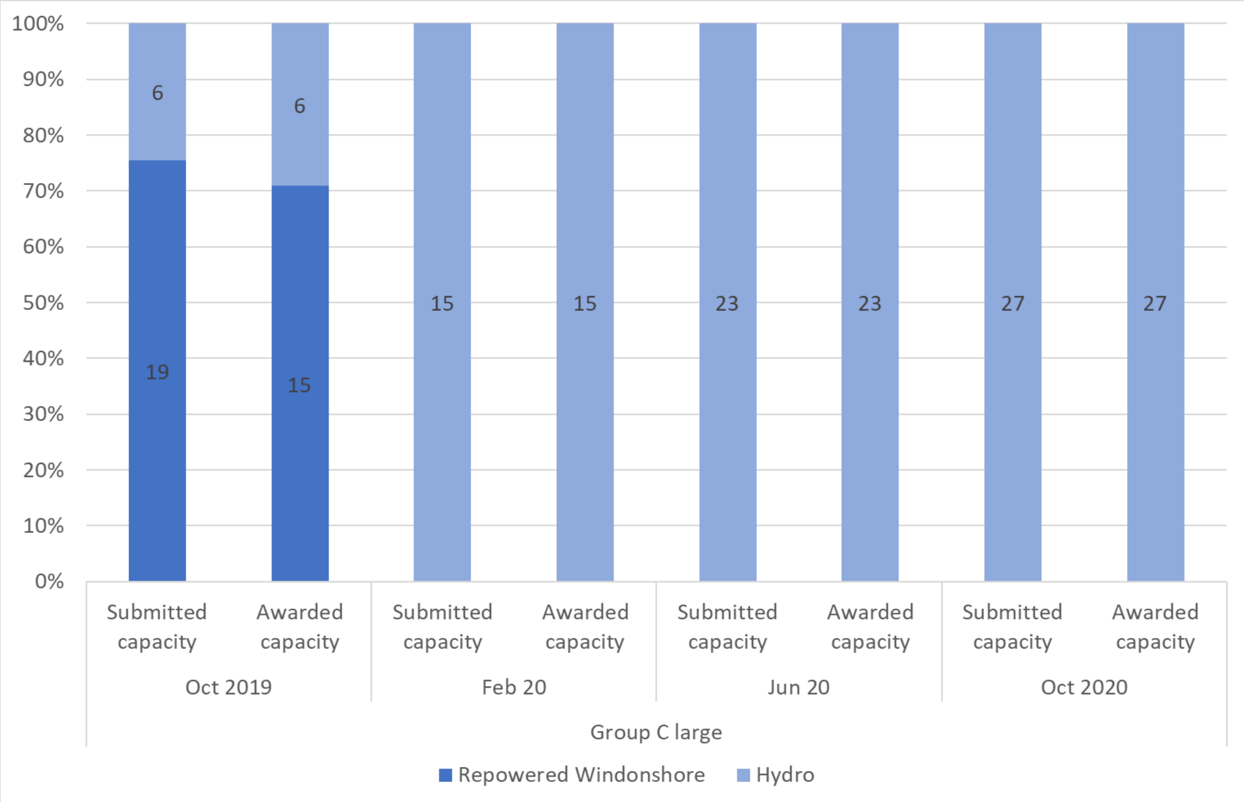


Figure 19: Technology shares in Italian Group C multi-technology auctions for large projects (Source: AURES II database)

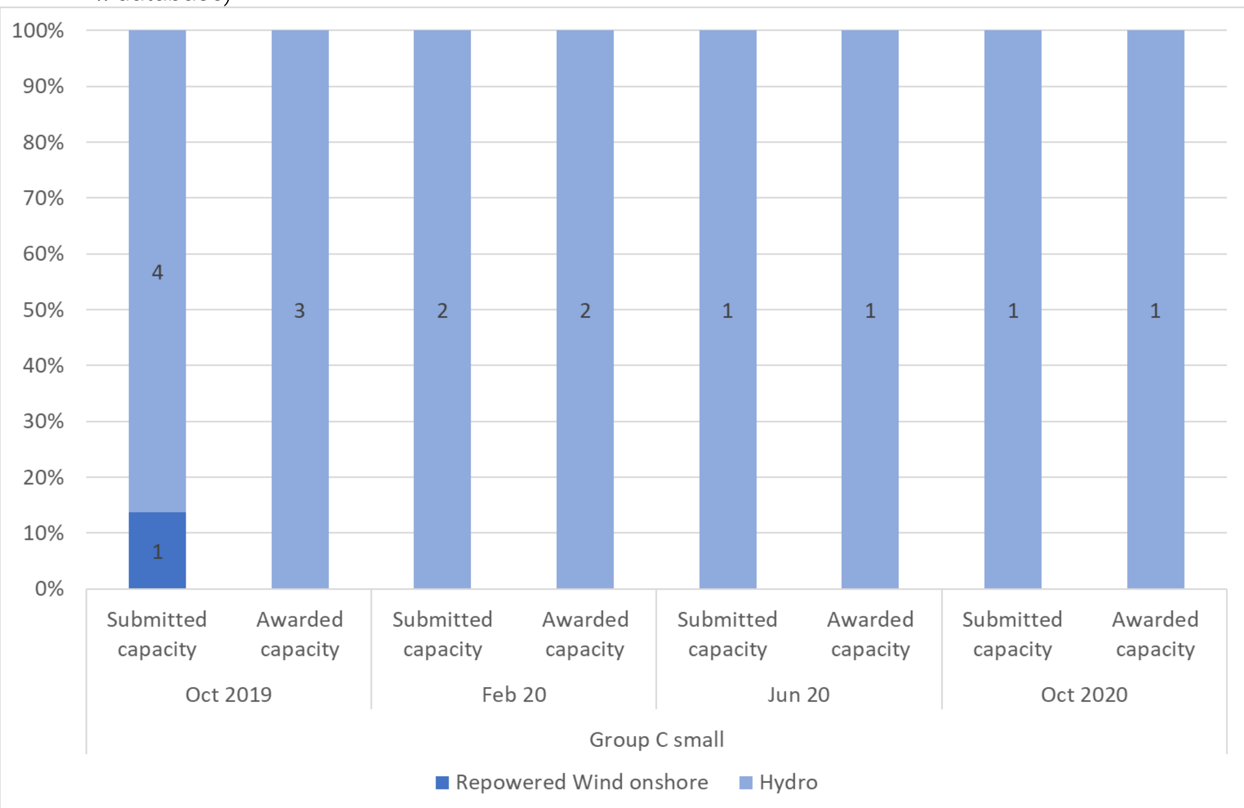


Figure 20: Technology shares in Italian Group C multi-technology auctions for small projects (Source: AURES II database)

Figure 21 shows the resulting prices from Italian multi-technology auctions for larger plants. In general, it becomes clear that the level of competition was very low in most auction rounds, especially in Groups B and C. Prices were thus close to the ceiling prices. In Group A, competition was slightly higher in October 2019 and February 2020, but in the later auction rounds, also in this group, the ceiling price sets the support level. Similar observations can also be made in the case of smaller plants.

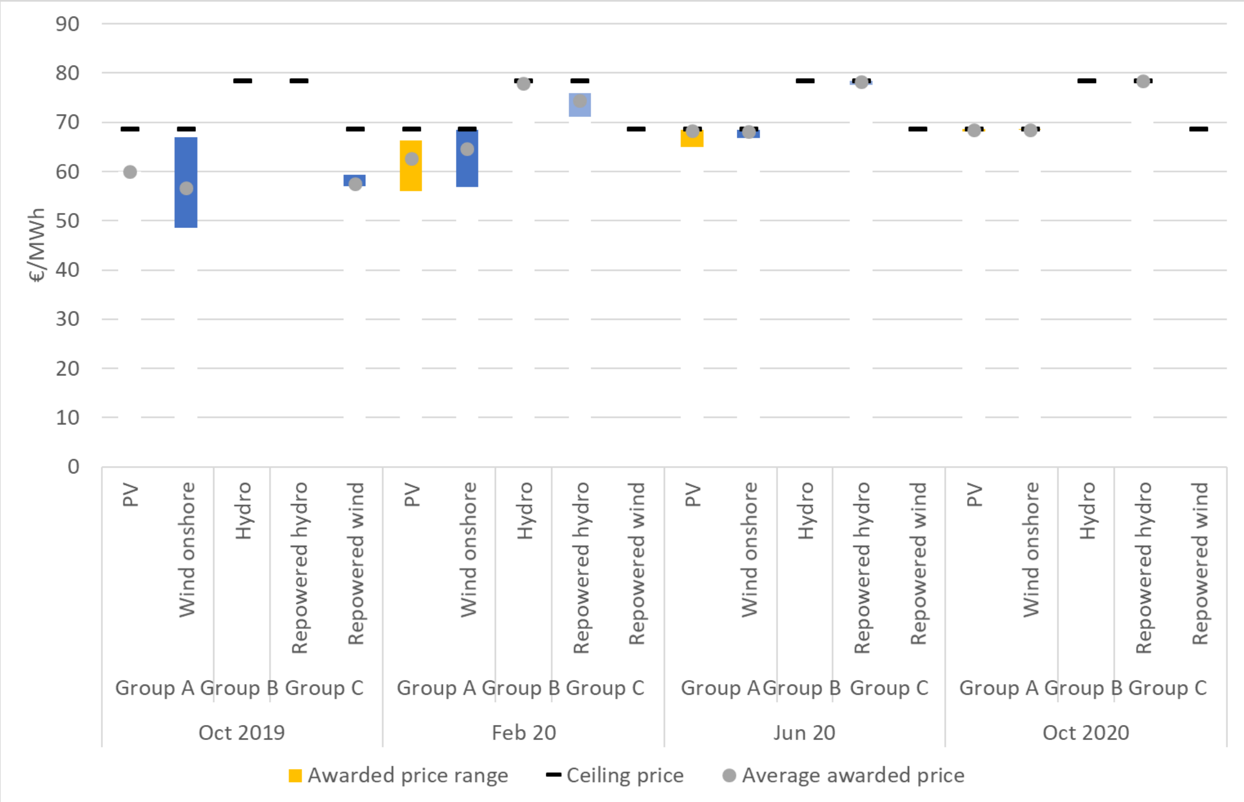


Figure 21. Awarded prices in Italian multi-technology auctions for large plants (Source: AURES II database)

Conclusions

Italy uses different technology baskets for its multi-technology auctions. So far, most auction rounds resulted in a limited degree of competition and subsequently resulting prices close to the ceiling price. Some auction rounds had to be cancelled due to the low degree of competition. In Group A, onshore wind and PV plants were equally successful, the share of PV participating and awarded in the auctions for small plants increased over time. In the auctions for repowering of onshore wind and hydro, we observe a very limited participation of onshore wind projects.

