Report D2.2 (c), October 2015

A Methodological Note on the Links Between Components for the Assessment of Design Elements in Auctions for RES

AURES

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A Methodological Note on the Links Between Components for the Assessment of Design Elements in Auctions for RES

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1. Introduction

Why do we need a methodological note on the relationships between key components for the assessment of RES auctions? The aim of this short note is to provide a methodological framework on the links between components for the assessment of design elements in auctions for RES. This can be expected to facilitate the assessment of design elements, i.e., the analysis of the contribution of different design elements to the success of auctions for RES.

A main hypothesis in AURES is that, as with other RES policies, the proper functioning of auctions for RES, e.g., its success, depends on the choice of design elements. The devil is in the details. A key issue in this context is how we define “success” in the choice of design elements. This is certainly not a trivial issue. All assessments of RES-E support schemes are implicitly or explicitly based on the use of several criteria. The criteria are considered in this project are effectiveness, static efficiency, dynamic efficiency, minimisation of support costs, local impacts, socioeconomic feasibility and legal feasibility (see below and report on criteria).

A crucial starting point in the analysis, which came out as a conclusion from the findings in the respective literature reviews on criteria and design elements as well as from del Río and Linares (2014), is that the link between specific design elements and criteria are mediated by the effects on bidders and the market. Design elements impact those effects and, in turn, influence the score in different criteria. Therefore, several components and their interrelationships are taken into account: criteria, design elements and effects.

This methodological note should be regarded as part of a broader package of three reports, together with the design elements and the assessment criteria reports. Its aim is to facilitate the analysis throughout the AURES project by clarifying the relationships between different components.

Accordingly, this methodological note is structured as follows. The next section describes the main components for the assessment of RES auctions. Section 3 provides a general discussion of the interrelationships between the different components. A detailed, yet preliminary discussion illustrating the links between those components and organized per design element, is provided in section 4.

2. Key components for the assessment of design elements in auctions for RES

Key components for the assessment of design elements in auctions for RES include assessment criteria, effects at different levels (bidders, market and regional) and design elements. These components can be described as follows.

2.1. Assessment criteria

The success of the functioning of any RES-E support scheme can be judged according to several criteria. In this context, we adopt a “policy-maker” perspective. Table 1 describes the criteria considered in this project and provides relevant indicators associated to them. Full details on how these criteria were derived as well as a full description of these criteria are provided in the report on assessment criteria in task 2.2 of the AURES project.

Table 1. Description of the criteria and indicators

Criteria	Description	Indicators
Effectiveness	Degree to which auctions result in deployment of RES-E projects.	Realisation rate (%)
Static efficiency (cost-effectiveness).	Reaching the target at the lowest possible overall costs. An auction outcome is efficient if the bidders with the lowest generation costs are awarded. The relevant costs here include generation costs and transaction costs, whether private or public. The later are called administrative costs.	Total generation costs (system costs)(€, €/MWh) (Private) transaction costs (€) Administrative costs (€).
Dynamic efficiency	This refers to long-term technology effects, including impact on innovation, technology diversity, cost reductions over time…	Private R&D investments (€). Evolution of the share of different technologies over time (%) Evolution of the costs of the technologies over time (€/MWh).
Support costs	Impact on the level of support for different technologies (average and total).	Average support level per technology (net of generation costs)(€/MWh) Total support costs net of total generation costs (€).
Local impacts	Impact on several variables at the EU, national, regional and local levels. They can be environmental or socioeconomic, and include emissions of GHG and local pollutants, variations in fossil fuel energy dependence, employment effects, industry creation, regional development and export opportunities…	GHG emissions being reduced (additional to the ETS)(tones) Emissions of local pollutants reduced (tones). Reduction of fossil fuel imports: trade balance affected (avoided fossil fuel consumption from Green-X) Local content / Promotion of local industry Regional concentration of deployment (??) Additional Jobs in renewable sector (number).
Sociopolitical feasibility	Degree to which the design elements and the whole support scheme are socially acceptable and politically feasible. This depends on other criteria (minimization of support costs, the existence of positive and negative local impacts from RES-E deployment, etc…). A main aspect is whether the design element or support scheme fits in the existing institutional structure.	Fit to decision makers' institutional capacity Qualitative variable (more/less acceptable; more/less politically feasible). "Revealed preference of (national) policy-makers for a specific design element"?
Legal feasibility	Extent to which a given design element or the whole support scheme comply with EU legislation (primary and secondary law), including State Aid rules and internal market principles.	Compliance with State Aid rules (Y/N) Compliance with internal market principles (Y/N).

2.2. Design elements

Design elements have an indirect influence on the criteria through their impact on the different levels of "effects". The design elements in auctions for RES considered in this report can be grouped in two broad categories, tender-specific design elements and additional RES tender-specific design elements (Box 1). See the dedicated report on design elements for further details.

Box 1. List of relevant design elements for RES-E auctions.

1. AUCTION-SPECIFIC DESIGN ELEMENTS

- 1.1. Price-only/multi criteria auctions
- 1.2. Type of auction: auction formats and pricing rules
- 1.3. Price ceilings and minimum prices
- 1.4. Other
    - 1.4.1. Seller concentration rules
    - 1.4.2. Information provision
    - 1.4.3. Web-based vs. in-person auctions
    - 1.4.4. Secondary market

2. ADDITIONAL RES AUCTION-SPECIFIC DESIGN ELEMENTS

- 2.1. Targets/Scope/Volume auctioned
    - 2.1.1 How to set the volume auctioned?
    - 2.1.2. Energy or capacity-related remuneration
    - 2.1.3. Volumes auctioned
    - 2.1.4. Number and frequency of rounds
    - 2.1.5. Volume auctioned in each round
    - 2.1.6. What to do with the amounts not awarded and not built
- 2.2. Diversity: Technological, size, actors, geographical
    - 2.2.1. Technological diversity
    - 2.2.2. Size diversity
    - 2.2.3. Geographical diversity
    - 2.2.4. Actor diversity
    - 2.2.5. Other diversity types
- 2.3. Prequalification criteria
- 2.4. Duration of contract
- 2.5. Penalties for non-compliance/delays
- 2.6. Updating of remuneration over time
- 2.7. Other design elements
    - 2.7.1. Local content rules
    - 2.7.2.. Deadlines and grace periods.

2.3. Effects on bidders, market and system level

The impact of design elements can take place at different levels, depending on the aggregation considered, from micro (bidders) to meso (system) and macro (regional). Obviously, these levels are interrelated.

Regarding the impacts on bidders, design elements may affect their participation in the auction. This can occur through two mechanisms: by influencing the costs of participation, the risks of participation or the revenues expected in an auction (bid prices). In general, the higher the costs, the higher the risks and the lower the expected revenues, the lower the level of participation.

The impact at the bidders' level translates into market effects, which include the number of bidders in the auction, the diversity of those bidders and market concentration. In turn, these have wide-ranging consequences on the functioning of the auction and the outcomes of the RES-E support scheme (assessed with the aforementioned criteria).

Finally, there might be relevant effects at the level of the system, including impacts on the regional distribution of deployment.

The following table summarises the types and subcategories of effects and proposes some indicators for these effects.

Table 2. Main indicators for the effects on bidder, market and system level

TYPE OF EFFECT	SUBCATEGORY	INDICATOR
Effects on bidder level	Participation risks	Quantitative: sunk investments before bid Quantitative: level of (bid bond) guarantees Qualitative: Comparison across different alternatives.
	Participation costs	Quantitative (€). Qualitative: Comparison across different alternatives.
	Unfavourable strategic bidding behavior	Number of unfeasible projects (nº), i.e., costs above support levels.
Effects on market level	Number of bidders	Quantitative: number of bidders. Quantitative dynamic: variations in the number of bidders
	Diversity of bidders	Quantitative: Ratio of incumbents/new entrants Small bidders
	Market concentration.	Quantitative: Herfindhal index.
Effects on system level	Regional distribution of deployment	Grid stability Local job creation Local RES and CO2 targets

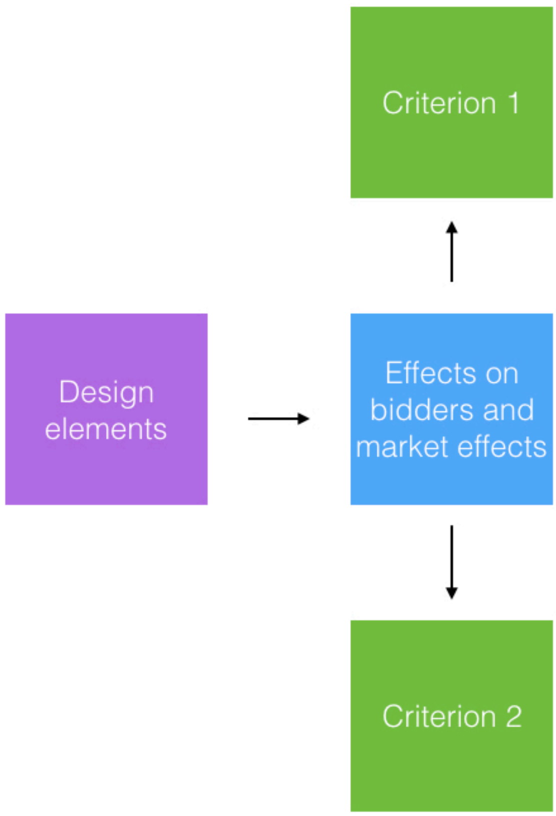
The identification of those components has been based on a literature review on RES-E support and RES-E support with auctions. This led to their classification in each category of components. In addition, the analysis of the links between the components (see below) has also been based on the relationships observed in empirical studies of auctions for RES.

3. A general framework on the links between the components

The following diagram synthetises the relationship between the aforementioned three components in our very basic framework. A more detailed discussion on the interrelationships, overlaps and links between those components follows in the next section.

The basic idea is that there is an indirect connection between design elements and assessment criteria (AC). Design elements have impacts on the bidders and market “effects” in RES-E auctions. In turn, these effects have an influence on the success of RES-E auctions, which can be measured taking into account different criteria. There are other instruments and measures unrelated to RES-E support which might have effects on bidders or the market, but the focus in this methodological note is on the chain design elements-effects-criteria in figure 1.

Figure 1. Illustrating the links between the components



Trade-offs and interactions between criteria and between design elements can be expected. These interactions are of different sorts:

-Conflicts: A design element would have a positive impact on one criterion (by influencing one specific bidder or market effect) while simultaneously having a negative impact on another criterion (through its influence on a different bidder or market effect).

-Complementarities: A design element would have a positive impact on one criterion ((by influencing one specific bidder or market effect) while simultaneously having a neutral impact on another criterion (through its influence on one effect).

-Synergies: A design element would have a positive impact on one criterion (by influencing one specific bidder or market effect) while simultaneously having a positive impact on another criterion (through its influence on one effect).

There are some potential problems in auctions for RES which work against the criteria, i.e., which lead to a poor score on the relevant criteria. They could be auction-specific, including the existence of underbidding and the limited competition (leading to high bid prices).

In a very general context "underbidding" means that the bid is lower than a certain benchmark bid, whereby several options exist to determine different benchmark bids (e.g. straightforward truthful bid (cost-covering bid), equilibrium bid, etc.). In the context of this project “underbidding” refers to a bid submitted by a bidder which is not cost-covering. There are two reasons for "underbidding": First bidders may have high uncertainties in estimating their costs and revenues and thus "underbidding" occurs unconsciously. Second, bidders may practice underbidding consciously for strategic reasons, e.g. to enter the market. Underbidding would result in delays in completing the projects or even to their non-realisation.

High investors’ risks is a problem shared with other RES-E support schemes or design elements, but they would activate different types of mechanisms in auctions for RES, i.e., they have a specific influence in auctions for RES. Risks directly affect bid prices (since bidders factor those higher risks into their bids) but they also affect the participation in the auction, which reduces competition and also tends to result in higher bid prices (see below). Those problems could also be common to all RES-E support schemes and unrelated to the choice of the support scheme (grid connection costs, the impact of the economic/financial crisis…), i.e. the choice of a specific support scheme or design element cannot mitigate the problem. The focus in this note is on auction-specific problems. Problems in RES-E auctions may be caused by factors which can be tackled with appropriate design elements or not, i.e., they may be inherent to auctions in which case we may wonder whether auction is a preferable instrument. In fact, the question could/should be broader: under what conditions and circumstances are auctions a preferable instrument?

4. Illustrating the links between the components

The aim of this section is to specifically show how design elements can affect assessment criteria (AC) by influencing the bidder and market effects. Obviously, this is a very preliminary analysis which nevertheless can be useful for the rest of WPs. It can be regarded as a rough framework for further empirical research in the context of AURES.

The approach is systemic and dynamic. It is systemic because it considers feedback loops between effects, criteria and design elements. It is dynamic because interactions occur over time. In fact, the problems detected can be mitigated in t+1 with the implementation of a design element.

Since the aim is to establish links between design elements and criteria, which are the focus of WP2, the discussion is organized per design element.

Where do the links come from? They are both empirically-based and theory-based. We have used the same empirical literature on RES-E auctions in our criteria and design elements reports to identify those links. We have performed a matching of the theoretical factors influencing assessment criteria with the impacts of the design elements observed in empirical research. For example, the following influences on the assessment criteria can be discerned:

-Effectiveness: Underbidding leads to project failures[1]. High risks discourage potential investors and bidders.

-Static efficiency: Investors' risks also influence allocative efficiency. A greater LCOE (e.g., greater generation costs) would result from higher risks.

-Support costs. High bid prices, as a result of low competition and higher investors' risks would result in support costs not being minimised. Low competition can be the result of quantitative and qualitative factors: low number of bidders, lack of diversity of bidders and market concentration. Note that even if an auction awards the lowest bids, it does not need to follow that those bids have been submitted by those bidders with the lowest costs.

-Dynamic efficiency. Dynamic efficiency depends on investments in local manufacturing facilities and development of a robust supply chain. Effectiveness in deployment will facilitate local investments in the renewable energy technology supply chain. In addition, a technology-specific RES auction is likely to be more innovation-friendly than technology-neutral auctions.

-Local impacts: existence of positive and negative impacts from RES-E deployment and RES-E support. Deployment in the territory directly affects local impacts, either positively (socioeconomic benefits in terms of industry and job creation throughout the supply chain) and negatively (NIMBY related to environmental externalities, such as visual intrusion or land occupation due to deployment of RES-E plants).

[1] In a very general context "underbidding" means that the bid is lower than a certain benchmark bid, whereby several options exist to determine different benchmark bids (e.g. straightforward truthful bid (cost-covering bid), equilibrium bid, etc.). In the context of this project "underbidding" refers to a bid submitted by a bidder which is not cost-covering. There are two reasons for "underbidding": First bidders may have high uncertainties in estimating their costs and revenues and thus "underbidding" occurs unconsciously. Second, bidders may practice underbidding consciously for strategic reasons, e.g. to enter the market.