4.7 Netherlands

Since 2011, the Netherlands have conducted 24 auction rounds. 14 of these were multi-technology auctions. These auctions include all technologies apart from wind offshore for which the 10 technology-specific auctions were implemented. In the following, we describe and analyze shortly the Dutch multi-technology auctions.

Auction design

The Netherlands were the first EU country introducing multi-technology auctions in 2011. The auctioned product in these auctions is a certain budget. Bids are accepted until this support budget is reached. The budget is set for one year (twice per year since 2016). Each year there are several opportunities for handing in bids with increasing ceiling prices. As soon as the budget is fully used, the remaining dates for bids are not implemented. Hence, there is an incentive for plants to participate in the first bidding rounds of the (half) year even though accepted prices are lower in these rounds.

The Dutch system uses technology-specific ceiling prices. Apart from electricity production from renewables, the Dutch auctions also include biogas infeed into the gas grid and other technologies that contribute to reducing CO_2 emissions.

Auction results

Figure 22 shows the development of the available, submitted and awarded budget in the Dutch multi-technology auctions. For 2020, only the budget for the first half of the year is included. The available budget has increased sharply between 2015 and 2016. However, as in the years before, the submitted budget and thus the degree of competition in the auctions was quite high. From 2018, a lower rate of competition can be observed.

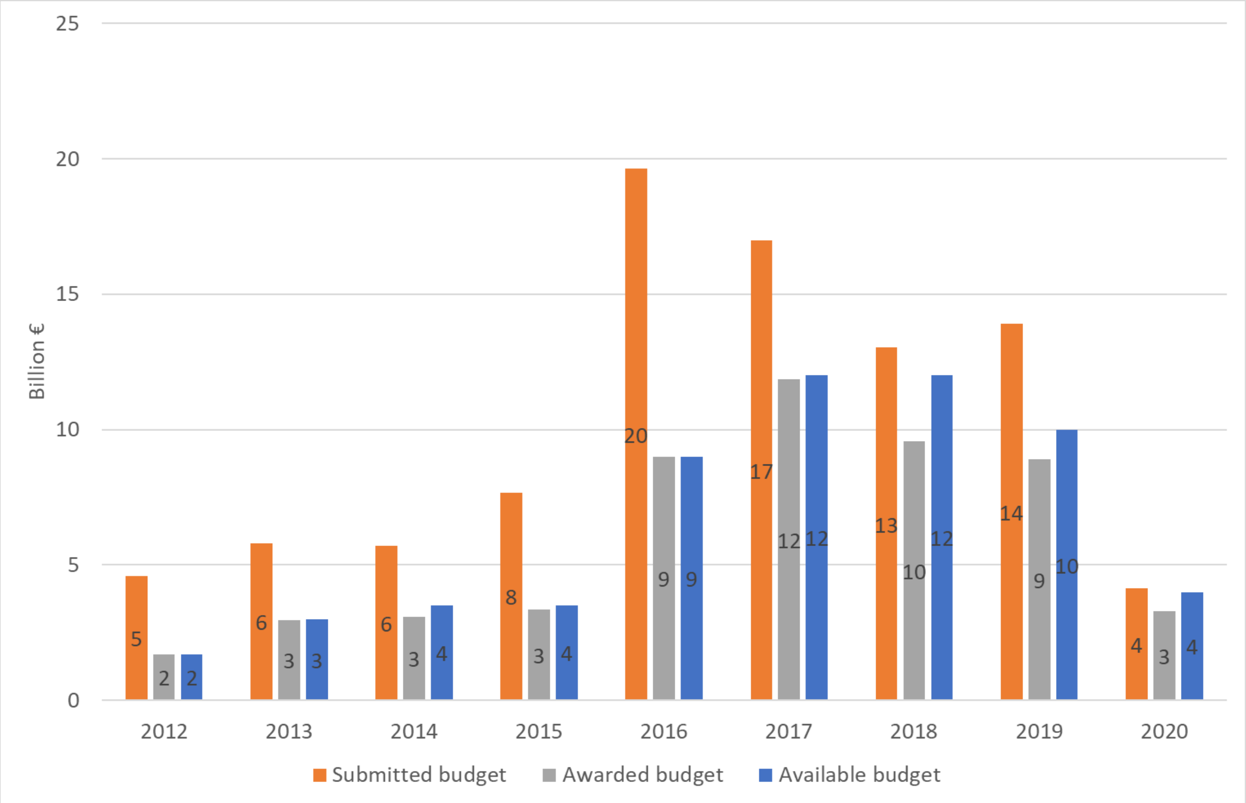


Figure 22: Development of submitted, awarded and auctioned budget in Dutch multi-technology auctions (Source: AURES II database)

The technology share of awarded capacities in the Dutch auctions has changed substantially over time. The share of onshore wind was always very volatile but a stable reduction over the last years can be observed. The PV share was quite high in 2014. Since 2017, PV is the most awarded technology in the Dutch auctions. Bioenergy played an important role until 2016, but is much less important since then. Hydropower is awarded to a small extent in some years. Also other technologies, which include among others geothermal or solar thermal heat, have been awarded to varying degrees (compare Figure 23).

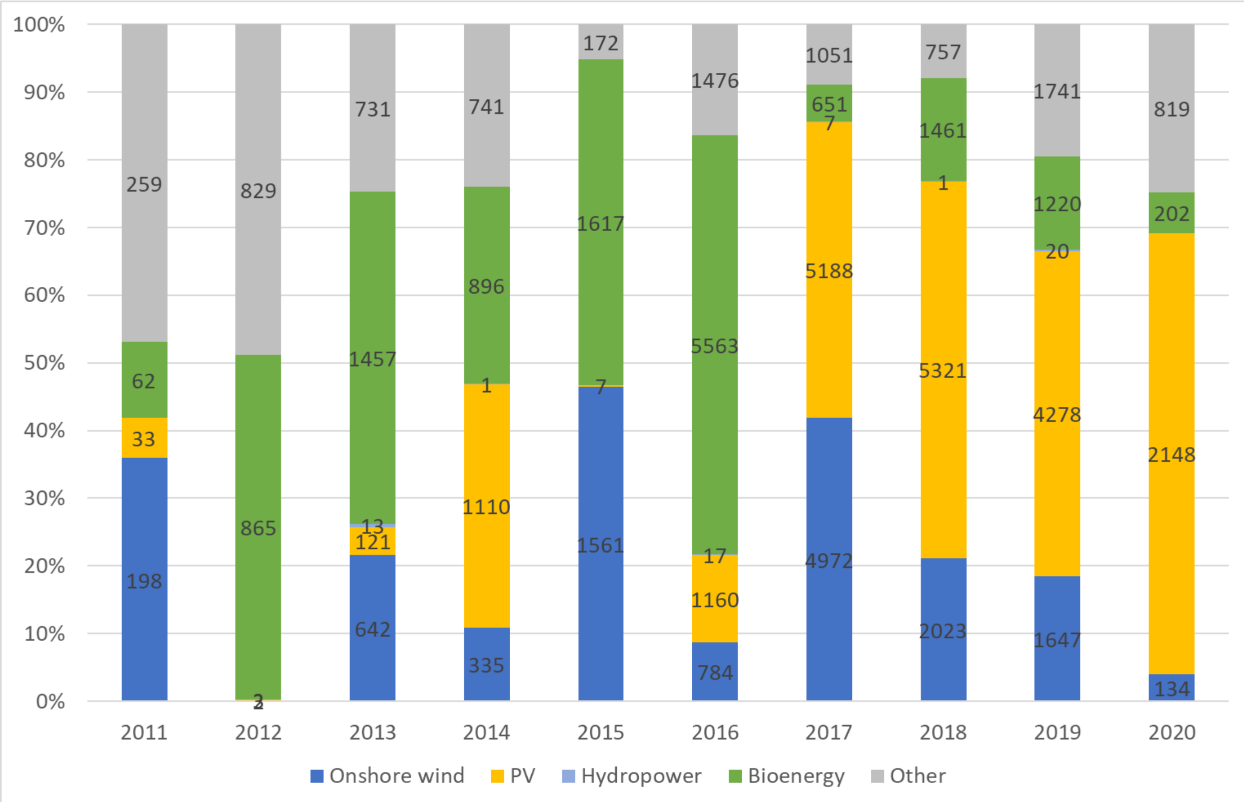


Figure 23: Technology share of awarded capacities in Dutch multi-technology auctions (Source: AURES II database)

Figure 24 shows the development of average awarded prices in the Dutch multi-technology auctions. It can be seen that the prices have increased substantially in 2016, in line with the auction value and even though there was a high degree of competition. The prices for PV have also increased a lot in this year. Since 2017, there is again a downward trend in prices with relatively low awarded bids in the 2020 auction round. The 2020 prices are however at about the same level as in 2012 although technological learning has led to a steep price reduction for some renewable technologies in that period. Interestingly, the rate of competition (i.e. the submitted vs. the awarded bids) was is not a good indicator for resulting price levels in the Netherlands.

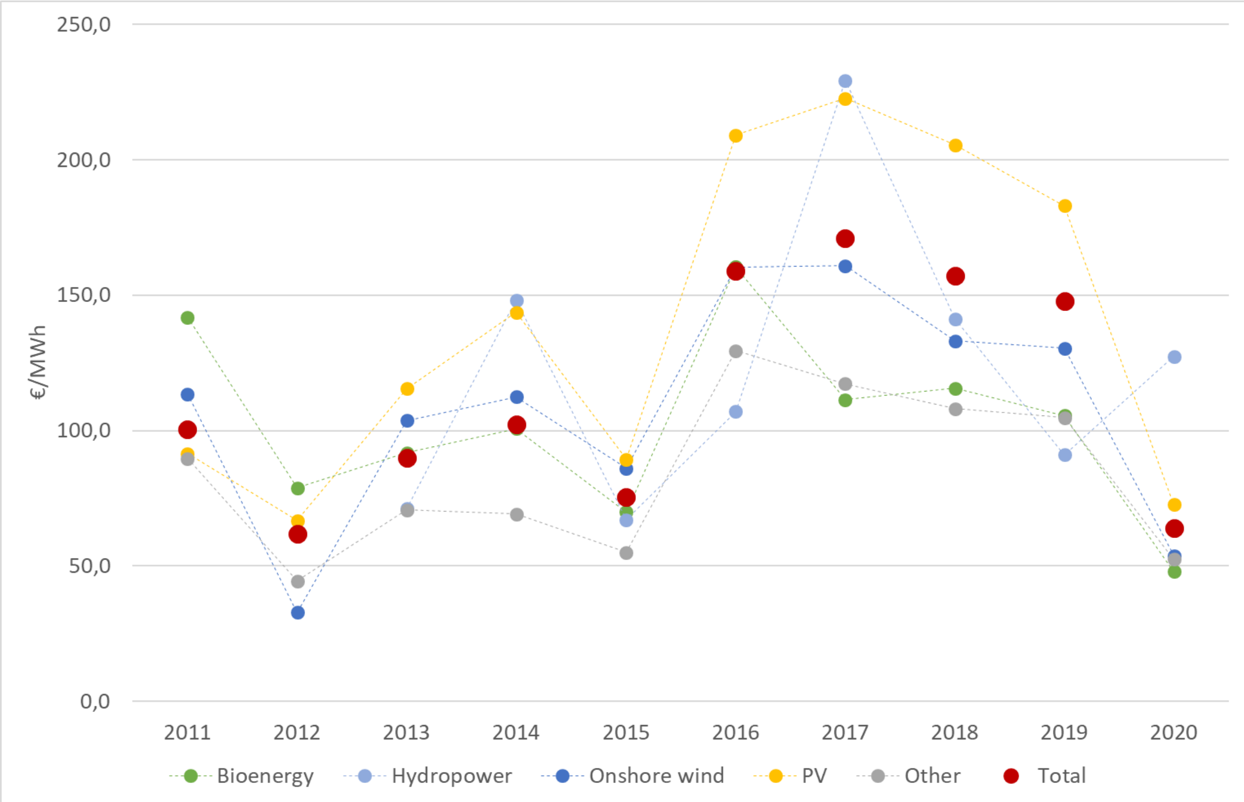


Figure 24: Development of average awarded prices per technology in Dutch multi-technology auctions (Source: AURES II Auction database)

Conclusions

The Dutch developments show that the technology mix in multi-technology auctions can change substantially over time. The price developments are somewhat surprising as no clear downward trend can be observed over the whole period. The increase in available budget in 2016 was however linked to a substantial price decrease even though the rate of competition as high in that year. In recent years, PV has become the dominant technology in the Dutch auctions.

4.8 Poland

Between 2016 and 2020, Poland has implemented 39 auctions rounds. These include 21 technology-specific auctions for bioenergy and biogas and 18 multi-technology auctions rounds for other technologies. In the following, we present the design and results of these multi-technology auctions. In its auctions, Poland determines the level of a two-sided sliding premium (CfD) indexed to inflation with a duration of 15 years.

Auction design

Poland divides the technologies in technology baskets. In addition, auctions are differentiated by size (below and above 1 MW installed capacities) and target either existing or new plants. One basket includes offshore wind, geothermal, hydro and bioliquids. In this basket, six auctions were conducted but only one of them was successfully concluded and projects awarded. Another basket includes PV and wind onshore[2]. The last

[2] In 2016 and 2017, this basket also included geothermal, hydro and offshore wind. But these technologies were never participating or awarded in any auction round.

basket is for existing plants with high full load hours (above 3600) and CO_2 emissions below 100 g/kWh. Auctions in this basket were conducted in 2016 and 2017 and successfully concluded.

Figure 25 shows the development of auctioned electricity generation in the Polish multi-technology auctions. It shows clearly that the auction sizes varied significantly with a very high auction volume in 2019.

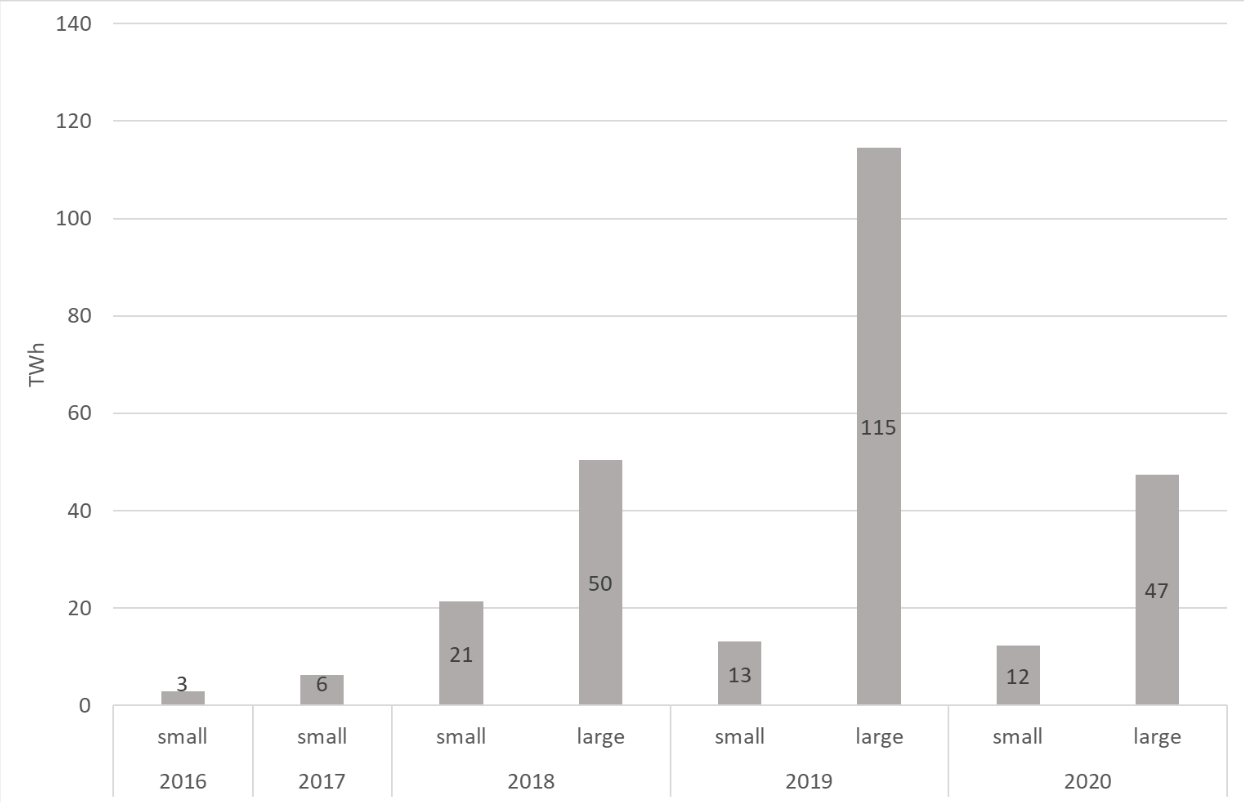


Figure 25: Development of auctioned electricity in Polish multi-technology auctions (Source: AURES II database)

Auction results

In the following, the results of the auctions are shown for each basket.

<u>Geothermal, offshore, hydro and bioliquids</u>

As stated above, only one of the 6 auctions rounds conducted in this segment led to awarded bids. Also in this auction round, the available electricity or budget were both by far not reached. In the auction, 816 GWh of electricity were awarded (i.e. about 54 GWh per year). The awarded prices ranged between 98.3 €/MWh and 112.7 €/MWh with the average value at 109.0 €/MWh.

<u>High full load hours</u>

In both auction rounds conducted, the level of competition was very low. Only hydropower plants were awarded. The rounds resulted in an awarded electricity of about 417 and 312 GWh (respectively 27.8 and 20.8 per year respectively). The price range in the first auction was very wide between 69 €/MWh and 173 €/MWh with an average of 86.5 €/MWh. In the second auction, the span was a bid more narrow with prices between 68.1 €/MWh and 111.3 €/MWh with an average of 87.1 €/MWh.

<u>PV and wind onshore</u>

Between 2016 and 2020, one auction for plants with an installed capacity below 1 MW was conducted per year. Between 2018 and 2020, one auction per year for plants with a higher installed capacity was run in addition.

While in the auctions for small plants, PV was clearly the dominant technology in all rounds, wind onshore dominates the auctions for larger plants. No technology-specific data is available for the large auctions in 2020 so that it is unclear whether there is a trend towards an increased PV share in these auctions.