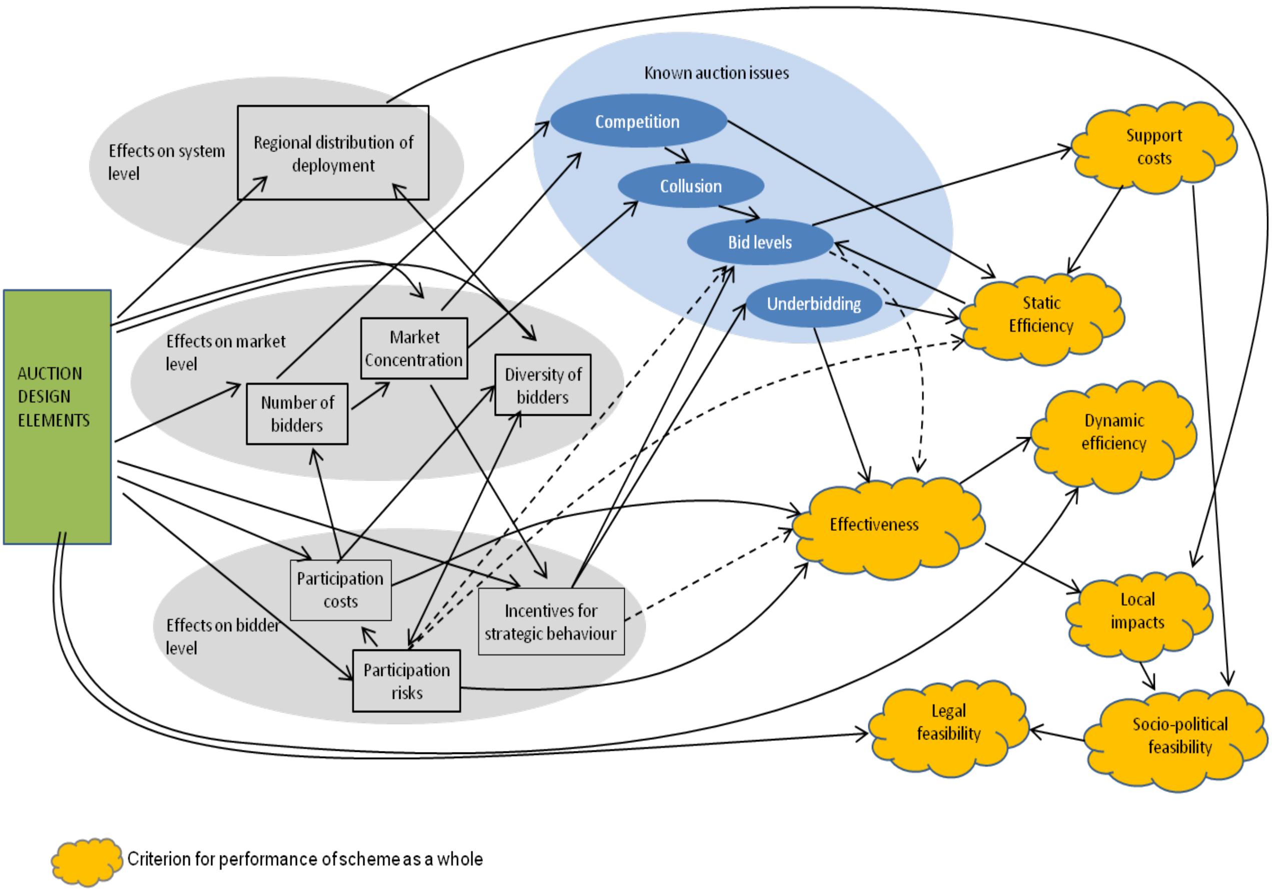
- Sociopolitical feasibility. This is directly connected to other criteria, e.g. local impacts and minimization of support costs. It has a national and a local component. The former is related to the perceived benefits and costs of RES-E deployment. The benefits include a lower fossil-fuel dependency, industry creation and jobs. The costs are mostly support costs, paid by either consumers or taxpayers. Local impacts can also affect social acceptability and political feasibility. They can be positive (beneficial socioeconomic and environmental impacts) and negative (NIMBY phenomena).

-Legal feasibility. A legally unfeasible support scheme is unlikely to be a politically feasible one.

It can be observed that several effects influence different criteria (see the report on criteria for further details on the interrelationships between criteria). For example, this is the case with investors' risks, which influence effectiveness, support costs and static efficiency. In turn, a given effect may simultaneously have a direct and indirect impact on the criteria.

The main starting point (hypothesis) is that the impacts of design elements on criteria are mediated by their effects on bidders, but also by their market and system-level impacts (i.e., "effects" from now on). Design elements impact those effects, which, in turn, influence the score in different criteria. The interaction between the different components (design elements, market effects and assessment criteria) is depicted in the following figure and further explained below.

Figure 2. Illustrating the links between the components. Source: Own elaboration.



Design elements have an influence on assessment criteria either directly or indirectly through their impact on several “market effects”, which include the number of bidders, diversity of bidders and market concentration.

A main driver of these market effects is the attractiveness to participate in the auction for potential bidders. In turn, this depends on the costs and risks of participation (influenced by prequalification criteria…) and the benefits of participating (bid levels compared to costs). Design elements may encourage or discourage participation in the auction procedure. This occurs by influencing two main variables: the costs of participation and investors risks, e.g. the risks of participation. For example, very high prequalification requirements increase the costs of participation. Very high penalties increase investors’ risks. In turn, the costs and the risks of participation affect participation qualitatively (actors’ diversity) and quantitatively (number of bidders). The increase in both costs and risks reduces the attractiveness to participate in the auction, and, thus, the number of bidders. But it may also affect actors’ diversity, since those costs and risks are likely to be borne unequally by different types of actors. Small actors would be particularly discouraged. A lower participation and a lower diversity of actors (i.e., only large firms) would tend to reduce competition and increase the possibility of collusive behavior. In other words, the diversity of actors positively affects competition through a lower probability of collusive behavior. This would tend to result in higher bid prices, and, thus, higher support costs. In addition to the influence on participation in the auction, higher risks of participation as a result of a specific design element are directly factored into bids, leading to higher bids.

These factors directly influence the effectiveness of the auction. These factors also affect other criteria. Greater risks influence static efficiency through a greater LCOE. And greater risks are likely to be factored into bid prices as well.

Therefore, the market effects have a central role in the picture because they affect a main aspect in auctions: competition. The greater the competition level, the lower the probability of collusion, the lower the expected awarding prices/auction revenue. On the other hand, a greater level of competition results in lower generation costs and, thus, allocative efficiency is improved (the greater the level of competition, the more likely that the cheapest technologies/locations/producers would be selected). Static efficiency and bid prices are connected since lower generation costs tend to result in lower bid levels ceteris paribus.

Design elements do not only influence the market effects indirectly through their impact on the costs and risks of participation, but may also do so directly (for example, by setting seller concentration rules). And they may also influence other criteria directly, such as dynamic efficiency (for example, by setting technology-neutral vs. technology-specific support). Dynamic efficiency is clearly affected by the existence of a market on which R&D investors can expect to sell their products and which favours learning effects and dynamic economies of scale. Legal feasibility will also depend directly on the design elements chosen. As discussed in the section on interactions in the criteria report, indirect impacts of design elements on criteria through their effect on other criteria are likely. For example, this is likely to be the case for sociopolitical feasibility. Lower support costs and greater local benefits are more likely to make a specific design element more politically palatable.

Finally, different auction formats are more suitable under given competition situations, e.g., the choice of design elements depends on the degree of competition in the market (thus, an arrow from competition to design elements). For example, Maures and Barroso (2011) argue that when competition in an auction is weak, not revealing any information during the auction process becomes an advantage of sealed-bid auctions.

We provide preliminary, very rough recommendations on how the specific problems can be mitigated with the respective design element, but this is only illustrative of the type of analysis that we aim to perform during this project. Take into account that this is only a methodological note whose aim is to illustrate the links between components for the assessment of RES-E auctions. The content, i.e., the specific links will be established in later stages of the AURES project.

4.1. Targets.

4.1.1. How to set the volume

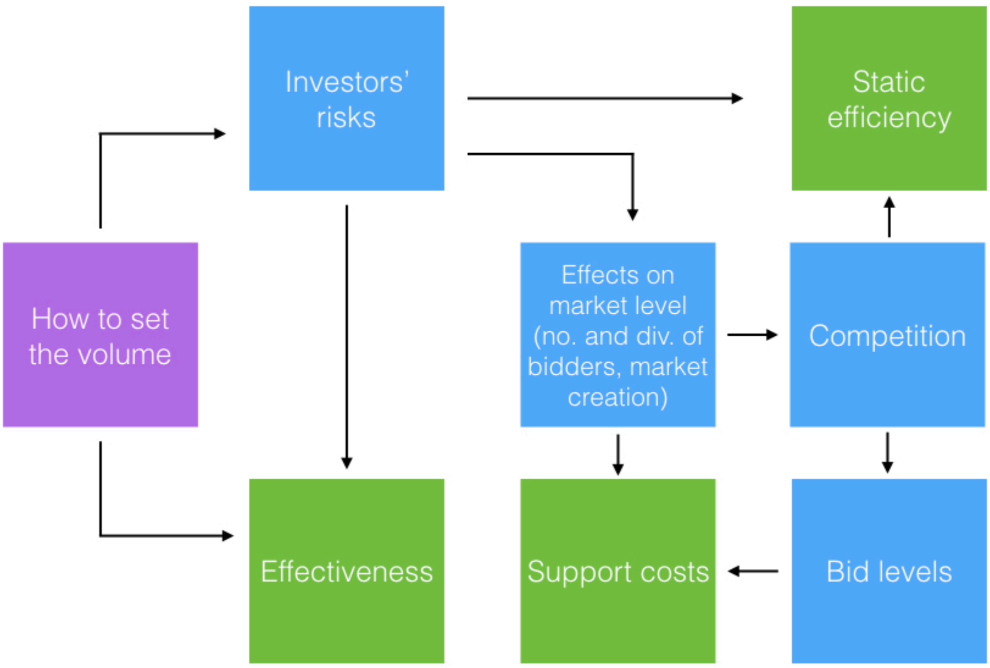
Alternatives and their pros and cons

There are three main ways to set the volume auctioned: capacity, generation or budget. A main advantage of using electricity generation in this context is that there is more certainty than capacity targets on the total policy costs. The greatest certainty in this sense takes place under budget caps. Certainty on generation is obviously greatest under the generation metric, and this can be considered a particularly positive feature with respect to grid management. However, compared to capacity targets, electricity generation targets are probably more difficult to set and might be too restrictive and risky for investors. It is more difficult to ensure that the target is exactly met, since with intermitted renewable, an amount of generation above or below the pre-set target are likely.

How the different criteria are affected

The way in which the target can be set (generation, capacity or budget cap) affects the certainty of reaching the EU Directive RES targets. It also affects investors' risks. In turn, as mentioned above (see figure 3), investors' risks affect three assessment criteria directly: effectiveness, static efficiency and minimization of support costs.

Figure 3. Illustrating the influence of "how to set the volume" on the AC



4.1.2. Volumes auctioned

Alternatives and their pros and cons

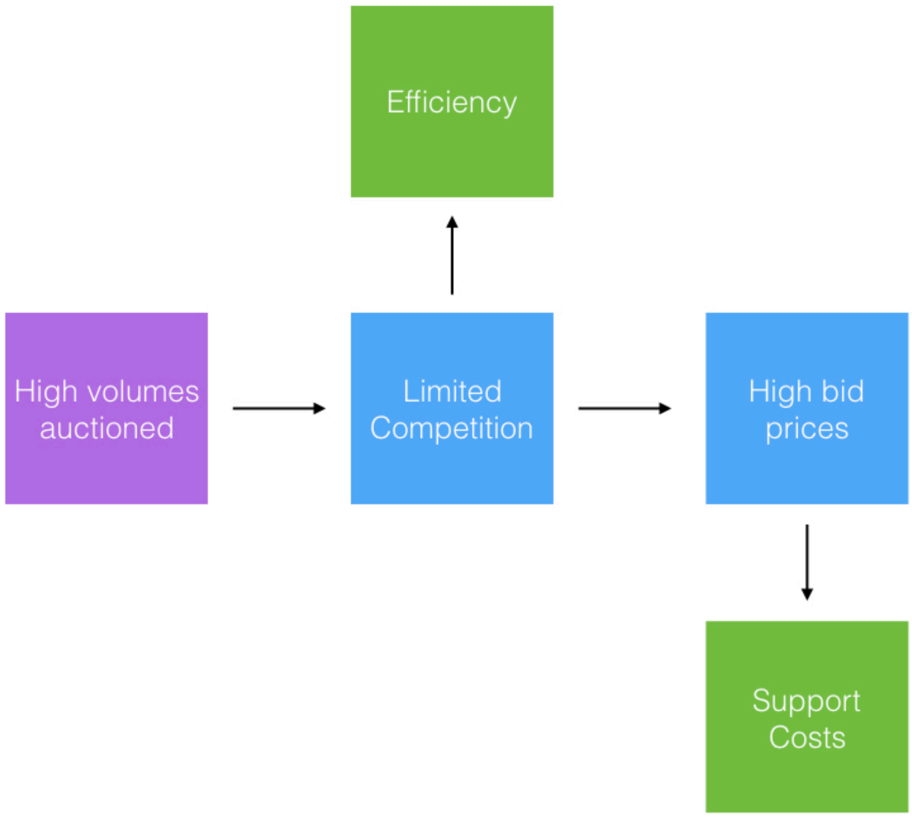
Targets provide an investment signal, contain policy support costs and allow the planning of the integration of intermittent RES into the grid. Obviously, the volume auctioned should be in line with those targets. Otherwise, competition would be affected and, thus, bid prices and support levels. A high auction volume (with respect to the market) results in limited price competition and high bid prices. The reason is that this leads to little scarcity being created in the bidding procedure. An example is the first RES auction in South Africa in 2011. The size and readiness of the local renewable energy market were initially overestimated, resulting in less capacity being bid than was made available. There was thus limited competition in round one, and bid prices were close to the price cap. Use of the single-price offer (rather than a dynamic reverse auction as employed, for example, in Brazil) also restricted competition (Eberhard 2013, p.6). The introduction of a ceiling price was key to avoid paying very high prices for the energy auctioned, given the low demand for some technologies. The low demand was addressed by reducing the volumes offered for hydro and solar in the second auction; however biomass still has had a very low coverage (around 2%)(de Lovinfosse et al 2013). Something similar occurred in Peru, where the volume auctioned was reduced by almost 78% from the first round in order to increase competition and reduce prices (IRENA 2013). Targets should take into account the technology market in the country. In this sense, targets and technological diversity are somehow related. For example, according to Fraunhofer ISI et al (2014), in view of the Netherlands' 2020 RE targets, the system is far from offering sufficient incentives for more costly RE options, which appear necessary to achieve RE targets through domestic action.