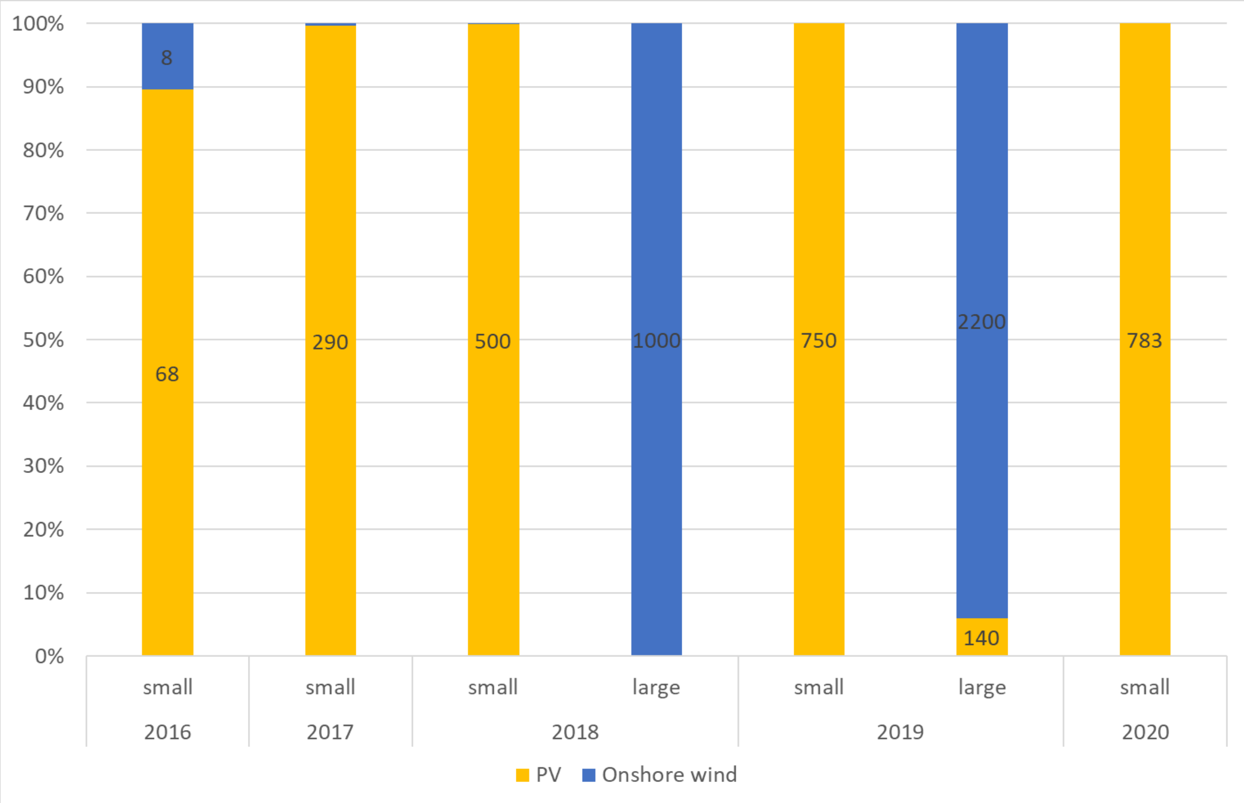


Figure 26: Development of technology shares in awarded bids in Polish multi-technology auctions (values are given in MW where these are available) (Source: AURES II database)

Awarded prices in the auctions for small onshore wind and PV plants in Poland have decreased over time from about 80 €/MWh in 2016 to slightly below 60 €/MWh in 2020. For the large scale auctions, no clear price trend can be observed. In 2020, the average awarded price of about 50 €/MWh was even slightly higher than the price in the two years before (about 45 €/MWh).

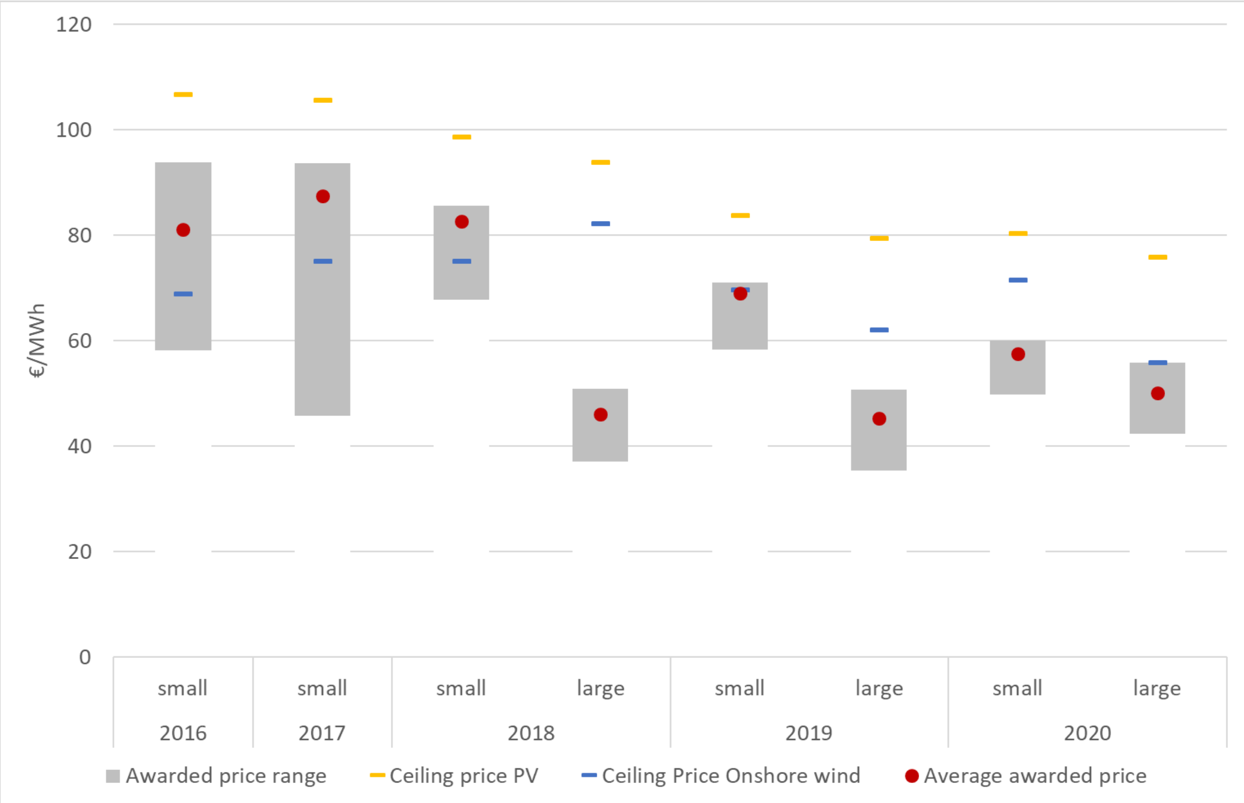


Figure 27: Development of prices in Polish multi-technology auctions (Source: AURES II database)

Conclusions

In Poland, multi-technology auctions are conducted for many technologies. However, only in the basket for wind onshore and PV, a sufficient degree of competition was reached. In the other segments, auctions had to be cancelled or resulted in low prices and insufficient submitted bids. While in small scale auctions, PV dominates, wind onshore was successful in the auctions for larger plants. Prices have decreased in the small scale auctions while no clear trend can be observed for larger plants.

4.9 Slovenia

Between 2017 and 2020, Slovenia has conducted 21 auctions whereof 19 were multi-technology auctions. The two technology-specific auctions took place in 2017 for CHP plants and hydropower. These two auctions are included in the following analysis as well as these technologies were also included in multi-technology auctions in the same year. Slovenia auctions the budget for a one-sided sliding premium with a duration of 15 years.

Auction design

Slovenia always conducts two auction rounds within one month. If too little competition occurs in the first round, projects and funds are allocated to the second round of calls. The first auction rounds typically persists of several technology groups. Since 2018, the first group included all renewable energy technologies apart from bioenergy and CHP technologies which are in the second group. In the second round, plants that were not awarded in the first round can participate together with repowering plants. In the early auctions in 2017, a technology-specific group for CHP was included in Round 1 and another technology-specific group for hydropower was included in round 2. As shown in Figure 28 the auctioned budget for both auction rounds was stable since November 2017.

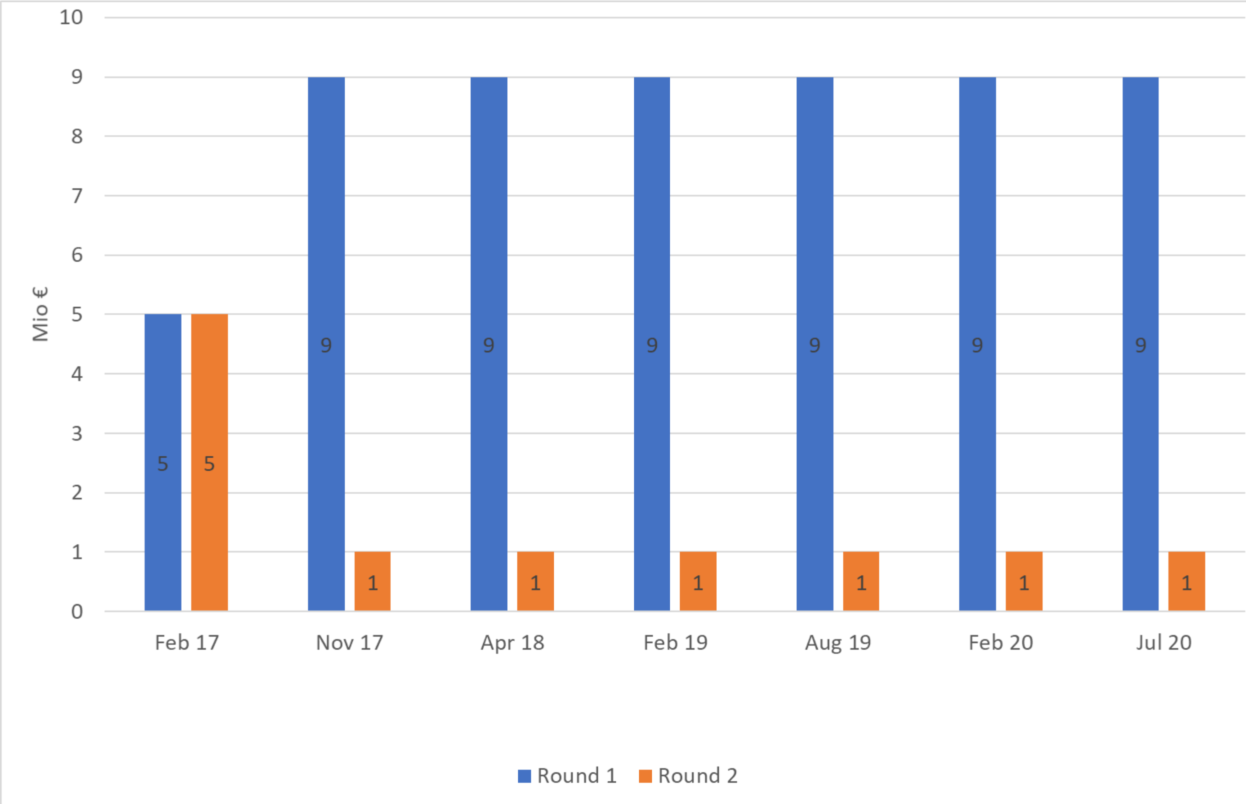


Figure 28: Development of auctioned budget in Slovenia (Source: AURES II database)

Auction results

While the auctioned budget was stable, the volume of submitted and awarded bids changed significantly over time (compare Figure 29). In general. the volume of submitted bids decreased substantially between 2018 and 2019. As shown in Figure 30, the technology shares changed significantly over time. Differences between the composition of submitted and awarded bids were however less pronounced. While in the first auction rounds, wind onshore was the dominant technology, CHP plants were most important in 2019. In the last auction round in 2020, PV plants reached the highest share of awarded capacity.

Figure 31 depicts the price development in the Slovenian multi-technology auctions. No clear trend can be observed. The prices for wind onshore and PV remained roughly a the same level. Bioenergy and CHP plwnat show stronger fluctuations but not (yet) a clear trend either.

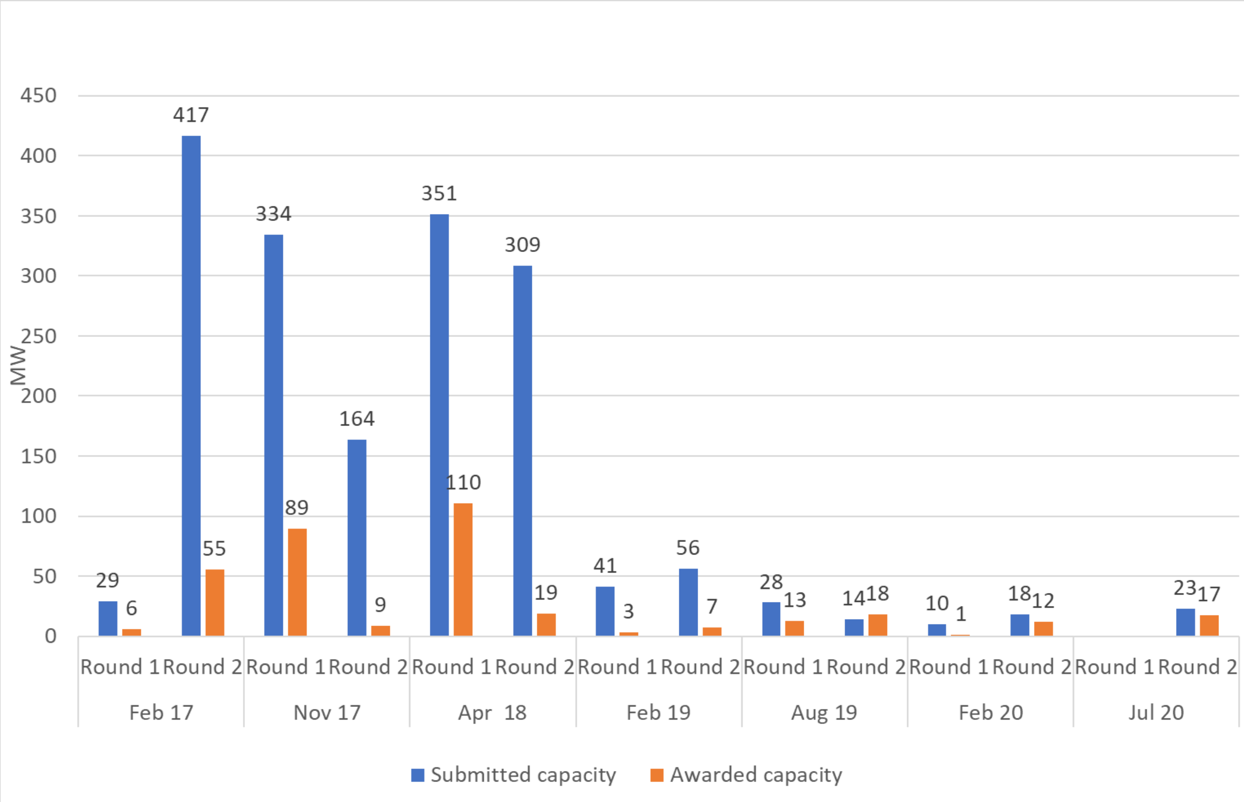


Figure 29: Submitted and awarded capacities in Slovenian multi-technology auctions (Source: AURES II database)

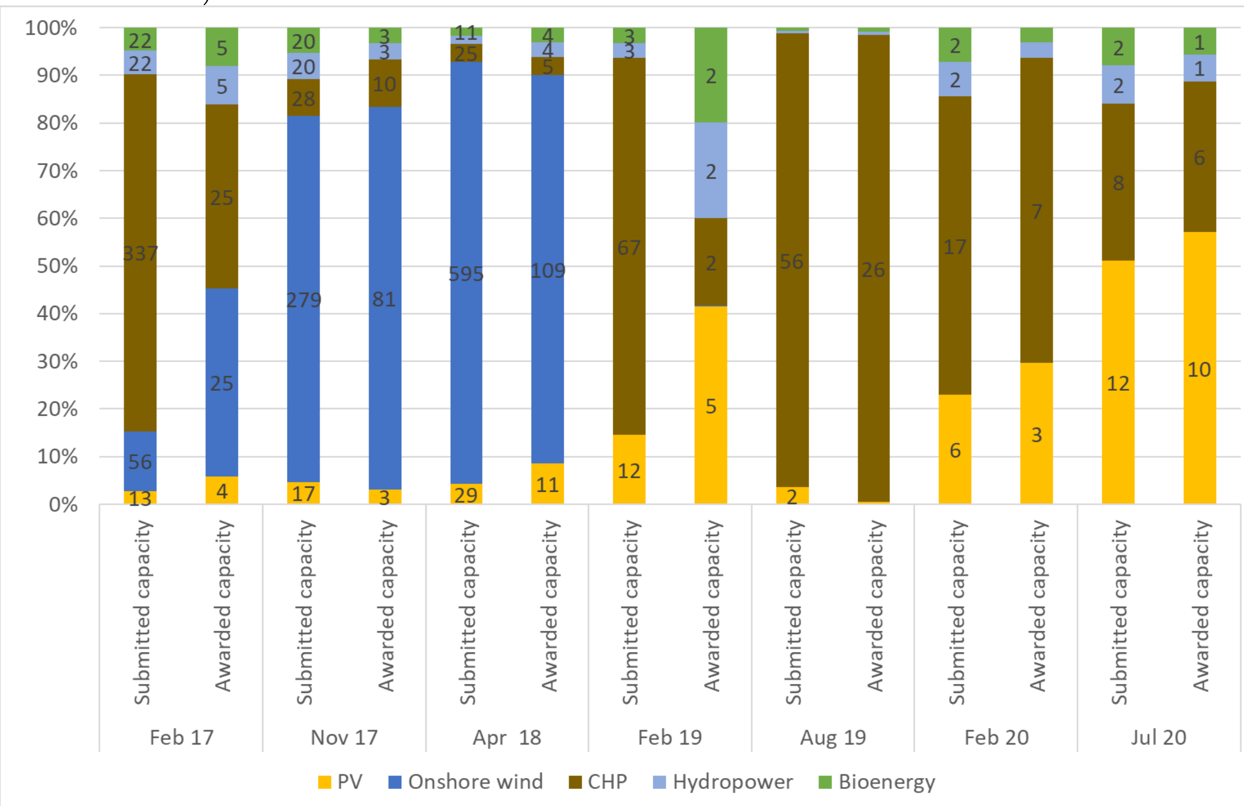


Figure 30: Technology shares in Slovenian multi-technology auctions (Source: AURES II database)