Setting the volumes to be auctioned and the targets themselves is an important decision in ensuring the effectiveness of the tendering scheme. Obviously, the targets should be set in relation to the capacity of the market to deliver. Intuitively, the amount to be auctioned should be in line with the RES-E targets. However, an alternative could be to auction higher volumes than the target, in order to guarantee a deployment level, taking into account that not all projects that are selected will actually be carried out (de Vos and Klessman 2014). However, this would bring some problems. On the one hand, it is difficult to politically communicate a seeming inconsistency between the expansion goal and the tendered quantity. On the other hand, from a practical point of view, it is difficult to determine beforehand the "excess quantity" that should be tendered (Fraunhofer ISI et al 2014).

How the different criteria affected

Volumes auctioned should be in line with targets and the market situation. A high auction volume (with respect to the market) results in limited price competition, higher bid prices and higher support costs. This problem can be mitigated with a ceiling price. but the solution would be rather to reduce the volumes auctioned in a second round. Given the ineffectiveness in completing projects in any auction scheme, some propose to auction higher volumes than the target, but this would bring the problems mentioned above.

Figure 4. Illustrating the influence of “volumes auctioned” on the AC



4.1.3. Number and frequency of rounds.

Alternatives and their pros and cons

Determining the optimal number of rounds and the volumes that would create greater competition is a challenge that requires learning by doing (IRENA 2013). More rounds may create a “narrow market” problem in each round, reducing the level of competition. However, the “optimal” number of rounds is likely to depend on the technology and situation of the market, with fewer rounds for technologies with potentially fewer actors (offshore wind) and more frequent rounds in the case of technologies and bands with more potential participants (roof-top solar PV). For example, auctions in France (solar PV) are quite frequent (5 rounds in 2012).

The intermittent nature of the calls for tenders results in stop-and-go tender schemes not conducive to stable conditions (European Commission 2005), leading to greater risks for investors and possibly lower levels of participation, greater bid prices and negative impacts on the RE supply chain (del Río and Linares 2014)[2]. Unless auction schemes are linked to a fixed schedule of auctions at regular intervals (*e.g.*, more than once per year), they may lead to a stop-and-go pattern of deployment. These conditions prevent investment in local manufacturing facilities and the development of a robust supply chain (IRENA 2013). For example, Elizondo

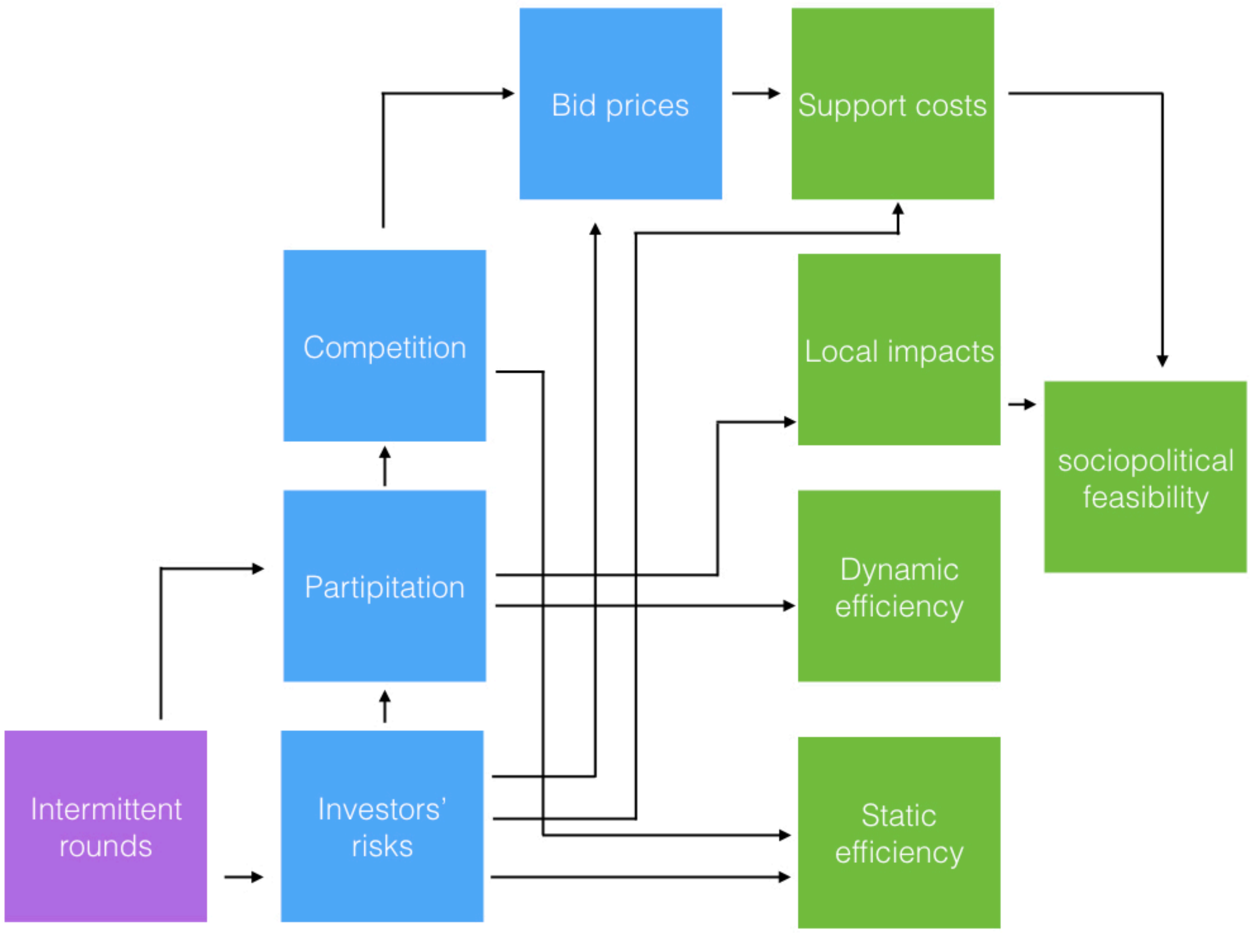
[2] For example, in the tranche-oriented system of the NFFO, a call for bids was made every 2 years and it was unknown when the next NFFO round would take place.

et al (2014) argue that with periodic auctions providing a steady stream of newly contracted wind power projects, the wind equipment industry in Brazil flourished.

How the different criteria are affected

Intermittent, unforeseen calls for tenders reduce the level of participation both directly and indirectly (by increasing investors' risks). This brings two different types of impacts. On the one hand, a lower participation reduces the number of bidders and competition, making higher bid prices, and thus support costs, more likely. On the other hand, they lead to a stop-and-go investment pattern which prevents investment in local manufacturing facilities and the development of a robust supply chain negatively affecting dynamic efficiency and local impacts. In turn, the negative impacts on both support costs and local impacts have a negative impact on socio political feasibility. On the other hand, too frequent rounds may create a narrow market problem and, thus, lead to lower levels of competition, higher bids and support costs.

Figure 5. Illustrating the impact of intermittent, unforeseen calls for tenders on the AC



4.1.4. Capacity auctioned in each round

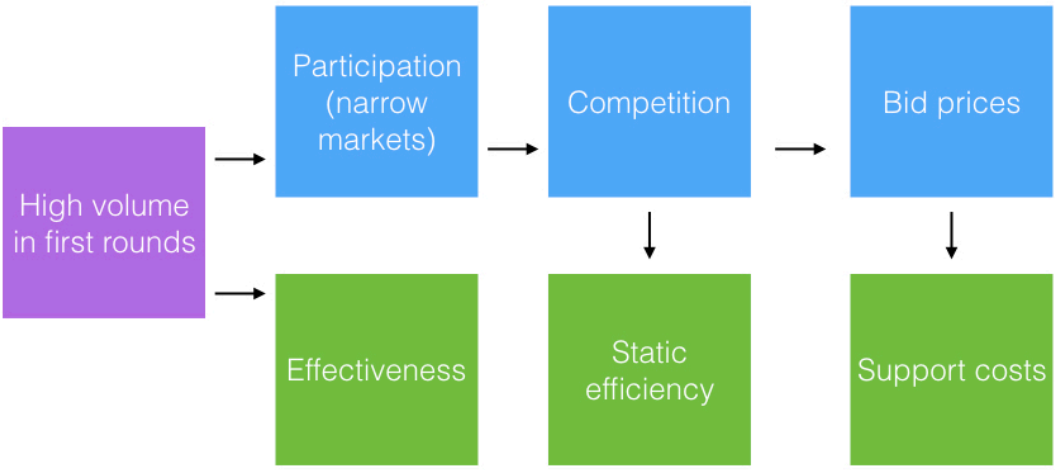
Alternatives and their pros and cons

Deciding on the volume to be auctioned in each round represents a challenge for policy-makers. Two broad alternatives exist. Either relatively larger volumes are auctioned in the first or in later rounds. Auctioning larger amounts of capacity in the short term would have the advantage of being able to pass the capacity not built to later rounds, mitigating the negative impact on the effectiveness of the scheme. The main disadvantage is that too large volumes can lead to lower levels of competition and too high bid prices.

How the different are criteria affected

As mentioned above, effectiveness would be affected. On the other hand, the incentive to participate would be influenced. This has an impact on competition, bid price and support costs.

Figure 6. Illustrating the impact of high volumes auctioned in first rounds on the AC



4.2. Diversity

4.2.1. Technological diversity

Alternatives and their pros and cons

There are several alternatives to induce technological diversity, including different technology bands (separate bidding procedures for each technology) and percentage requirements (e.g., a certain percentage of the overall auctioned volume should be met with different technologies). See the report on design elements for further details.

Technological diversity is justified at the global (worldwide, maybe EU) level for intertemporal (dynamic) efficiency to take place, i.e., in order to achieve long-term RES-E and CO_2 targets cost-efficiently. From a national policy maker perspective, the reason for technological diversity might be different: to reduce support costs (minimize windfall profits), exploit different types of resources, benefit from comparative industrial advantages and support the local industrial value chain.

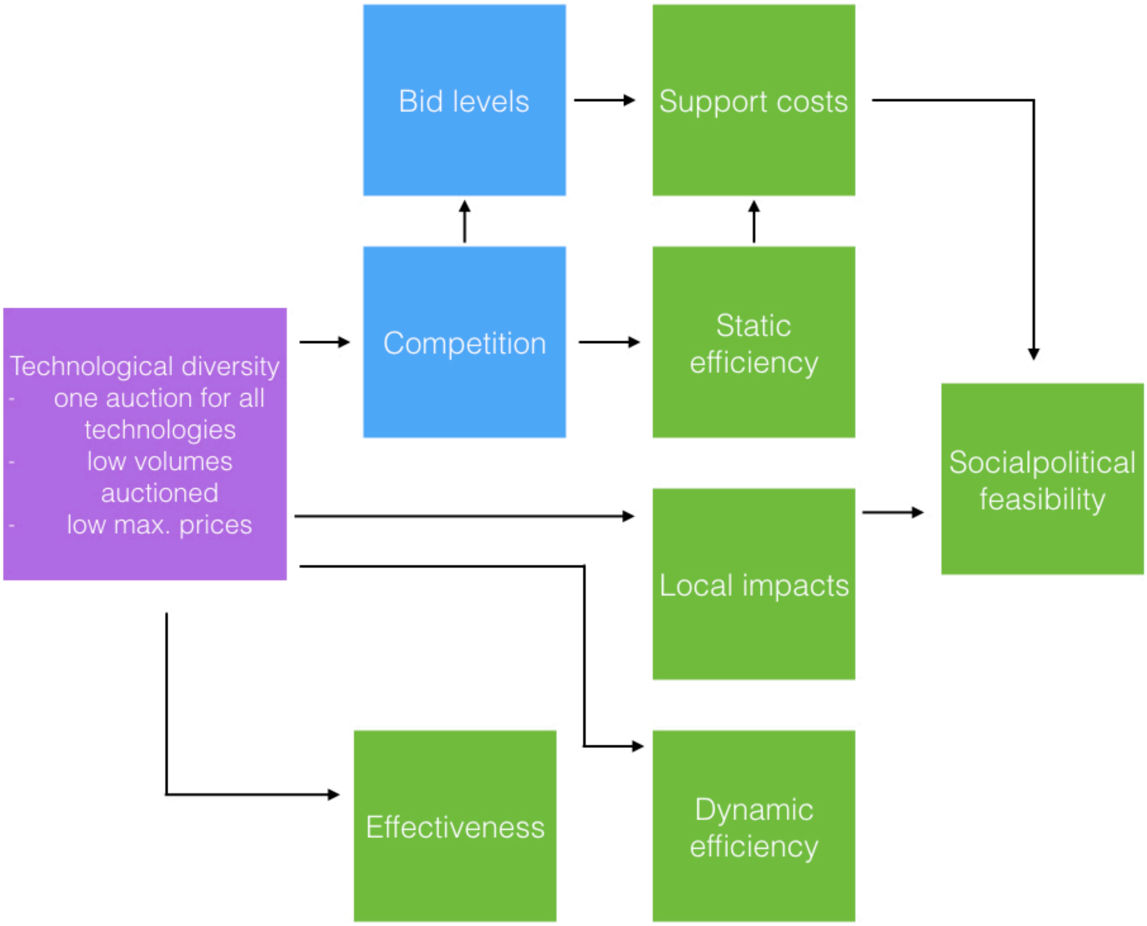
Technological neutrality is justified to comply with short-term targets cost-efficiently (allocative efficiency, i.e., minimum system costs).

A balance needs to be struck here. A single band discourages technological diversity, since only the mature technologies are promoted. Bands also have disadvantages: they lead to a fragmentation of the tendering process and, thus, lower competition levels. Too many bands may lead to a lack of qualified bidders in each band and too few actors, reducing the benefits of competition. It may also lead to market power (del Río and Linares 2014).