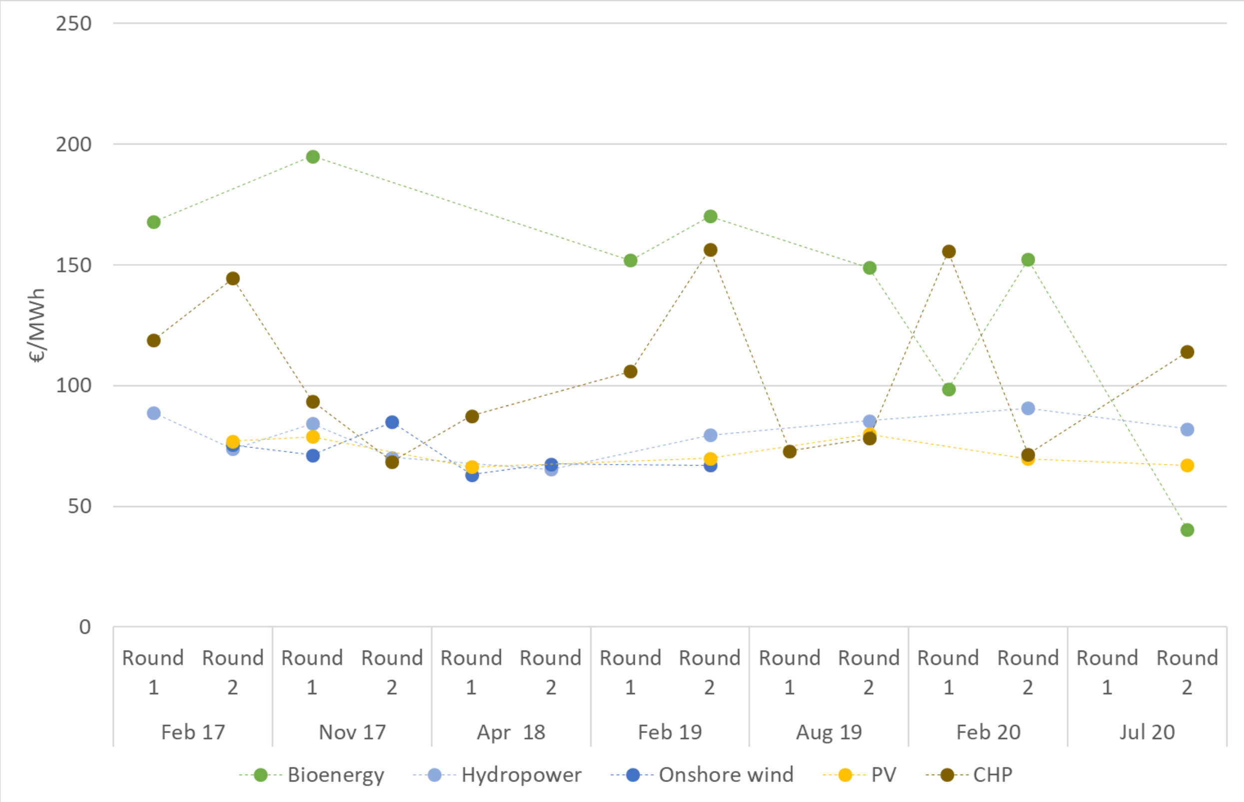


Figure 31: Development of average awarded bid prices by technology and auction round in Slovenia (Source: AURES II database)

Conclusions

Slovenia mostly uses technology-basket auctions for reaching their renewable electricity targets. In these auctions, a shift from onshore wind as dominant technology to CHP plants can be observed with an increase also in the importance of PV. While the available budget was stable, there was a decrease of submitted capacity over time. The award prices in the Slovenian auctions are very volatile, especially for bioenergy and CHP plants.

4.10 UK

In the UK, in 2015, one multi-technology auction for mature technologies (e.g. onshore wind and PV) and one for less mature technologies (e.g. offshore wind) were conducted. In 2017 and 2019, additional auctions for less mature technologies followed. The UK auctions a budget and uses the auction to determine a two-sided sliding premium (CfD) with a duration of 15 years. As shown in Table 7 the UK uses differentiated auction ceiling prices and realization periods. Offshore wind and remote islands wind technologies need to fulfil an additional material prequalification. There is no financial prequalification foreseen in the UK auctions. The UK differentiates its auctions according to technology maturity. In Pot 1, established technologies are auctioned (including PV and wind onshore). Pot 2 contains less established technologies (including offshore wind).

Table 7: Design elements of UK multi-technology auctions (Source: AURES II database)

	Ceiling price (€/MWh)	Financial prequalification(€/kW)	Material prequalification	Realization period

PV	14,48	none	Relevant planning consents, connection agreements, demonstration that CfD regulations are held up, projects beyond 300MW: Supply Chain Statement	43
Onshore wind	11,71			
Waste CHP	10,07			
Offshore wind	18,63			49 (2015) - 60 (2017/2019)
Advanced conversion	153.8 - 186.3			
Biomass with CHP	144.8 - 147.4			
Offshore wind	13,13		In addition: EIA	
Remote Island Wind	7,19			

Auction results

Figure 32 shows the technology mix of the awarded capacity in the UK multi-technology auctions. Onshore and offshore wind respectively are by far the dominating awarded capacitoies. In Pot 1 in 2015, also waste CHP and PV plants were araded to a lower extent, wjile in the Pot 2 auctions, also advances conversion plants, biomass with CHP and in 2019 remote island wind gained a small share of the auctioned capacity.

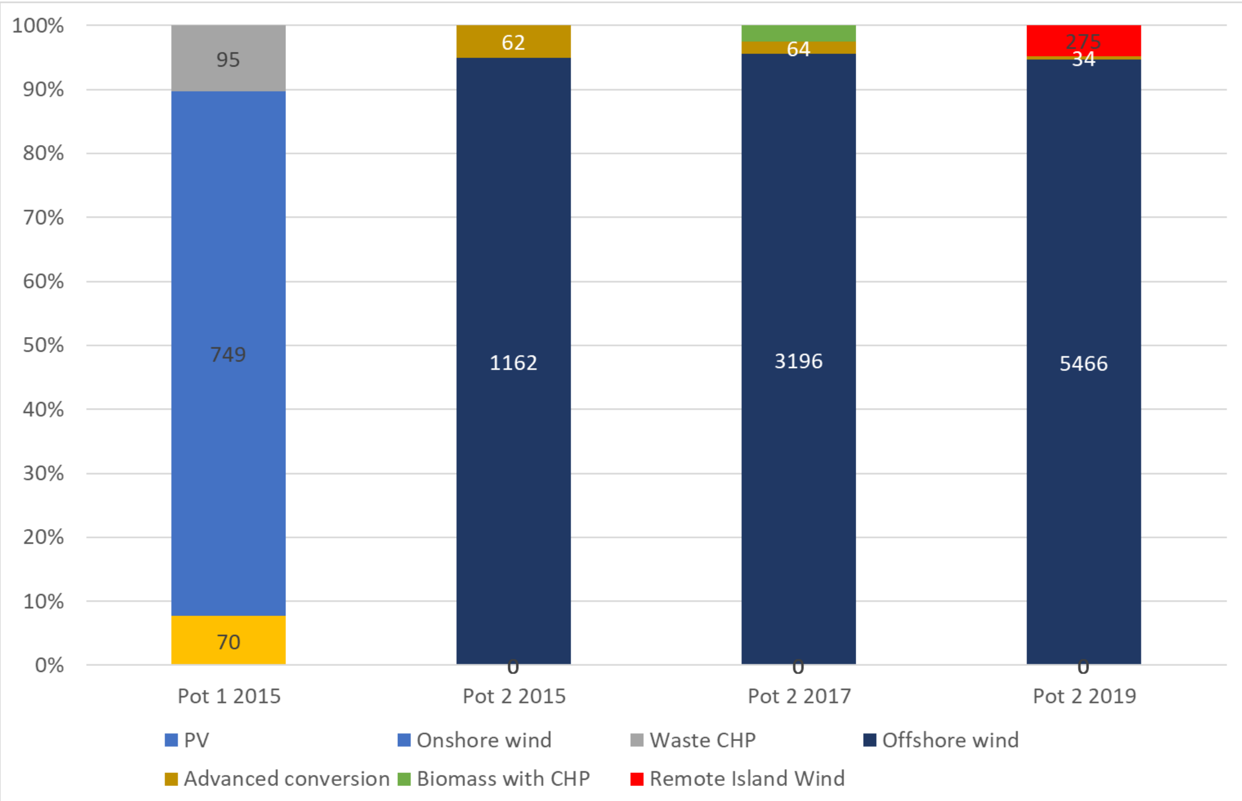


Figure 32: Technology mix of awarded capacity in UK multi-technology auctions (Source: AURES II database)

The awarded prices in the 4 auction rounds are shown in Figure 33. It can be seen that in the Pot 1 auction round 2015 the ceiling price was binding for waste CHP and the successful wind onshore plants were in the same price range. PV was awarded mostly at lower prices. In the Pot 2 auctions, a clear downward trend can be observed over time from about 150 €/MWh in 2015 to below 60 €/MWh in 2019. The ceiling prices were never binding in this pot which indicates a sufficient level of competition.

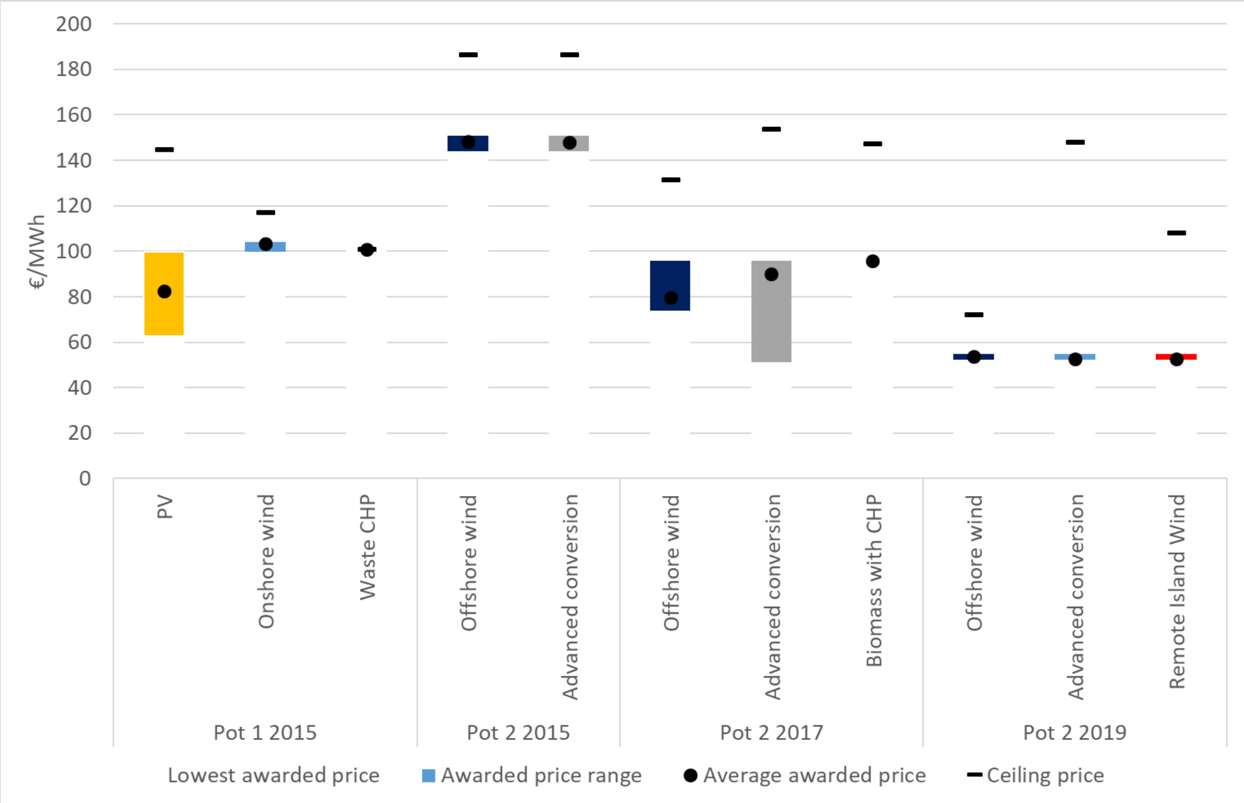


Figure 33: Awarded prices in UK multi-technology auctions (Source: AURES II database)

Conclusion

The UK has organized several multi-technology auction rounds for less established technologies. Established technologies were only auctioned once in 2015. Offshore wind was clearly the dominant technology in these auctions and like in other countries (with technology-specific auction) a clear downward trend in awarded prices can be observed in the UK auction rounds

4.11 Other countries with multi-technology auctions

In this section the other EU countries which have organized some multi-technology auctions but where not enough data is available for a full analysis, are presented.