How the different criteria are affected

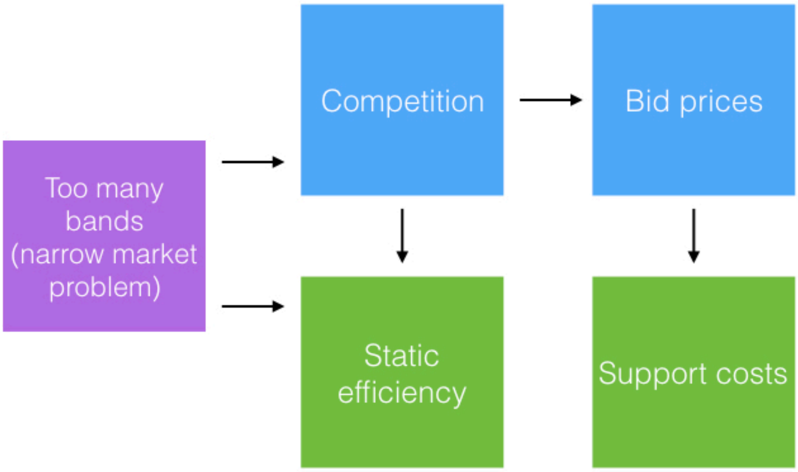
Technology diversity may be needed in order to comply with the RES targets, i.e., technology neutrality may be ineffective. Static efficiency would be negatively affected, since generation costs would not be minimized with higher-cost technologies. Administrative costs would be higher with technology bands, since these bands need to be defined. The impact on support costs is uncertain. On the one hand, diversity reduces the excessive remuneration to the more mature technologies but, on the other hand, more expensive technologies are supported, requiring higher support levels (i.e., higher support costs). Dynamic efficiency would be positively affected, given that different types of technologies would be supported. Local impacts can be regarded as positive, since technology diversity would impact all stages of the value chain, leading to employment and industry creation as well as to a more disperse RES-E deployment in the territory. The impact on sociopolitical feasibility is uncertain, since support costs would be higher, but there would be local benefits.

Figure 7. Illustrating the impact of technological diversity on the AC



A problem in promoting technological diversity would be too many bands. This would lead to a narrow market problem, lack of competition in each band, high bids and relatively high support costs. In addition, static efficiency (generation costs) would be negatively affected. Therefore, this begs the question of how much diversity is recommendable.

Figure 8. The impact of too many bands on the AC



4.2.2. Size diversity

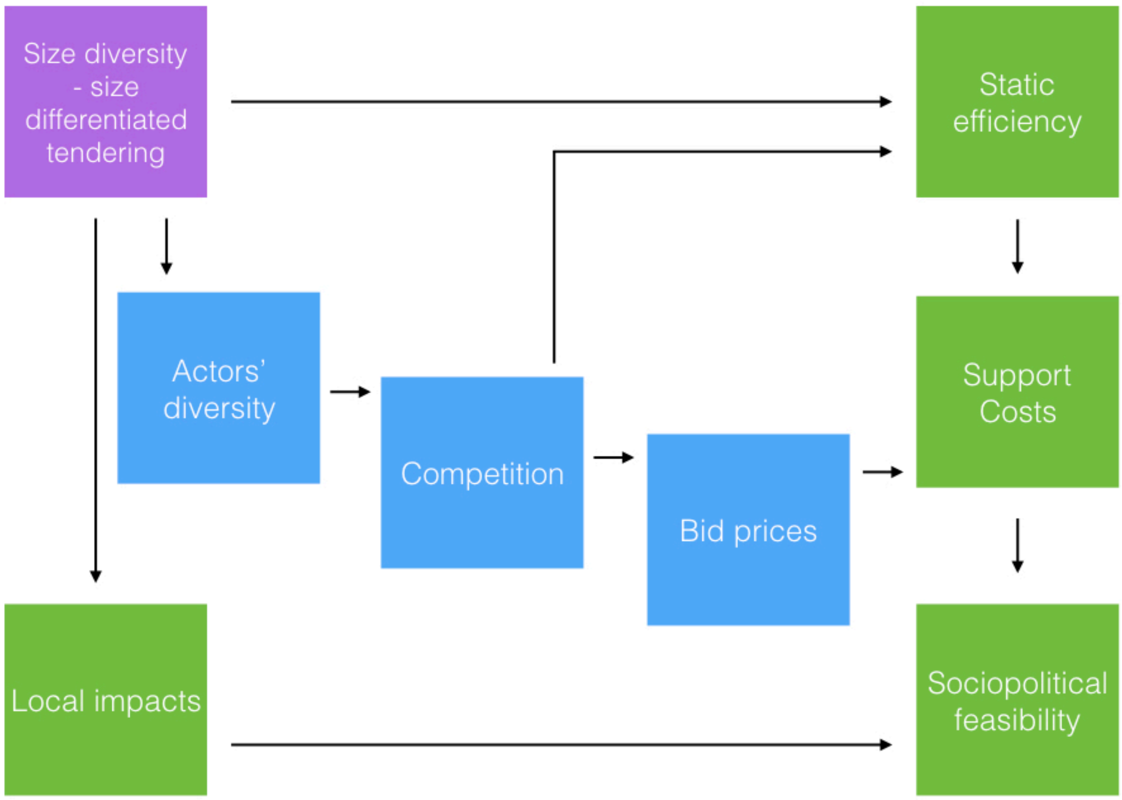
Alternatives and their pros and cons

Size-differentiated tendering procedures would entail different bidding procedures for different plant sizes. It might be argued that inducing this diversity interferes with the market and reduces allocative efficiency and economies of scale. While it is true that static efficiency may be higher with larger installations, there are some advantages in having smaller installations in place. One is that this is an indirect manner to encourage actor diversity (see next subsection). In addition, smaller installations are likely to lead to lower environmental impacts in terms of land occupation (Morris 2015) and visual intrusion (thus, less NIMBY and more sociopolitical acceptability) and lower degrees of grid congestion (although grid extension would be more likely).

How the different criteria are affected

Size diversity would encourage smaller installations. This would inhibit economies of scale in RES-E generation, negatively affecting static efficiency. On the other hand, the higher actors' diversity would enhance competition, and, thus, result in lower bids and lower support costs. In addition, the smaller RES-E plants would tend to have a lower environmental impact (visual intrusion, land occupation) and, thus, NIMBY phenomena are less likely. Both lower support costs and beneficial local impacts would make size diversity politically feasible.

Figure 9. Illustrating the impact of size diversity on the AC



4.2.3. Geographical diversity

Alternatives and their pros and cons

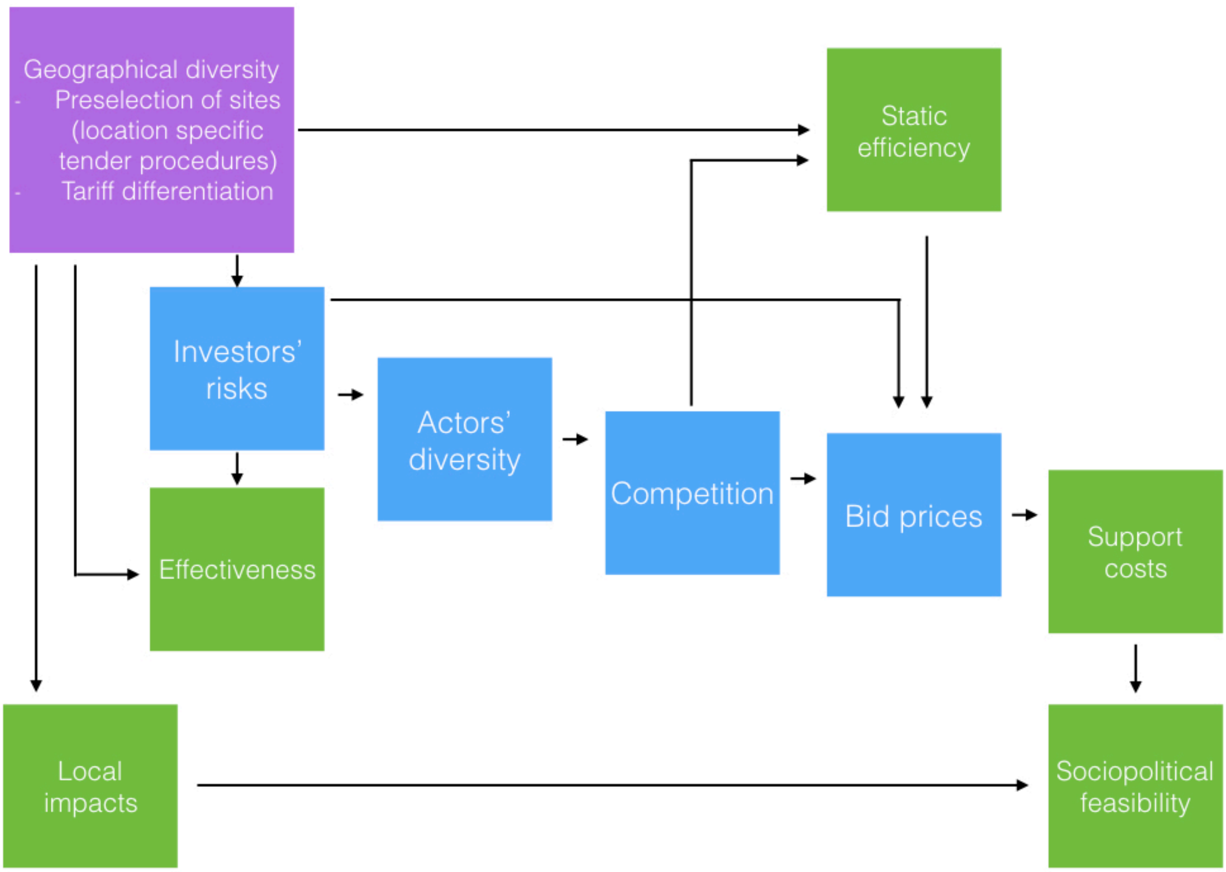
Geographical diversity can be implemented through tariff differentiation and pre-selection of sites with location-specific tendering schemes, e.g. different bidding procedures for different sites would be organised.

Despite the well-known claim that a greater geographical diversity would result in lower levels of allocative efficiency, several arguments in favour of this diversity exist, including more social acceptability given the lower NIMBY phenomena, the lower excessive remuneration in the best sites and fewer grid restrictions. Held et al (2014) argue that misdirected incentives for over-dimensioning of the rated capacity can be avoided by linking the support level directly to location-specific wind conditions, i.e. in terms of wind speeds. According to IRENA, site-specific auctions require additional government resources, but they present advantages that include reduced risk of non-compliance by freeing the investors from the liability of securing land, obtaining environmental permits, carrying out resource assessments and securing access to the grid (IRENA 2013).

How the different criteria are affected

Geographical diversity leads to a lower level of allocative efficiency compared to geographical neutrality, since the best locations are not selected and, thus, generation costs are not minimized. Therefore, comparatively higher bid prices are likely to result. However, although administrative costs are greater, the transaction costs for potential participants are lower. The lower participation costs and investors' risks increase the degree of participation, and also the diversity of actors participating. Thus, a higher level of competition is likely to result in lower support costs, offsetting the higher bids resulting from the non- minimization of generation costs. The more even geographic distribution of RES-E plants across the territory will reduce the negative environmental impacts associated to the locations of these plants and, thus, NIMBY phenomena, favouring sociopolitical feasibility.

Figure 10. Illustrating the impact of geographical diversity on the



4.2.4. Actors' diversity

Alternatives and their pros and cons

There are several alternatives to promote actors' diversity, including alternative bidding procedures for different types of actors, percentage requirements and seller concentration rules[3].

[3] Other design elements may have indirect consequences in terms of enhancing or being a barrier to the participation of smaller actors. For example, high penalties or prequalification requirements may fall disproportionately on these actors. In general, high transaction costs or too complex procedures are likely to make the participation of these actors relatively less attractive compared to larger ones.

It is frequently argued that auctions are unsuitable for small installations and smaller actors. It has been argued that some of the aforementioned factors and, namely, information failure and difficult access to finance, have a disproportionately negative impact on small actors and, thus, that the instrument is not suitable for small actors, suggesting that smaller projects should be promoted with a different instrument (Morthorst et al 2005, Mitchell 1995). It is difficult to tell a priori if encouraging large installation or actors instead of small ones is a negative aspect. Although it is explicitly assumed to be so in the specialised literature, size is a double-edged sword. Larger installations facilitate economies of scale in production but a model of distributed generation calls for smaller plants scattered around the territory. Furthermore, some RE projects are inherently large (offshore wind and concentrated solar power) and tenders may be particularly suitable for these technologies. In contrast, smaller projects may need to be promoted with another instrument.

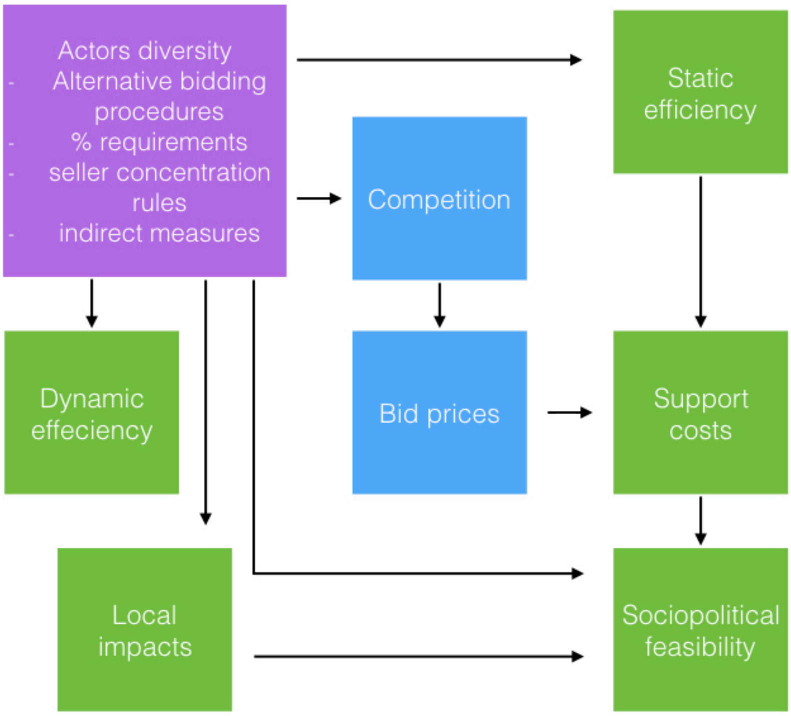
Actor diversity seems to bring a number of advantages which, again, have to be weighted against possible drawbacks in terms of static efficiency. Bringing different types of actors would alter the market structure to which the bidding procedure applies. This diversity (i.e., small together with large companies) would increase competition, reduce the likelihood of market power and collusive and strategic behaviour, and would result in lower bid prices.[4] According to Fraunhofer ISI et al (2014), ensuring a broad diversity of actors could be beneficial, for different investor types address different parts of the overall potential of a technology. Thus, for example, utilities might focus on large wind farms, whereas local communities might invest in individual wind turbines. Accordingly, a variety of actors might be needed to fully exploit the potential for RE expansion.

How the different criteria are affected

Actors' diversity favours competition and reduces the risks of collusive behavior. Lower bid prices and support costs would result. Greater private transaction and administrative costs and lower economies of scale would also be an outcome, influencing the static efficiency criteria. This would also likely affect bid prices. There would be beneficial dynamic efficiency and local impacts. The former are related to the creation of different niches for different types of users (utilities, local communities…), which allows a wider range of applications and innovations associated to those applications. Beneficial local impacts result from a lower environmental impacts and greater and more dispersed socioeconomic effects, leading to enhanced sociopolitical feasibility. Actors' diversity would also tend to favor social acceptability. Mendonça et al (2010) found that steady, sustainable growth of RES would require policies that ensure diverse ownership structures and broad support for RES. Increasing the diversity of actors reduces long-term policy risks (i.e. the risks created by policy), since the wider the range of types of actors and technologies participating, the greater the social and political legitimacy of RES-E support policies, which should ensure the continuation of public support for such policies in the future (del Río et al 2012).

[4] As argued in Fraunhofer ISI et al (2014), essentially, actors can be classified as investors, developers, plant operators or sales agents. Following this source, in this report, the discussion focuses on investors and the owners of renewable energy plants, as these actors receive the support granted in the tendering procedure.

Figure 11. Illustrating the impact of actors' diversity on the AC



The above analysis suggests that conflicts between different types of "diversities" might occur (e.g., actor and technological diversity), but that also they may share common aspects (e.g., size and actors).

4.3. Prequalification requirements

Alternatives and their pros and cons

Prequalification requirements may fall on the project or the project developer. They may include technical requirements, documentation requirements, preliminary licenses (proven technology, land secured and an environmental license obtained), deposits and other guarantees, financial capability requirements and experience. The aim of requirements on the project developer is to guarantee the financial viability of the project developer and mitigate the risk of project failure, e.g., the risks that projects contracted will be delayed and, in the worst of cases, finally not built.

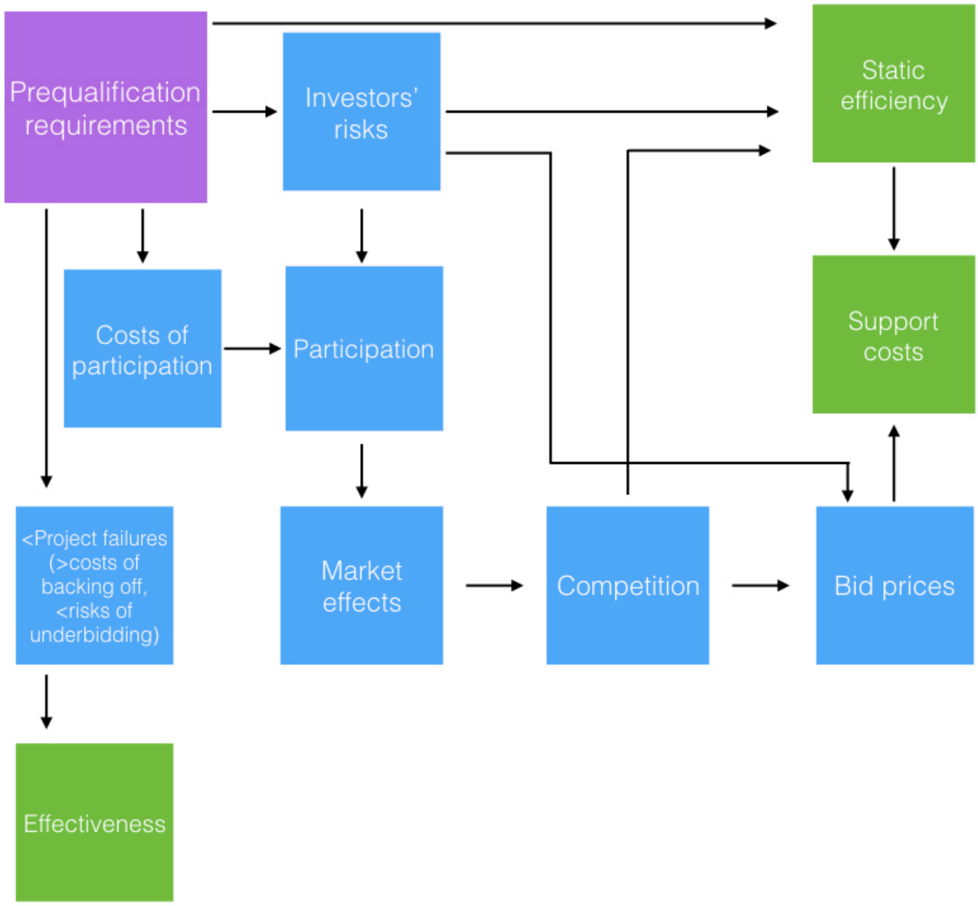
Designing prequalification requirements is a sensible issue, since they may bring some negative consequences. They increase the costs and risks of participation, deterring the participation of actors (especially the smaller ones) and reducing actors' diversity. As a result, a lower level of competition, higher bid prices and policy costs would result. The impact of these requirements on risks for investors is ambiguous. Bid bonds increase these risks (in case of non-completion), specially for actors with low equity/debt ratios. Financial guarantees such as deposits aim to reduce the societal risk of non-delivery leading to electricity supply shortages, transferring it solely to the developer (Moore and Newey 2013). As these costs are sunk at the time of the auction there is an inherent risk that they cannot be recovered (Fraunhofer ISI et al 2014). But, on the other hand, they offer some guarantee that project developers participating in the auction will finally carry out the project. The risk of winners´curse, strategic behaviour and underbidding is mitigated, although not completely removed[5]. Requiring planning/permitting before bidding reduces the failure rate of winning bids, but imposes high upfront costs which may deter many participants.

How the different criteria are affected

Prequalification requirements increase the costs and risks of participation by actors, compared to a situation in which they do not have those requirements. Both higher costs and risks discourage potential participants (lower number of bidders and fewer smaller actors, since those costs and risks fall disproportionally on these actors). This leads to lower levels of competition in the auction and, thus, higher bid prices. Higher bid prices also result directly from higher investors' risks. On the other hand, the existence of prequalification requirements is likely to result in a lower rate of project failures, since backing-off has financial consequences for winners and the risks of speculative or adventurous bidding (underbidding) would be reduced, although not eliminated. It can avoid the excessive optimism about the trends in technology costs which may lead to proposing unrealistically low bids. This has a positive effect on the effectiveness criterion.

[5] As argued by Moore and Newey (2013), without a system of deposits, there is an incentive is created to bid artificially low.

Figure 12. Illustrating the impact of pre-qualification requirements on the AC



4.4. Type of auction

Alternatives and their pros and cons

What are the design alternatives for auction formats? The most common types of auction designs used to set the remuneration level for the support of RES-E are the sealed-bid, descending clock and hybrid:

Sealed-bid: According to Maurer and Barroso (2011, p.8), sealed-bid auctions represent a special category whereby each pre-qualified bidder submits a schedule of prices and quantities. In this type of auction, all bidders simultaneously submit sealed bids so that bidders do not know the bid of any other participant and cannot adjust their own bids accordingly. There are basically four alternatives, differentiated on the basis of whether there is a single product to be allocated to a single owner or multiple units of the same product to one or multiple owners and, in the latter case, on which price is received (the same price in the case of uniform pricing or different prices in the case of discriminatory pricing). Both single-item auctions (e.g. for off-shore wind in Denmark) and multi-item auctions (e.g. for solar PV in France) have been used in the past to promote RES deployment.

Sealed-bid auctions may be used when there is a single object or product to be allocated to a single owner, for example, the construction of a power plant, and the bid consists of a single price.

- First-price sealed bid auction. In a first-price sealed bid auction, all bidders submit their bids simultaneously and unaware of the competitors' bids. The highest bid will be awarded and determine the award price, i.e. the winning bidder receives her bid in case of winning.
- Second-price sealed bid auction: In a second-price sealed-bid auction, all bidders submit their bids simultaneously and unaware of the competitors' bids. The highest bid will be awarded, but in contrast to the first-price auction not determine the price: the award price is determined by the second highest submitted bid, i.e. by the bid of another bidder if all bidders submitted only one single bid.

Sealed-bid may also be used when the auction involves several units of the same product.

- Pay-as-bid auction. In the pay-as-bid auction bids must contain quantities and respective prices. The auctioneer gathers together all the bids, creating an aggregate supply curve, and matches it with the quantity to be procured. The clearing price is determined when supply equals demand. The winners are all those bidders whose bids, or sections of their bids, offered lower prices than the clearing price. The winners will receive different prices based on their financial offers, i.e. their bids, why they are often also called discriminatory pricing auctions.
- Uniform price sealed-bid auction. The uniform price sealed-bid auction is also used when there are multiple units of the same object or product to be allocated, resulting in a single price. Bidders are allowed to bid in a similar way as in the pay-as-bid auction, and the process for selecting the winners is the same. The only difference with the pay-as-bid auction is the price each bidder receives. In the uniform price sealed-bid auction, all the winners receive the same price, which is the market clearing price. Thereby we distinguish two variants: Either the highest accepted bid determines the award price or the lowest rejected bid determines the award price.

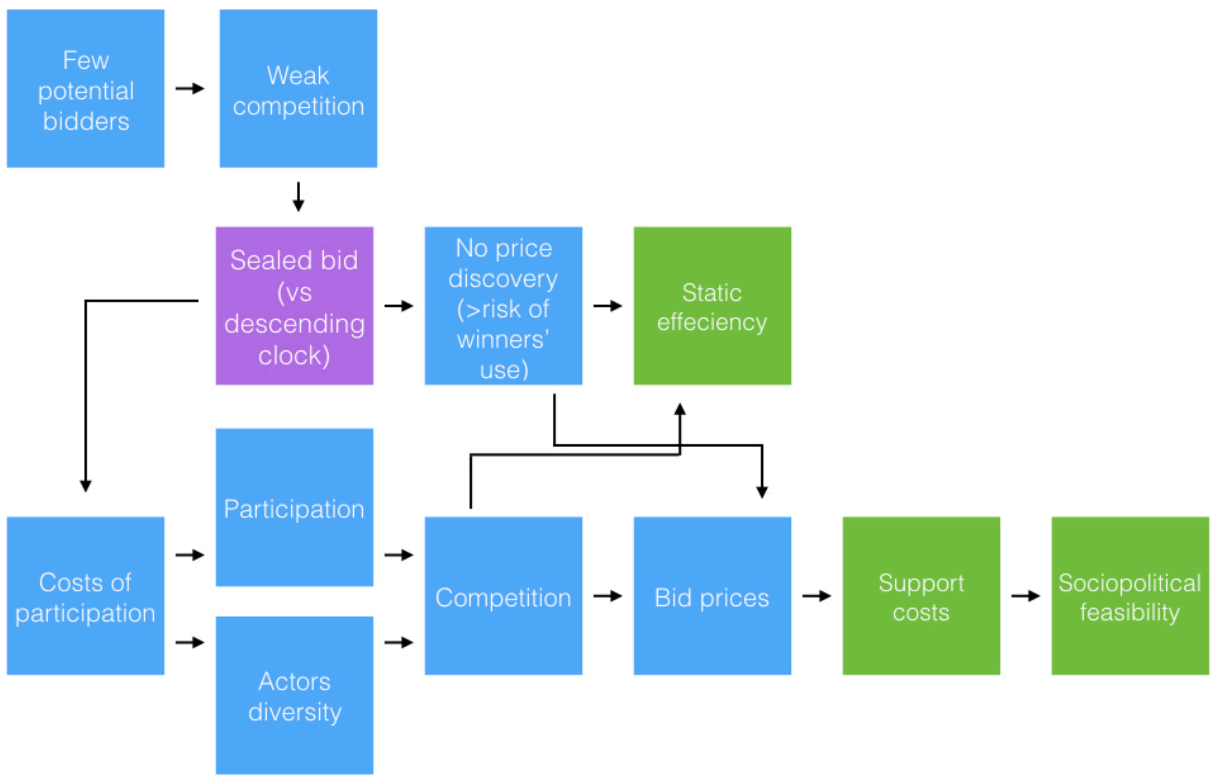
Descending clock: The price is determined throughout the auction process via multi-round bids. According to this arrangement, the auctioneer starts by calling a high price and asking bidders to state the quantities they wish to sell at such a price. If the quantity offered exceeds the target quantity to be procured, the auctioneer names a lower price, and again asks bidders the quantities they want to offer at the new price. This process continues until the quantity offered matches the quantity to be procured or until excess supply is negligible. The winners are those bidders who offer a quantity at the clearing price (i.e. the price where supply equals demand). The payment of a winner equals the clearing price times the quantity offered at that price (Maurer and Barroso 2011, p.10).

Hybrid designs. Combinations of the above are possible and would bring advantages in terms of mitigating the drawbacks of the pay-as-bid and descending clock alternatives. A combination which seems to have worked quite well in Brazil (Elizondo et al 2014) is a descending clock stage followed by pay-as-bid auction. The first phase (Phase I—Price Disclosure) encompasses a descending price clock auction. Once it is concluded, a second phase (Phase II—Negotiation), with a final round of bids using a pay-as-bids cheme, is used for the "classified" bidders of the first phase. This auction is generally used to extract value from bidders in auctions of goods with lesser-known values. The objective of the first phase is to provide some price discovery for the players so that those bidders who can sell the product at the lowest cost are selected for the second phase. Since only a small number of bidders might be left in the auction as the price decreases, it is preferable to switch to a sealed-bid stage to minimize the chances of collusion and therefore reduce the final auction price as much as possible.

How the different criteria are affected

The implementation of sealed bid auctions is more appropriate when there are few potential bidders and a weak competition (Maurer and Barroso 2011). Therefore, in this case we can draw a link from competition to design elements. However, compared to descending clock auctions, sealed bids are worst at inducing price discovery and lead to a higher risk of winners' curse (op.cit.). Higher bid prices are likely to result. On the other hand, sealed bids induce a greater participation, since they are less complex and have lower transaction costs than descending clock auctions. This increases the level of competition and leads to lower bids. The net impact on support costs is an empirical issue, but higher bid prices are likely to result according to several authors (Maurer and Barroso 2011…) [6]

Figure 13. Illustrating the impact of sealed-bids vs. descending clock on the AC



4.5. Price ceilings

4.5.1. Existence of design element

Alternatives and their pros and cons

In most auction procedures, there is the possibility to set a maximum price (or price ceiling) for bids, above which no bids are accepted. There is a broad agreement that ceiling prices are necessary to cap the risk of

[6] Note that the level of competition is affected by and affects the choice of auction procedure.

high cost to consumers in case of low levels of competition and collusive behaviour. Therefore, the discussion is about the level of the price, not its existence.

How the different criteria are affected

The existence of ceiling prices mitigates the risks of high bid prices in case of lack of competition and collusive behaviour, i.e., they cap the risks of high support costs. However, ceiling prices are not an appropriate manner to address the problem of lack of competition. This should be tackled by creating the appropriate conditions for effective competition.