4.11.1 Estonia

Estonia has conducted only two multi-technology auctions in 2020. The auction in Estonia determines a fixed feed-in premium on top of the electricity market price where the overall income per kWh (i.e. the sum of the market price and the feed-in premium) is capped. The duration of support is 12 years.

In both auction rounds, plants with an installed capacity between 50 kW and 1 MW were allowed to participate. A bid bond of 1 €/expected yearly electricity generation in kWh was applied. As a material prequalification, bidders had to hold a grid connection agreement. A ceiling price of 53.7 €/MWh in combination with a cap on the total revenue/MWh of 93 €/MWh applied. The realization period of 6 months in the first auction round was expanded to 12 months in the second auction round.

In both auction rounds, the degree of competition was high. In the first round, both wind onshore and PV were successful, in the second round, only PV won the auction (compare Figure 34).

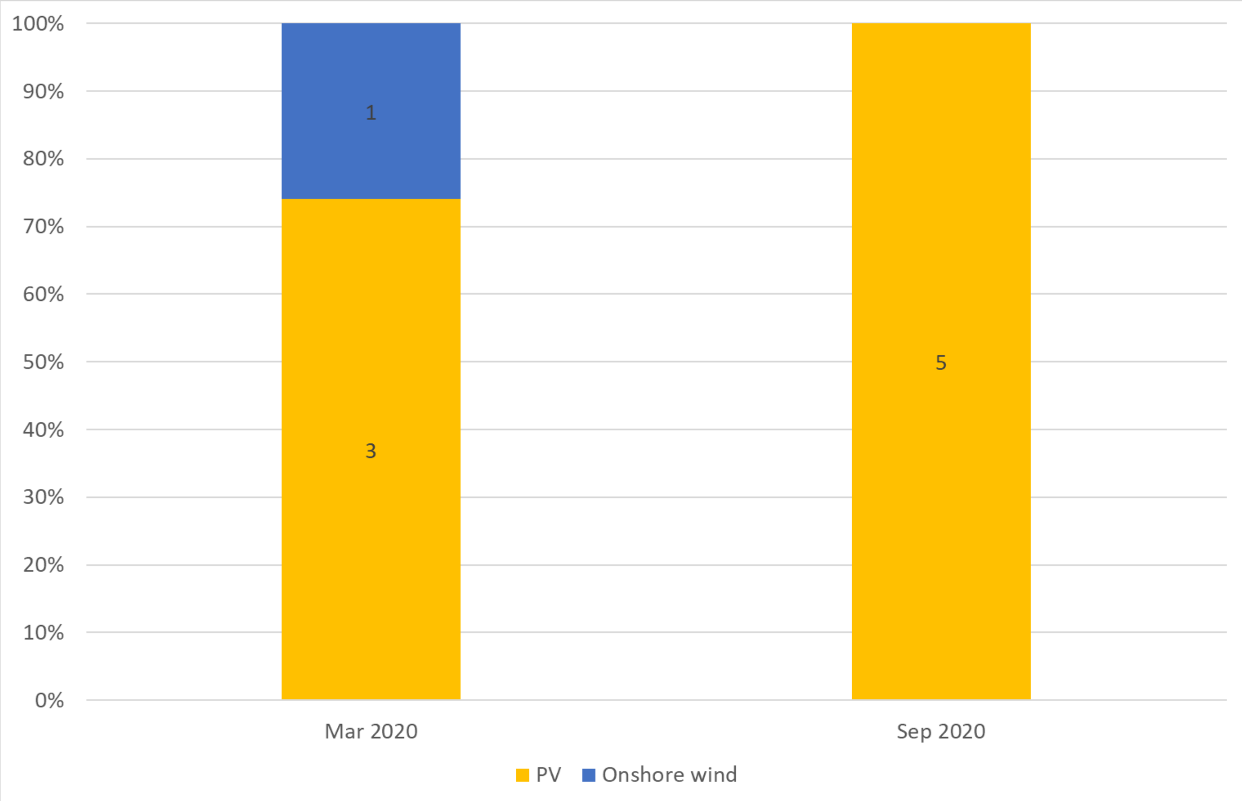


Figure 34: Development of technology share in Estonian multi-technology auctions (Source: AURES II database)

4.11.2 Finland

Finland has conducted one multi-technology auction in 2018. The auction was used to determine a fixed feed-in tariff on top of the market price which in Finland is implemented with a cap on the total revenue per kWh and a support duration of 12 years. The ceiling price was set to 53.5 €/MWh. As financial prequalification, a bond of 0.016 €/kWh of expected yearly electricity generation was applied. As a material prequalification, bidders had to hold a building permit, a grid connection agreement and where applicable a finalized EIA. In the auction, only wind onshore plants participated which was however sufficient for a high degree of competition. The resulting support level was 2.49 €/MWh (on top of an electricity market reference price of 30 €/MWh) with a minimum of 1.27 €/MWh and a maximum of 3.97 €/MWh.

4.11.3 Ireland

In Ireland, one multi-technology auctions for PV and onshore wind with plant sizes between 0.5 MW and 5 MW was conducted in 2020. The auction was used to determine a two-sided sliding premium (CfD) with a duration of 15 years. 3 TWh of electricity were auctioned.

Table 8 gives an overview of the Irish auction design. Interestingly, it includes maximum quotas for community-led projects as well as for solar projects.

Table 8: Auction design in Ireland (Source: AURES II database)

Plant	Financial	Material	Ceiling	Realization	Quotas

size (MW)	prequalification (€/kW)	prequalification	price (€/MWh)	period (months)	
0.5 - 5	27	Full planning permission, grid connection agreement/offer	120	23	Maximum of 30 GWh of community-led projects, maximum of 300 GWh of solar projects

Both wind onshore and PV plants were successful in the auction with a slightly higher success rate for wind onshore (compare Figure 35). The average awarded price was 74.1 €/MWh.

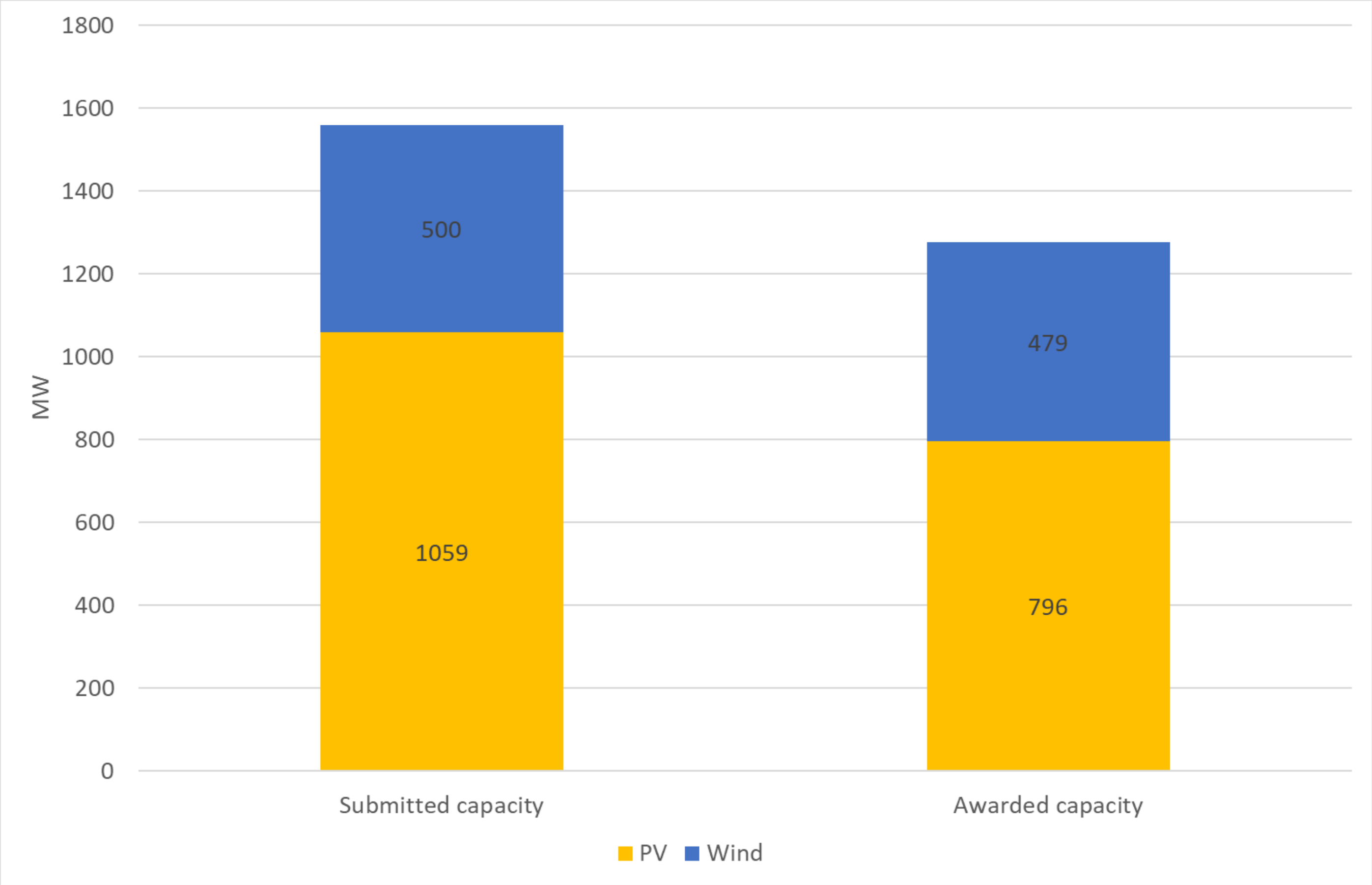


Figure 35: Technology share in Irish multi-technology auction (Source: AURES II database)

4.11.4 Lithuania

Lithuania has implemented 13 auctions between 2013 and 2020. While in 2013 and 2015, the country organized several technology-specific auctions, in 2019 and 2020 two multi-technology auctions were organized. In the following, the results of the 2019 auction are described as the information on the 2020 auction has not yet been collected (as of July 2021).