Figure 14. Illustrating the impact of price ceilings on the AC

4.5.2. Level of ceiling prices.

Alternatives and their pros and cons

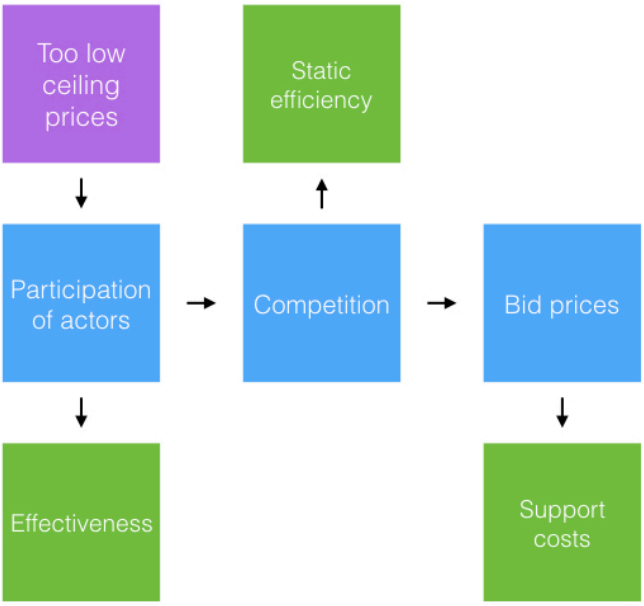
Setting the ceiling price at an “appropriate” level is not a trivial exercise and bears the risk of falling under the asymmetric information problem which is a main feature of FITs (del Río and Linares 2014). How to set this price is a crucial issue since it may affect support costs and the level of competition. If this price is set too high, bidders might collectively be tempted to bid well above their lowest possible profit margin. If it is set too low, only few bidders will enter into the auction, leading to undersupply (ineffectiveness) and a lack of competition.

How the different criteria are affected

Paradoxically, both too high and too low ceiling prices may lead to relatively high support costs. Too high ceiling prices will probably lead to high bid prices, i.e., close to the ceiling, resulting in higher support costs. In contrast, too low ceiling prices will probably induce lower participation of actors, lower competition, higher bid prices (although always lower than the ceiling) and higher support costs. If these prices are too low, few bidders may enter the auction and, thus, few projects may be realized.

Figure 15. Illustrating the impact of high ceiling prices on the AC

Figure 16. Illustrating the impact of low ceiling prices on the AC



4.5.3. Disclosure of ceiling prices

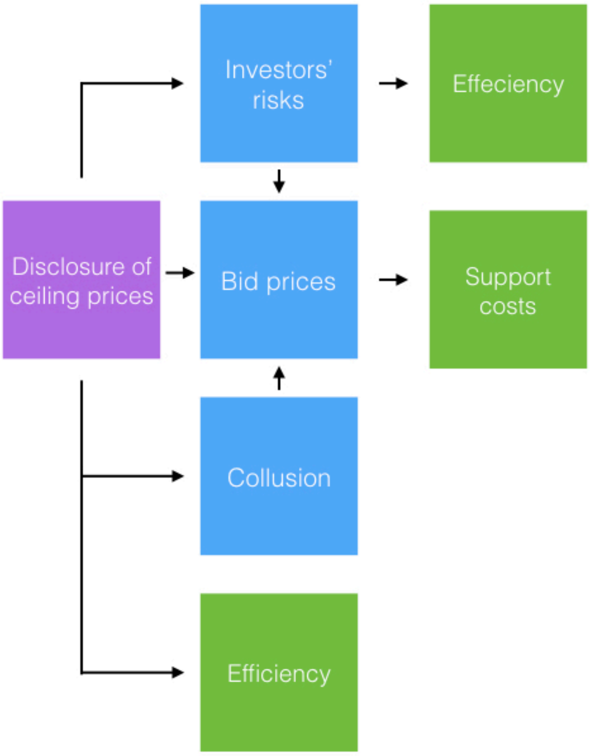
Alternatives and their pros and cons

Ceiling prices can be disclosed before the auction or not. There is some empirical evidence that disclosure usually biases the results of the auction as was the case in the first rounds in South Africa (Eberhard 2013) and Peru (IRENA 2013) since bidders tend to propose relatively high bids which are marginally close to that price, resulting in unnecessarily high support costs. On the other hand, it could be argued that, if the ceiling price is not disclosed, target fulfilment may be put at risk if too many bidders unknowingly bid above the ceiling price. Disclosure of ceiling price can be advantageous since it sets a signal of competition and mitigates the risk of collusive behaviour (strategic supply reduction). No disclosure leads to higher risks for the bidders (and, thus, higher bids) and transparency builds confidence.

How the different criteria are affected

Disclosing the ceiling prices before the auction procedure are likely to result in higher bid prices (see above) and, thus, higher support costs.

Figure 17. Illustrating the impact of disclosure of ceiling prices on the AC



4.6. Minimum prices

Alternatives and their pros and cons

Minimum prices might be implemented in descending clock auctions in order to prevent the risk of underbidding. This has been the Case in Cyprus, where a safety net was established below which bids would be excluded. However, the safety nets were not announced before the tender and were intended to be an exclusion criterion for any project bidding at a lower price (Kylili and Fokaides 2015). There is also a minimum price in Italy, set at 89€/MWh by the tendering authority (Fraunhofer ISI et al 2014).

How the different criteria are affected

Minimum prices will most likely impact only the effectiveness criterion, by reducing the risks of extremely low bid prices. By "extremely low" we mean prices which are below generation costs.

Figure 18. Illustrating the impact of minimum prices on the AC

4.7. Penalties

Alternatives and their pros and cons

Penalties can take different forms: their design might include the termination of contracts, lowering support levels, shortening support periods by the time of the delay (or multiplied by x), confiscation of bid bonds or even additional penalty payments, for instance, in case that a delay would harm security of supply (Held et al 2014). Penalties can be either be a fixed amount (i.e., the performance bond in the Netherlands) or be modulated by the delay (as in Denmark and India). They can be set per MW (as in Quebec, India, Peru and Argentina), per kWh (Denmark) or as a percentage of the investment made (Brazil)(del Río and Linares 2014).

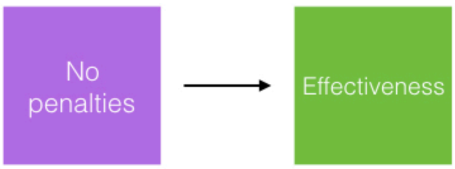
Penalties on project delays or non-realisation would contribute to effectiveness if successful projects not being built block projects which have not been successful in the tender (del Río and Linares 2014). However, high penalties would lead to substantial risks for bidding participants, high bid prices (since they are likely to be priced into the submitted offers), negatively affect actors' diversity and possibly competition, leading to higher support costs[7]. High penalties may just increase the cost and that, by themselves, they will not ensure that projects are built (del Río and Linares 2014).

Therefore, it is an issue of how penalties should be implemented and what their level should be rather than whether they should be there. Setting an "appropriate" penalty is certainly a challenge. Their level should neither be too low (rendering them meaningless) nor too high (discouraging participation by actors).

How the different criteria are affected

Lack of penalties would have negative impacts on effectiveness, by increasing the risks of project failure.

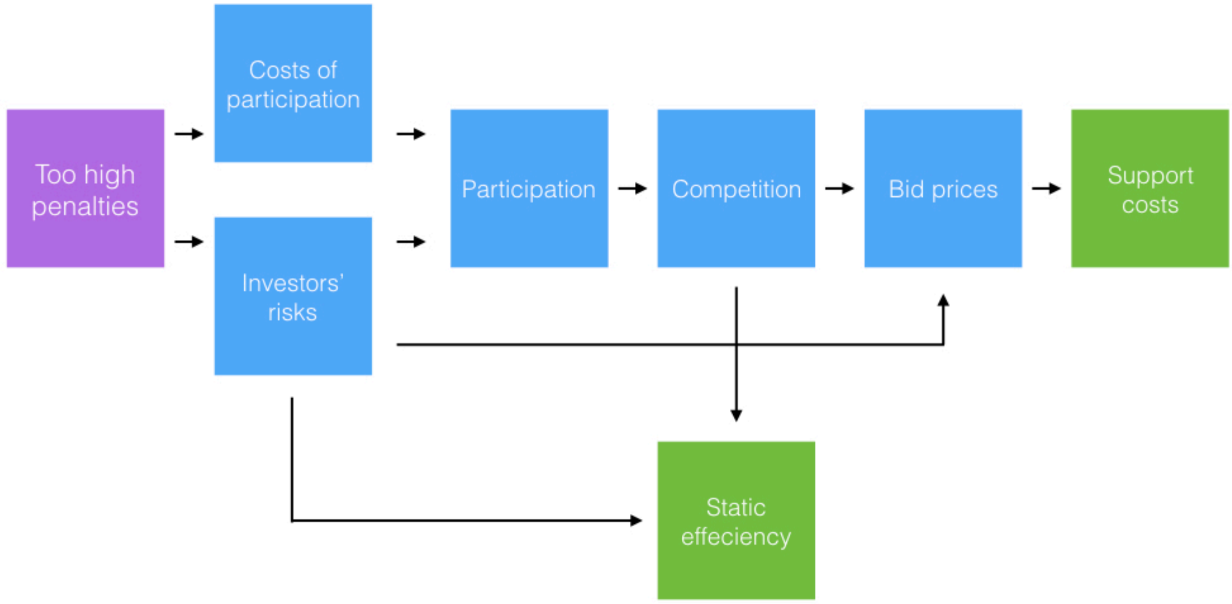
Figure 19. Illustrating the impact of lack of penalties (or very low ones) on the AC



High penalties lead to high costs and risks of participation by actors. Both higher costs and investors' risks discourage potential participants (lower number of bidders and fewer smaller actors, since those costs and risks fall disproportionally on these actors). This leads to lower levels of competition in the auction and, thus, higher bid prices. Higher bid prices also result directly from higher investors' risks.

[7] Peru provides an example of too high bids discouraging participation of actors, especially small ones. Initial quotas in Peru were not covered (500 MW for biomass, solar and wind and 500 MW for small hydro). One of the reasons for the relatively low participation in the first call was the high guarantees required (between 20000 and 100000€/kW) (Nova 2011).

Figure 20. Illustrating the impact of high penalties on the AC



4.8. Deadlines

Alternatives and pros and cons

Another relevant issue, related to the above, is whether to set a deadline to build the projects if they are to receive the contract, and how long this deadline should be (del Río and Linares 2014). A short deadline increases investors' risks (of not deploying the project) and would put upward pressure on bids. A longer deadline will allow technology progress to take place, and therefore may result in lower expected prices for renewable energy technologies. However, it may also induce overoptimism, and introduce significant uncertainty into the process (Lewis and Bajari 2011).

How the different criteria are affected

Too long deadlines would involve a greater flexibility for investors and, thus, probably lower costs (static efficiency), which could translate into lower bids. But it would also increase the risks that project costs increase between winning the bid and starting construction and, thus, that the project is not financially viable (as was the case in the U.K. NFFO, Mitchell and Connor 2004).

Notwithstanding, too short deadlines would also bring problems. They would tend to increase investors' risks, probably lead to delays and directly and indirectly affect bid prices, resulting in high support costs.

Therefore, effectiveness, static efficiency and the level of support costs would be affected with both too long and too short deadlines.

Figure 21. Illustrating the impact of too long deadlines on the AC

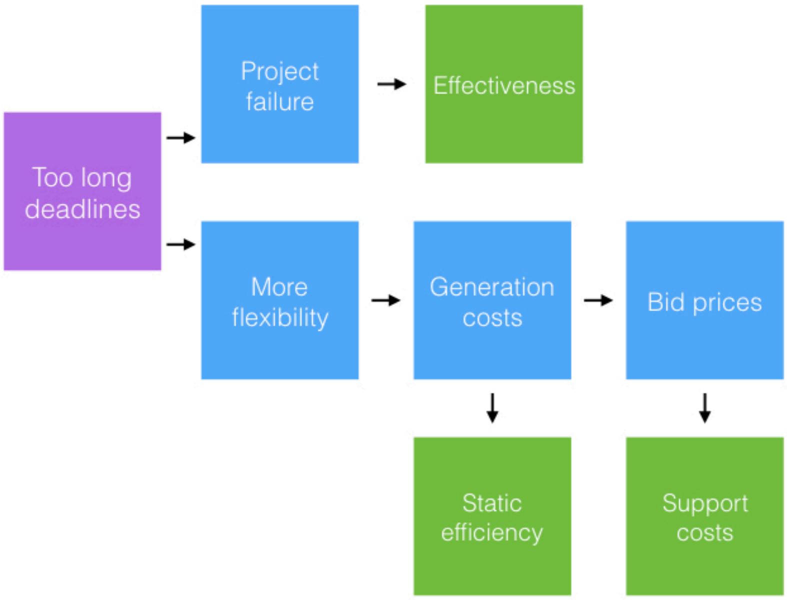
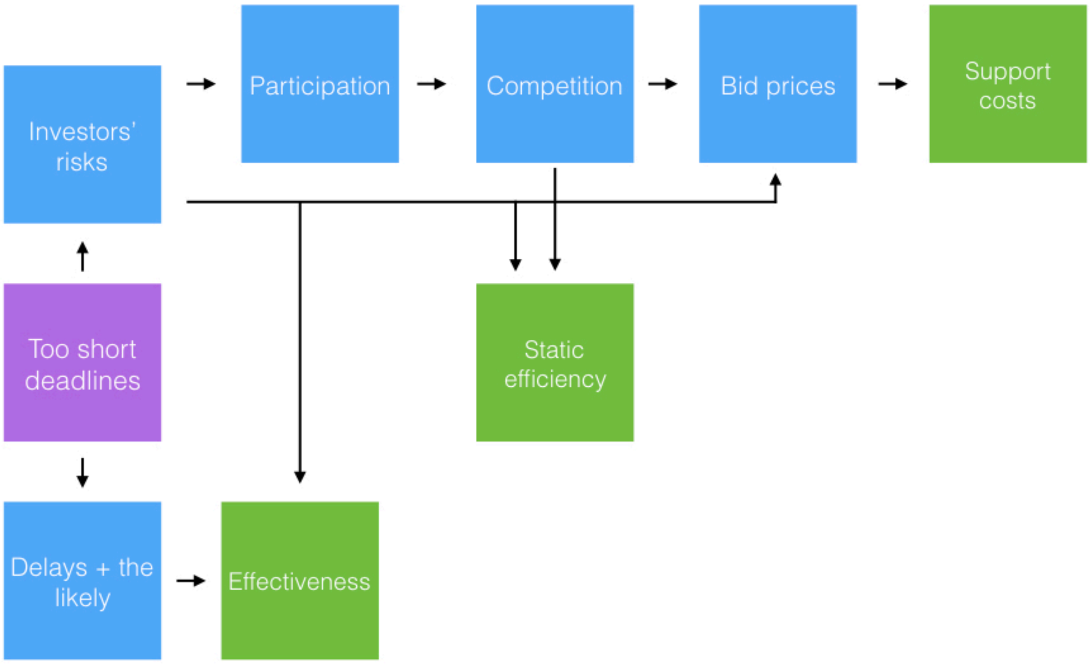


Figure 22. Illustrating the impact of too short deadlines on the AC



4.9. Duration of contracts

Alternatives and their pros and cons

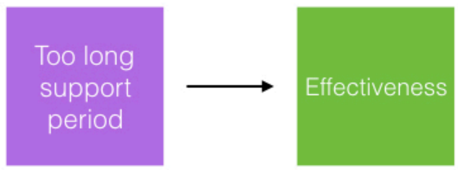
Setting a specific duration on the period over which RES-E plants are remunerated is a common design element in all support schemes, i.e., in tendering but also in FITs, FIPs and quotas with TGCs. The aim is to limit policy costs and provide certainty to investors on the period over which they can expect to be remunerated. No clear disadvantages for different alternatives in setting the duration of contracts have been identified. Therefore, the issue is not whether such duration should be set, but rather its length. Longer term contracts make it easier to raise finance and may lead to lower bid prices[8].

Common economic sense suggests that the length of the contracting period should take into account the time over which the plant can recover its costs and receive a reasonable profitability level. From an investor perspective, the calculation of those costs should be made using the LCOE approach. The duration of the contract is likely to be different for different technologies. Both too long and too short periods should be avoided. The former would lead to a high consumer burden over time. Too short support periods should also be avoided. Initially, tenders were granted based on short-term contracts. This led to high prices per kWh so that projects could recoup their capital within the short time-span (higher cost of finance). While the cost per kWh may have been high, the total amount of support may not, since support has a short time span. If access to finance is more difficult for smaller actors, these will be more affected by the too short support periods (del Río and Linares 2014).

How the different criteria are affected

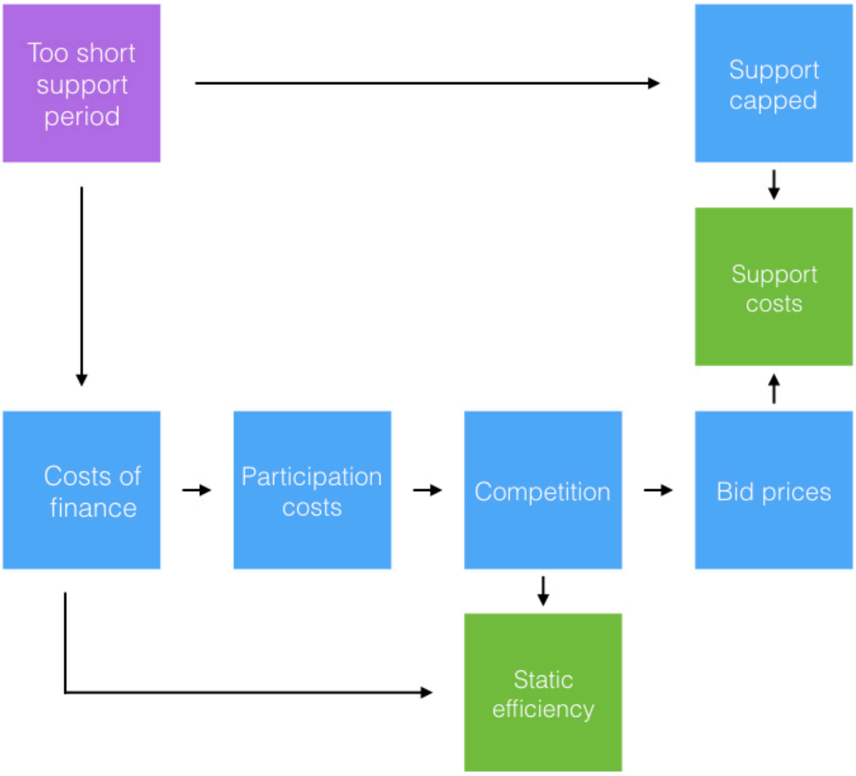
Long contract duration positively affects effectiveness. In contrast, too short support periods lead to higher costs of financing. In turn, this negatively affects static efficiency (higher LCOE) and the level of participation. The later negatively impacts competition, increases bid prices and results in higher support costs, although support would be capped by a short support period.

Figure 23. Illustrating the impact of too long support period on the AC



[8] A longer duration period in NFFO3 (15 years) with respect to the NFFO2 was one of the factors leading to a reduction in the price, since the capital repayment costs per kWh decreased (Ruokonen et al 2010).

Figure 24. Illustrating the impact of too short support period on the AC



4.10. Updating of remuneration

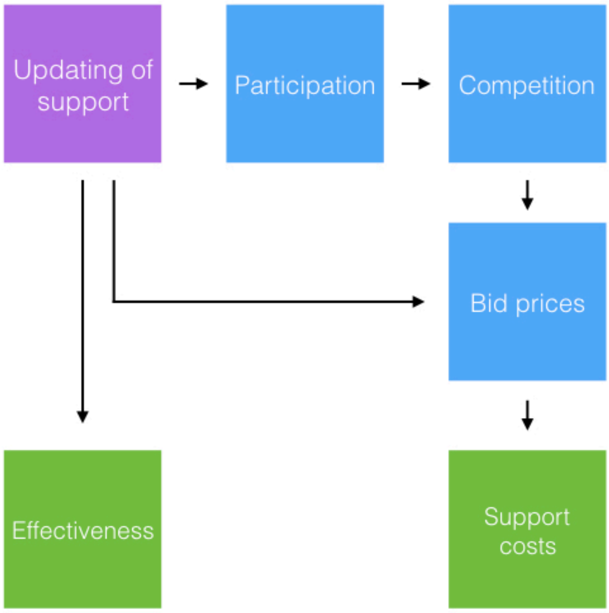
Alternatives and their pros and cons

The rationale behind this design element is to adapt the remuneration level to the context conditions of the economy over time. The more logical manner to update the support over time is to link it to the consumer price index.

How the different criteria are affected

Updating of remuneration benefits RES-E generators, who receive greater support than if remuneration was not updated, at the expense of those paying the support policy (e.g., either consumers or taxpayers). It is likely, however, that bidders will factor such updating into their bids, putting upward pressure on bid prices. In addition, the prospect of a greater remuneration would increase the benefits of participating in the auction. This would increase the number of bidders in the auction, increase competition and result in lower bid prices. This effect is likely to be limited, however.

Figure 25. Illustrating the impact of updating of support on the AC



4.11. Seller concentration rules

Alternatives and their pros and cons

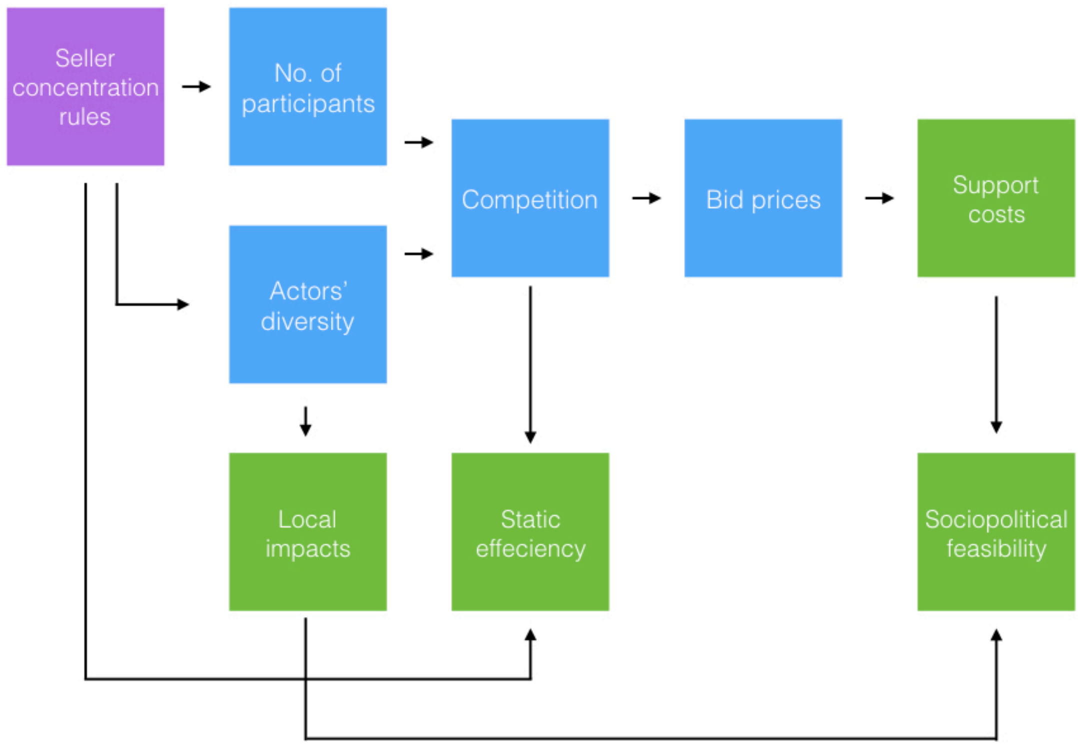
Several design alternatives are possible in this context: Setting a minimum number of bidders under which the auction will not be carried out, limiting the size of bids per bidder, limiting the number of rounds in which bidders can participate and cancelling the bidding procedure if the bidding price is excessively high.

Seller concentration rules can be justified in order to enhance competition and actors' diversity. This may be required to prevent that, if there is only a single bidder, he captures the whole budget with a very high bidding price (in the absence of a reserve price). For some, a negative aspect would be that these rules interfere with the market allocation. They may make sense in some market contexts more than in others.

How the different criteria are affected

Seller concentration rules aim at increasing competition and reducing the likelihood of collusive behavior. This would lead to lower bid prices and, thus, lower support costs. The greater actors' diversity would also likely result in beneficial local impacts (with a greater role to be played by small economic actors). Both aspects (greater support costs and local benefits) have an opposing influence on sociopolitical acceptability.

Figure 26. Illustrating the impact of seller concentration rules on the AC



4.12. Local content rules

Alternatives and their pros and cons

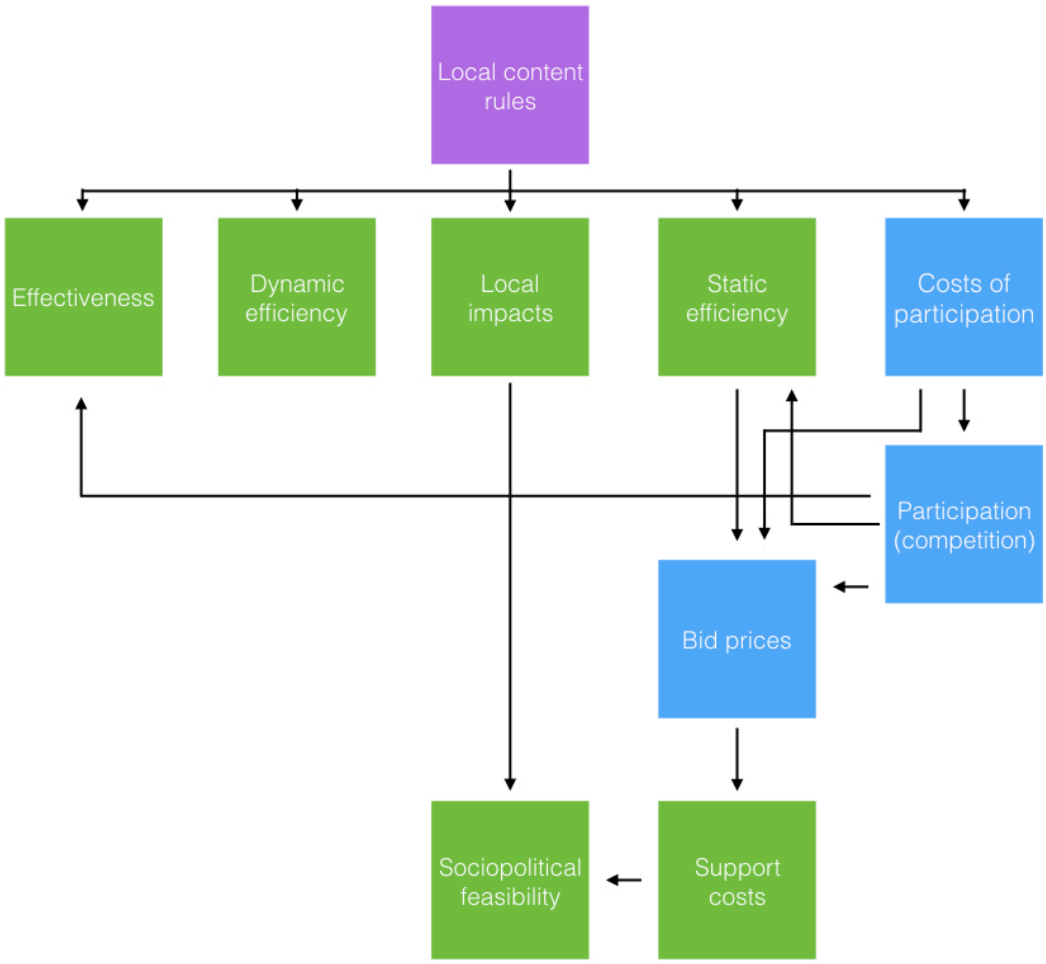
Local content rules refer to the requirement to use renewable energy equipment being manufactured by local firms. There are two main alternatives in this context: A percentage of the renewable energy equipment being manufactured by local firms and organising two auctions, one for domestic content requirement, and the other without.

Local content rules aim at enhancing the local economic development opportunities in the country. Some argue that beneficial innovation effects would result, but the impact on dynamic efficiency is unclear. While the local innovation-supply chain would be supported, it is not clear whether this is beneficial from a wider perspective. It is not straightforward that this would have benefits for the country in question since this depends on the appropriability of the benefits from learning effects. If these were not locally appropriable, the benefits to the local economy would be modest and possibly non-existent. It seems that these requirements bring more disadvantages than advantages for the successful functioning of auctions. There are several drawbacks, including fewer bidders (since local content rules increase the costs and risks for investors), lower levels of competition and higher administrative costs (monitoring and verification of the local content impact of the projects). This would end up in higher bid prices and greater policy costs. In addition, the project can be delayed if these rules are too stringent, negatively affecting the effectiveness of the scheme. If non-existent or low-quality local manufacturers are the norm, then a bottleneck for the successful completion of projects would exist.

How the different criteria are affected

Local content rules are likely to increase the costs of participation, since restricting the provision of equipment to local manufacturers would tend to result in lower quality and/or more expensive technologies. These higher costs will lead to higher generation costs. They are likely to be factored into bids both directly (and indirectly through lower levels of competition). Support costs would then be higher. The negative impact on sociopolitical acceptability has to be weighed against the positive local impacts in terms of industry and employment creation throughout all the stages of the value chain. A negative impact on effectiveness is likely if those local content rules are too stringent and investments in RES-E projects are thus made less attractive and/or if there are delays (depending on local market conditions, with few local manufacturers).