In Lithuania, the auctions are used to determine a fixed feed-in premium with a cap (depending on the market price level) for a duration of 12 years. The ceiling price in the 2019 auction was set to 3.9 €/MWh. As a material qualification, bidders had to hold a letter of intention with grid operator regarding grid access. The financial prequalification was 14,48 €/kW for all technologies. Only wind onshore plants were successful in the auction and the full auctioned electricity generation of 300 TWh (or 25 TWh per year) was awarded to onshore wind plants.

4.11.5 Malta

In Malta, 4 auctions have taken place in 2018 and 2020 whereof one in 2020 was a multi-technology auctions and the remaining 3 were for PV. The multi-technology auction in 2020 aimed for projects between 400 kW and 1000 kW installed capacity. The auction volume was 5 MW, the submitted capacity slightly higher and the awarded capacity 4.5 MW. The auction was used to determine a one-sided feed-in premium with a duration of 20 years and 1600 full load hours each year. The average awarded bid level was 135.1 €/MWh.

4.11.6 Slovakia

Slovakia planned to conduct a multi-technology auction in 2019 but the auction was cancelled.

4.11.7 Spain

Until 2020, Spain has conducted 5 auction rounds, two technology-specific auctions in 2016, and two multi-technology auctions in 2017. The latter ones are analyzed in the following. These auctions were used to determine a discount on the standard value of the initial investment of the reference standard plant (RSP). This leads to obtaining the standard value for the initial investment of the standard plant (SP). From this last value, plus the rest of retributive parameters, the remuneration for the investment of the SP will be obtained (applying the methodology set in RD 413/2014). From 2021, Spain has introduced a two-sided sliding premium (CfD) as a new support instrument.

In both auction rounds, a financial prequalification of 60 €/kW applied. The material prequalification was a building permit. Plants had a realization period of 36 months. No information on the level of bids is available.

While in the first auction round (with a total accepted bid volume of 3 GW), wind onshore clearly dominated in the second round (with a total accepted bid volume of about 5 GW) PV gained a share of more than 75% (compare Figure 36).Other technologies that still gained a small share in the first round, but disappeared in the second round.

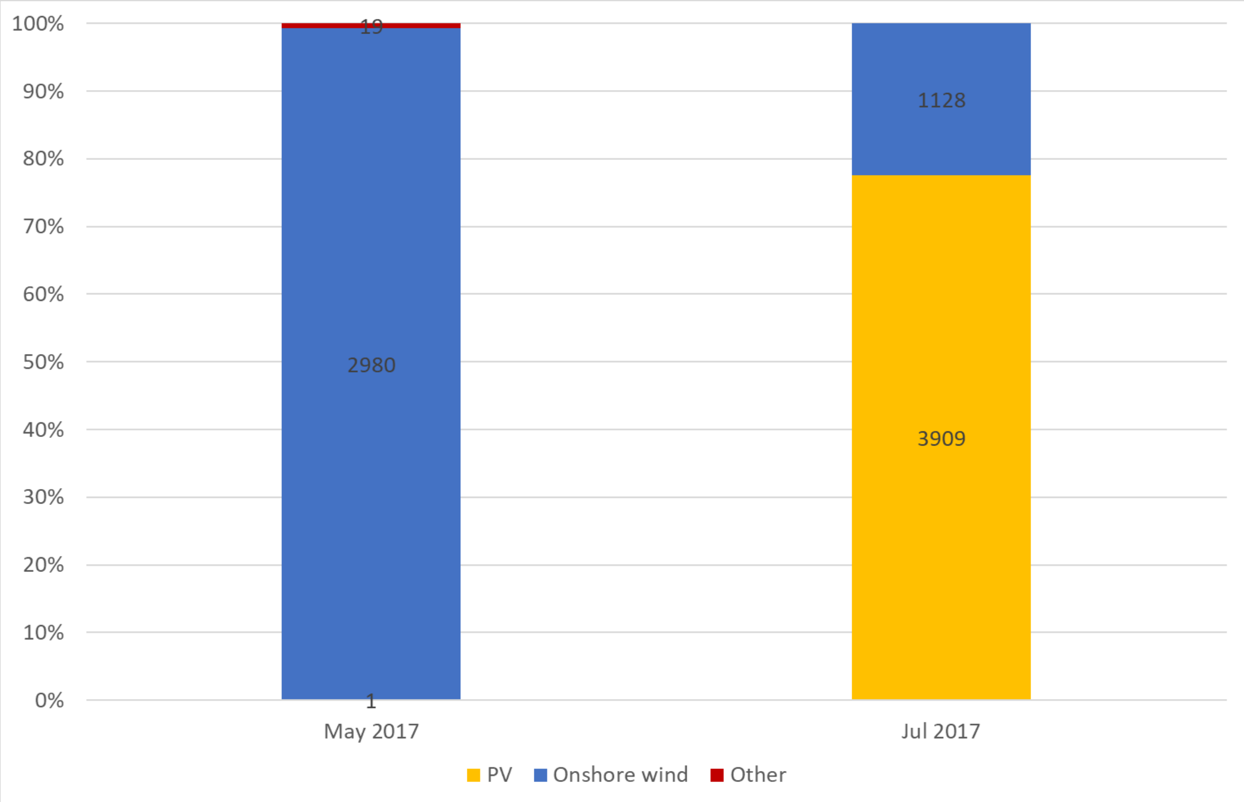


Figure 36: Technology share in Spanish multi-technology auctions (Source: AURES II database)

The Spanish case shows that technology shares in multi-technology auctions can change even in a relatively short term if selected technologies are on an equal level of competitiveness.

5 Summary and conclusion

The European regulation foresees multi-technology auctions as one of the main means for allocating the support for renewable electricity generation. Accordingly, the number of multi-technology auctions as well as their share in total auctions has increased substantially in recent years, even though the majority of auctions in the EU (and the UK) are still technology-specific.

In most countries, multi-technology auctions are used alongside technology-specific auctions. The multi-technology auctions are in these cases sometimes open for the same technologies (as for example in Germany), for different technologies (as for example in the Netherlands or Poland) or for different plant sizes (e.g. in Greece). Some countries group all technologies into different baskets (e.g. the Italy, Slovenia or the UK). The Netherlands stand out as they have the most longstanding experience with multi-technology auctions and even include heating and other CO2 reducing technologies. Countries at the other end of the spectrum only auction a very small share of their renewable electricity in multi-technology auctions (such as Germany) or have even abandoned multi-technology auctions in recent years (such as France).

The technology baskets in the different countries are defined in different ways. The UK uses for example only two different groups and distinguishes between more and less established technologies. The Netherlands have one group which includes everything but offshore wind. Poland, Slovenia and Italy define different baskets. Slovenia always conducts two auction rounds for different technologies. Plant not awarded in the first round can also participate in the second round. Hungary and Greece as well as Poland and Italy differentiate by plant size. Despite all differences, in almost all countries, PV and wind onshore compete within one auction type.

The auction results show that while there are often dominating technologies in the multi-technology auctions, the technology mix can change over time. A stable trend that PV has become more competitive in the last years can be observed in most countries. These results show that as discussed in Section 2, multi-technology auctions can indeed cause problems due to stop-and-go for some technologies. However, it is not clear from this analysis whether they cause more challenges than technology-specific auctions which in many countries do not guarantee a stable demand either. The argument that less mature technologies have lower chances in multi-technology auctions can also be partly confirmed. While there are changes in the technology mix, less mature technologies (as for example alternative offshore technologies in the UK Pot for less established technologies) have a lower chance of winning the auction. It is however highly uncertain whether these technologies will really be relevant for reaching the greenhouse gas reduction targets even in the longer term.

With respect to the awarded prices, there are also big differences between countries. in Denmark for example, a high rate of competition led to decreasing prices over time. A similar trend can also be observed in Greece and the UK. In France and Germany, awarded prices were similar to those of PV technology-specific auctions. In Italy, a very low rate of competition led to prices at the level of the ceiling price. In the Netherlands and in Slovenia (for biomass and CHP), awarded prices were very volatile. No clear price trend but rather steady prices can be observed in Poland and in Slovenia for onshore wind and PV. As a summary, no clear results with regards to the price level, also in comparison to technology-specific auctions can be drawn from the analysis in this report. The rate of competition can potentially be increased by allowing more technologies into the auction, but favourable market conditions are of course still necessary.

As for all auctions, the analysis here shows that the details matter when designing an auction and there is no one size fits all approach. Multi-technology auctions in their different forms can be a suitable means to reach renewable expansion targets. This is however only the case when the auctions are adequately planned and meet the requirements of their specific market.

AURES II is a European research project on auction designs for renewable energy support (RES) in the EU Member States.

The general objective of the project is to promote an effective use and efficient implementation of auctions for RES to improve the performance of electricity from renewable energy sources in Europe.

www.aures2project.eu

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