Figure 27. Illustrating the impact of local content rules on the AC



4.13. Information provision

Alternatives and their pros and cons

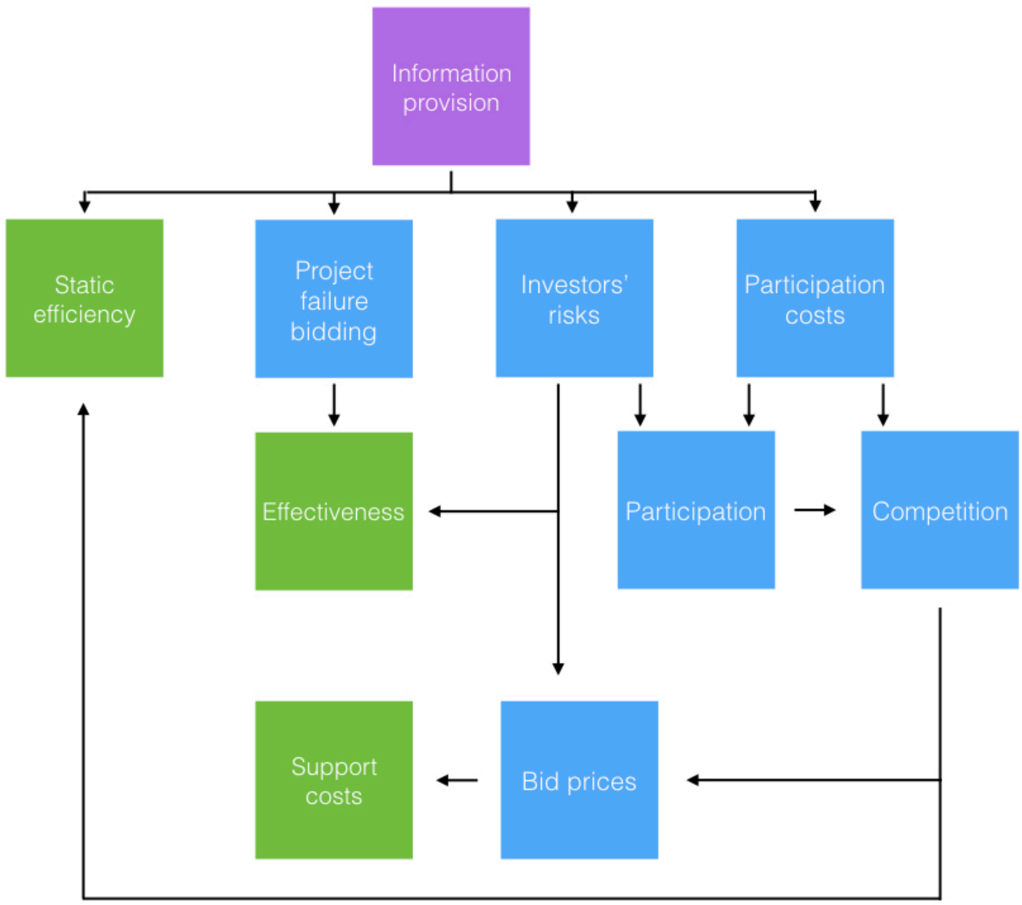
Geological and meteorological information (e.g. resource measurements) and information on administrative requirements could be provided by regulators or by an independent body to potential bidders.

Lack of information on the characteristics of the resource and, thus, about capacity factors may lead to excessively optimistic bids, i.e., to underbidding. Therefore, information provision (e.g. site assessment) could mitigate this problem. A rationale for publicly-supporting this information provision has to do with the existence of a possible market failure, i.e. with the public good character of the information. This allows all bidders more equal conditions to sharply calculate foreseen electricity generation costs (Held et al 2014). In addition, it is likely that smaller actors suffer more from this information provision problem. However, provision of this information would reduce the risks and costs for bidders at the expense of increasing the administrative costs of the support scheme. Therefore, the advantages have to be compared to the potential benefits in specific cases. In addition, the extent of the measure should be defined from the start, i.e., what type of information is provided.

How the different criteria are affected

Information provision reduces participation costs (private transaction costs) and risks for potential bidders and, thus, increases participation and competition, resulting in lower bid prices and lower support costs. It would lead to higher administrative costs and lower project failures, with a negative and a positive impact on static efficiency and effectiveness, respectively.

Figure 28. Illustrating the impact of information provision on the AC



4.14. Web-based vs. in-person auctions

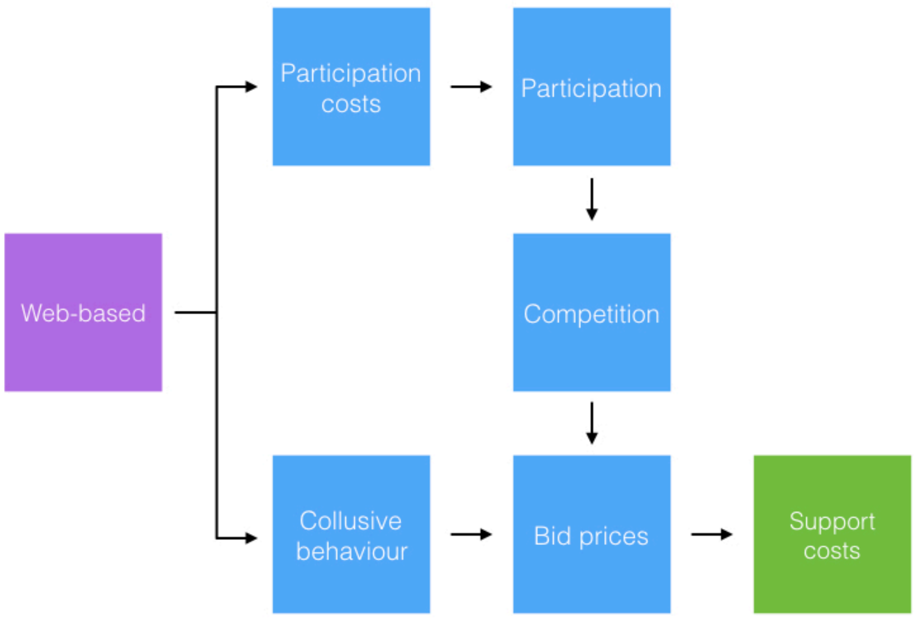
Alternatives and their pros and cons

Bidders in auctions could submit their bids through a web-based procedure or in person. Web-based auctions would possibly reduce transaction costs for participants and policy makers. However, this has to be weighed against the fact that they may increase the possibilities for strategic and/or collusive behavior, as seems to have been the case in Brazil (see de Lovinfosse et al 2013).

How the different criteria are affected

Auction procedures organized using the web would result in lower participation costs. This would enhance competition. However, if they encourage strategic and/or collusive behavior, the net impact on bid prices and, thus, support costs is uncertain with respect to in-person auctions.

Figure 29. Illustrating the impact of web-based vs. in-person auctions on the AC



4.15. Multicriteria vs. price-only auction

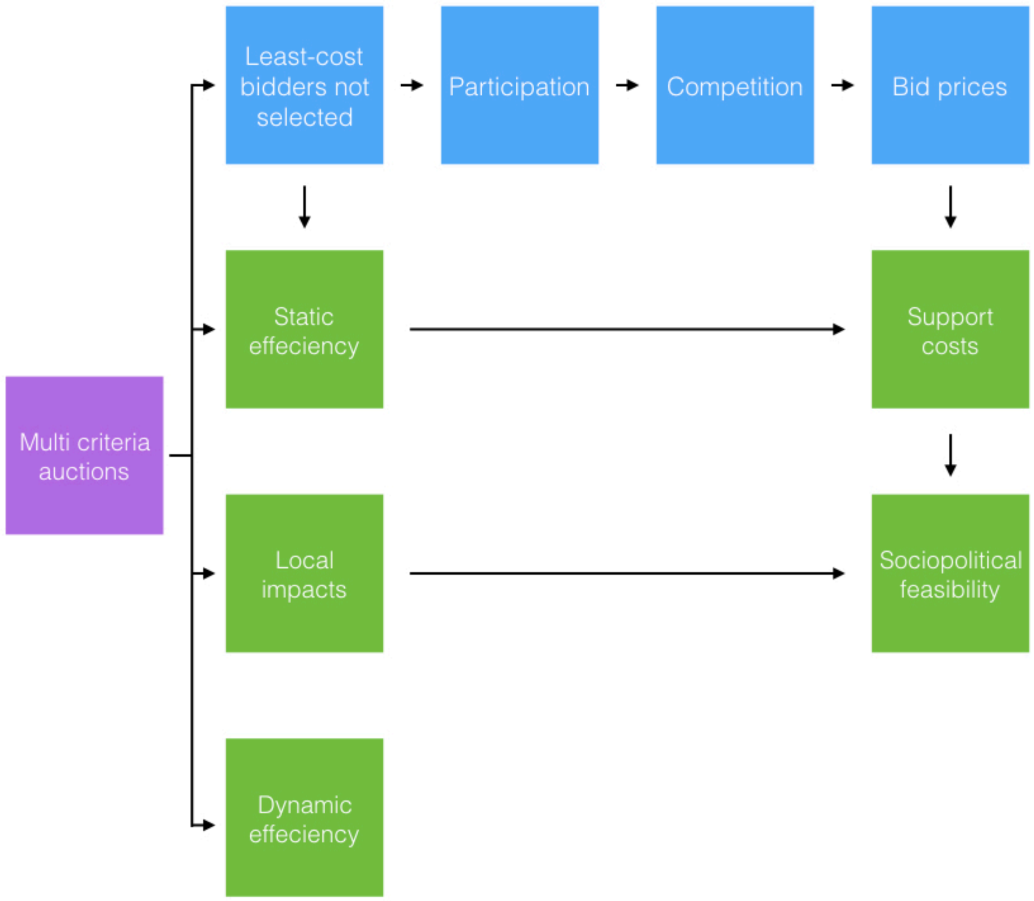
Alternatives and their pros and cons

Auctions could be organized using only a criterion (the bid price) or combining this criterion with others, such as local content requirements. Selection of the preferred bidder on criteria other than price allows for the achievement of multiple policy objectives (*e.g.* local employment, local environment, industrial development, *etc.*). Projects could be scored higher, for example, if they are located in high-load areas or in areas that currently lack electricity access, thereby engendering additional economic benefits to the jurisdiction (IRENA 2013). Two main drawbacks of multicriteria auctions with respect to single criterion ones would be: 1) the least cost bidders might not be selected. This creates an extra cost which has to be weighted with the benefits stemming from achieving those other policy objectives; 2) The weights of the criteria have to be very clear from the start in order to avoid subjective decisions.

How the different criteria are affected

Compared to price-only auctions, there is a lower probability that the least-cost bidders would be selected in multicriteria auction. This negatively affects static efficiency. The higher administrative costs under multicriteria auctions would also contribute to a lower cost-effectiveness. The higher generation costs make higher bids and, thus, support costs, more likely ceteris paribus. This has to be weighed against the positive local impacts. Both factors work in opposite directions with respect to sociopolitical feasibility. The benefits in terms of dynamic efficiency are uncertain, although the local supply chain is likely to benefit.

Figure 30. Illustrating the impact of multicriteria vs. price-only auction on the AC



4.16. Secondary market

The alternatives and their pros and cons

Under this design element, auctioning awards would be tradable in a secondary market, making the support pledge and project obligation transferrable to other projects and/or market actors.

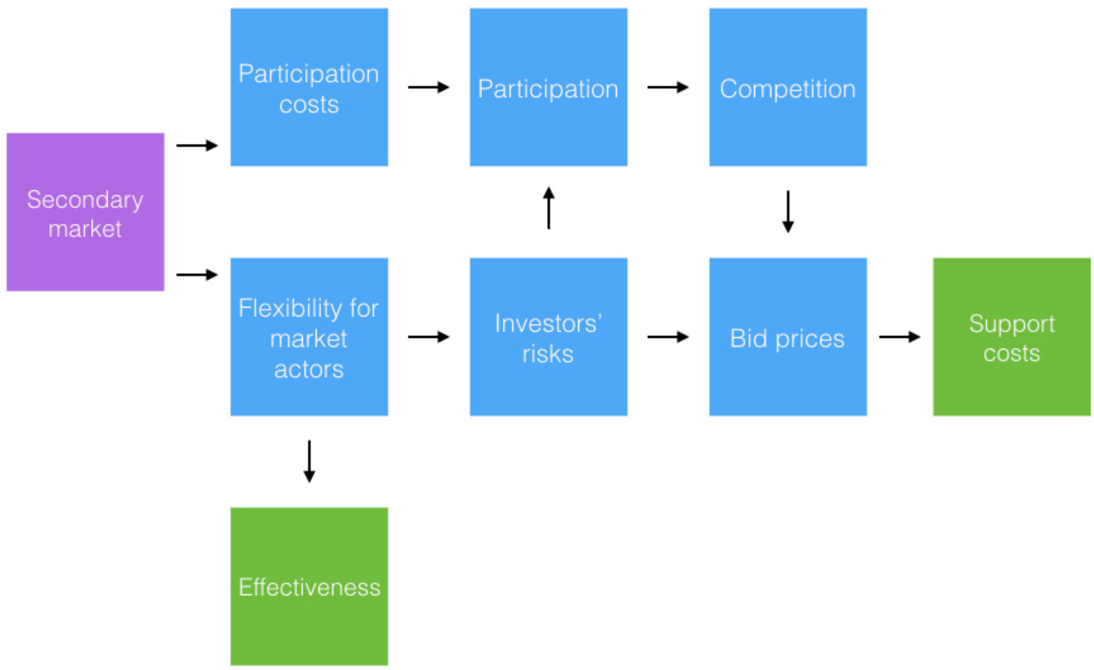
The main advantages of this design element is increasing effectiveness (improving the realisation rate of projects in the mid-term), creating flexibility for market actors, limiting risks for bidders and ensuring sufficient number of bids (Klessmann 2013, de Vos and Klessman 2014, Held et al 2014). According to Fraunhofer ISI et al (2014), if this secondary market is established in an efficient way, this would help to reduce the risk associated with the obligation to realize a project– and, by extension, the risk premium priced into the bidder's offer. The priced-in realization risk is then no longer the bidder's individual risk, but rather that of a substantially larger group, ideally consisting of all market participants.

Several disadvantages of this design element are that it may create speculation and tends to increase the required implementation periods (de Vos and Klessman 2014). It may also increase the complexity of the auction (Fraunhofer ISI et al 2014).

How the different criteria are affected

The existence of a secondary market would increase the flexibility to comply for auction participants, which would increase effectiveness. The lower risks would result in lower bids directly and indirectly through higher competition. Support costs would be lower.

Figure 31. Illustrating the impact of a secondary market on the AC



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AURES 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.auresproject.eu